

# Gist of Yojana

## May 2019



## Preface

### Yojana, May 2019: Harnessing Sustainable Energy

No one can deny the importance of value addition in the answer writing of CSE mains to get good marks. The magazines like Yojana become essential in this aspect. It is a repository of good points, data, facts and statements which can be used directly to score good marks. Many a times, direct questions are picked up from Yojana in essays or general studies papers. Moreover, it provides you with the good, in-depth and holistic understanding of the specific issue covered with almost all the analytical aspects related to the issue. It helps you in answering questions in mains exam which are becoming more and more analytical. Even in prelims exam, we find statements picked up from Yojana.

All this indicates inevitability of reading magazines like Yojana. Though reading whole magazine has its advantages, but one also has to keep in mind the time available. For this, one can choose to read the summary of magazine which also ensures the manageability of information which can be stored in mind and easily reproduced in exam. Our presented work is an effort in that direction only. It will equip you with all important points and analysis related to the topic which can be used directly in exam to score well.

The present issue is a summary of Yojana, May 2019 edition which discusses important aspects about India's development. We believe it will prove highly beneficial to aspirants in ensuring highest return for the time invested.

All the best 😊

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## Climate Change: Challenges and Opportunities

On April 1, the Indian Meteorological Department put out its forecast for April to June season: the average temperature in most parts of the country are likely to be 0.5 degree Celsius higher than normal with some areas registering temperature increase of more than 1 degree Celsius.

The IMD's forecast for last summer of higher than normal summer temperatures and heatwaves, too, was borne out. As a matter of fact, the IMD's data from its observational network finds that in keeping with the rising trend of earth's temperature, annual mean temperature in India between 1901 and 2017 has shown a significant increasing trend. Global average temperature is now 1 degree Celsius above pre-industrial levels.

As in other parts of the world, rising temperatures and warming are not the stuff of the future. And neither are impacts of warming planet. India has already been experiencing the impacts of 1-degree Celsius warming. It was evident in Uttarakhand, Chennai, Srinagar, Malin and more recently in Kerala and north-east India, the heat wave of the past summer and the uneven rainfall across the country with floods affecting some regions and very severe drought conditions facing many parts of the country. With global temperature increase likely to overshoot the "well below 2°C" goal of the 2015 Paris Agreement., the events of the past few years portends a huge and expanding danger.

Scientists working on IPCC special report, Global warming at 1.5°C, concluded that without a rapid and appreciable reduction in greenhouse gas emission, the world was on path of temperature increase of 1.5°C in twelve years that is by 2040. A warming of 1.5°C would mean that large tracts of existing coasts would be inundated and droughts and flood would intensify exposing billions of people to social and natural dangers.

Though no stranger to adverse impacts of a warming planer, the IPCC special report had a clear message for resource poor and vulnerable countries like India, would be among those most adversely affected if warming exceeds 1.5°C.

### India in A Warming World

Rising temperature and variations in rainfall will impact water supplies. The overall impact of climate change on water resources will manifest as a rise in floods and droughts. India is heavily populated 7500 km long coastline will mean that a sizeable population will be affected by sea-level rise and resulting coastal flooding. Cities like Mumbai and Kolkata too would be under threat.

## Acting on Climate Change

India has been stepping up on its efforts to slow down the rate of greenhouse gas emissions and to adapt to impacts that are already being experienced.

Climate change will require economy-wide transformation. India will need to make dramatic changes across the spectrum energy, transportation, urban and agricultural systems. It will require investing in human capital. Innovation and research and development.

In 2008, India launched the National Action Plan on Climate Change. Eight emissions – Solar energy, energy efficiency, forestry, sustainable habitat, water, agricultural, Himalayan ecosystem, and developing strategic knowledge for climate change – form the core of multi-pronged, long term and integrated strategies for addressing climate change.

As of February 2019, non-fossil fuel sources-based installed capacity accounted for 36.3% of the country's total power generating capacity of 350.16GW. though the share of non-fossil fuels sources that is renewable, hydro and nuclear has increased, fossil fuels still count for the bulk of power-generating capacity.

The dependence on fossil fuels, particularly coal, will according to the Central Electricity Authority projects a total power generating capacity of 619 GW by 2026-27. Renewable energy sources will account for 275 GW or 44% of total installed capacity while 263.88GW of capacity will be fossil fuels based.

## Highlights of India's Climate Actions

- Emission intensity of India's GDP has reduced by 21% over the period of 2005-14.
- Solar installed capacity has increased by about 9 times from 2.63 GW to 23.28GW between March 2014 and August 2018.
- The share of non-fossil sources in installed capacity of electricity generation increased from 30.5% in March 2015 to 35.5% in June 2018.
- Super critical thermal power units have risen from 40 to 66.
- A total of 120 old thermal generation units have a higher heat rate and cumulative capacity of 10.64GW have been retired till March 2018.
- Forest and tree cover increased from 24.01% of total geographical area in 2013 to 24.39% in 2017.
- Perform Achieve and trade (PAT) scheme for energy efficiency in industries and other energy-intensive sectors covering 478 designated consumers avoided emission of 31Mt CO<sub>2</sub> in cycle I.
- India in partnership with France launched the International Solar Alliance at the UN climate summit in 2015. The alliance is an effort to bring countries, particularly developing ones, together to harnessing the untapped potential of solar energy to provide universal energy access at affordable rates. The International Solar Alliance is treaty based intergovernmental organization headquartered in India.

- India is partnering 22 member countries and the European Union in the 'Mission Innovation' on clean energy, and is a co-lead in smart grid, off-grid and sustainable biofuels innovation challenges.

### What Next

The IPCC special report gives the world about 12 years to slow down warming to levels that will limit the damage resulting from a warming planet. As a lower-middle income country, India's material footprint is smaller than its high and upper-middle counterparts. However, it is already experiencing the adverse effects of material-intensive growth model: polluted air, water stress and climate change induced weather events. Clearly, as India moves ahead urbanizing at a rapid pace, building the nearly 70 per cent of its yet unbuilt infrastructure, increasing its manufacturing base, creating jobs in its non-agricultural and mining sectors, it will need to transition to production and consumption systems that are sustainable, produce less waste and use resources and products more efficiently and in a manner that can be reused, remanufactured, recycled or recovered.

Climate change is about rising temperatures, shifting precipitation patterns, extreme weather event. It is also much more. It is about changing the way we consume and produce. It is about creating more sustainable economies. And for a country such as India, filling the backlog of development in a climate constrained world poses a real and immediate challenge.

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## Energy Efficiency is the key for Sustainable Development

In India the electrification of households has taken place on a massive scale and demand for energy has increased. One of the key reasons for this has been the growing population. Another is enormous increase in energy intensive economic activities. As the conventional sources of energy are reducing and renewable sources are under developing phase, improving energy efficiency at all levels of energy-spectrum is the cost-effective and quick solution to address this problem.

The government through Nationally determined Contributions has aimed to reduce emission intensity of GDP to 33-35 per cent below what it was in 2005 by 2030. However, to achieve this target there is a need for a concerted move to ensure increased energy efficiency especially in three sectors:

- Industrial
- Real estate
- Consumer Appliance

### Industrial Sector

Industrial sector continues to be the highest energy consuming domain where energy conservation would play a vital role. There is also huge potential for energy conservation and technology enhancement for efficiency in key intensive industries. With an aim of energy efficiency improvement, Bureau of energy efficiency (BEE) is implementing Perform, Achieve and Trade (PAT) scheme under National Mission for Enhanced Energy Efficiency (NMEE).

### PAT

It is regulatory instrument to reduce specific energy consumption in energy intensive industries, with an associated market-based mechanism to enhance the cost effectiveness through certification of excess energy savings which can be traded. PAT cycle –I had 478 DC's covering total 8 sectors including Aluminium, Cement, Chlor-Alkali, fertilizer, Iron & Steel, Paper& pulp, Thermal Power Plant, Textile, which are mandated to reduce their specific energy consumption.

The energy savings of the Designated consumers of PAT Cycle –I have been converted to tradable energy savings Certificates. PAT in its second cycle seeks to achieve an overall energy consumption target of 8.869 MTOE. Since PAT cycle is currently based on a rolling cycle i.e. inclusion of new year, the "third cycle" of PAT was notified in March 2017 and it seeks to achieve an overall energy consumption reduction of 1.06 MTOE for which SEC reduction targets have been assigned to 116 DC's from six energy intensive sectors. Targets of the "fourth cycle" of PAT have been notified from existing sectors and two new sectors i.e. Petrochemical and Commercial Buildings (Hotels) with an overall SEC reduction target of 0.6998 million tons of oil equivalent.

## Real Estate Sector

The idea is to create a simple and implementable code focusing on building envelope which can be integrated with the existing building codes and bye-laws.

The design of the building envelope will have a direct impact on:

- Heat conduction through the roof, opaque wall and glazed windows.
- Solar radiation gains through glazed windows
- Natural ventilation
- Day-lighting

Eco Samitha (Energy Conservation Building Code for Residential Buildings)

The Eco-Nivas Samitha (Part – I: Building Envelope) aims to set minimum building envelope performance standards to limit heat gains (for cooling dominated climates) and to limit heat loss (for heating dominated climates) as well as for ensuring adequate natural ventilation and daylighting. The code is applicable to all residential use buildings projects built on plot area  $\geq 500$  meter sq. The code has been developed with special consideration for its adoption by the urban local bodies into building bylaws.

Its early and immediate was aimed at improving the construction and design of new residential building stock, as it is being built currently and in the near future, to significantly curtail the anticipated demand for comfort cooling in times to come.

## Labelling Programme for Energy Efficient Homes

Energy labels help consumers to make efficient decisions through the provision of direct, reliable and cost less information. The objective of proposed labelling programme is mentioned below:

- To provide information to consumers for EE homes
- Energy sustainability for India
- To achieve Indian NDC Targets
- Market Transformation for Energy Efficiency in housing sector

In conjunction with this, programme also brings up various ancillary benefits:

- It shall act as an embryo to stimulate the larger energy-efficient materials and technologies market.
- After the implementation of the labelling mechanism, the housing value chain would encourage on additional set of professionals to expedite the complete process of residential label granting.
- It will also motivate material manufacturers to invest in energy –efficient material manufacturing in India
- Labelling mechanism shall cause a reduction in bills. This will empower individuals with a greater disposable income that can be consumed at other avenues, saved for future contingencies or invested for cash generating asset creation for overall economic growth.
- It helps the nation in working towards the fulfillment of global Sustainable Development Goals 7 of united nations: Affordable and clean energy.

## Tapping Sustainable Energy Alternatives

What is sustainable development? Sustainable development is “development that meets the need of the present without compromising the ability of future generations,” which otherwise means “economic development that is conducted without depletion of natural resources.”

At the 1972 UN Conference in Stockholm, the world body raised concerns for preserving and enhancing the environment and its biodiversity to ensure human rights for healthy and protective world. According to World Health Organization, climate change affects the social and environmental determinants of health – clean air, safe drinking water, food security and shelter. Between 2030 and 2050, climate change is expected to cause approximately 2,50,000 additional deaths every year from malnutrition, diseases like malaria, diarrhea and heat stress. Its cost to health is estimated to be between 2-4 billion US dollars a year by 2030.

Since climate change is the defining issue of the present times, the world body has taken the initiative to reduce emissions of greenhouse gases through better transport, food and energy-use to bring in improved health, particularly reduced air pollution.

India is a signatory to the landmark Paris Agreement on climate Change, which has brought all nations to a common cause to undertake efforts to combat climate change through Nationally determined Contributors (NDCs) and to strengthen these efforts in the years ahead.

India has now embarked on a mission to bring down the share of fossil fuel in its energy basket, by tapping non-conventional sources. India being the founding nation of international Solar Alliance, has the leverage to switch over to cleaner energies and clean-up its smog choked cities.

The national Solar Mission promotes ecologically sustainable growth, while addressing the country's energy security challenge and contribute to global effort to meet climate change.

If India develops its alternative and sustainable sources of energy, the country does not require crude imports. It has the alternative sources in abundance as crude substitution, according to scientists involved in energy research.

Crude import is a key factor in India's current account deficit, which currently is 49 billion dollars or 1.9 per cent of the Gross Domestic product(GDP). The increasing CAD is a cause of concern for the country and if it crosses the threshold of 3 percent of the GDP, it would badly affect the economic stability.

Another technology that has been unveiled by Indian Scientists is for conversion of sewage into biofuels. A sewage treatment plant launched in Delhi would convert 10 lakh litres of sewage into three tonnes of biofuels per day.

India has a huge potential for producing liquid and gaseous fuels from biomass. A strategy for gradual reduction of import dependency has been initiated, as the country would continue to remain vulnerable to international situations. The strategy targets to reduce import dependency by 10 percent by 2022.

Besides biofuels, India has the potential to generate green energy from solar, Wind, Geothermal, Ocean thermal Energy, which are all non-carbon options and can help reduce carbon imports by demand substitution. Also, hybrids are expected to emerge in the energy sector like Wind-Solar and Wind-Solar-Biofuels.

Road transport sector accounts for 6.7 per cent of India's GDP. Currently diesel alone meets an estimated 72 per cent of transportation fuels demand followed by petrol at 23 per cent and balance by other fuels such as CNG, LPG, etc. for which the demand has been steadily rising.

The extraction and utilization of coal have created a massive impact on environment with far-reaching consequences. Nearly 65 per cent of India's electricity is generated from thermal power, for which the feedstock is invariably coal mined in India. Power generation through the Boiler-Turbine route results in atmospheric pollution due to particulate matter, carbon dioxide, Sulphur and nitrous oxides.

The other major energy source is oil. Oil pollution is an inescapable face of life in the 21<sup>st</sup> century, when the teeming millions depend on oil for various modes of transport. The process of extraction of oil, transportation and storage of oil cause enormous loss to natural and human environment. India has set a target to phase out petrol and diesel-driven vehicles by 2030.

Another major source of environmental pollution is nuclear power generating. Nuclear plants create 50% more thermal pollution than fossil fuel plants. The challenge India faces now is to improve energy access to modern energy at affordable price in a sustainable and responsible manner without sacrificing economic growth or social development to meet the aspiration of its burgeoning population.

## Steps to achieve India's Solar Potential

The needs of India's burgeoning population are rising however, the status quo of the resources might not be adequate to fulfil the growing demands of fast paced economy. Take for example power sector.

Country's per capita consumption of electricity stands at meagre 1,100IWh/year which is much lower compared to other large economies like the US and China. Demand for power is set to rise further with increasing rates of urbanization and industrial growth. Plugging this demand-supply gap by augmenting capacity in the power sector is the key priority for the policy makers.

India must honor its global commitment on curbing greenhouse gas emission, as per the Paris agreement, implying we need to move away from fossil fuel driven growth path. Clearly we need to look at alternate solutions so we can address our energy security, in a sustainable fashion, with a progressive reduction in carbon levels

However, there is room for more strategic interventions to fully realize India's solar potential and plenty of groundwork is needed to help us move closer to the ambitious target of 100GW solar power capacity by 2022. Here are five areas that more attention and focus, to take the Indian solar power industry to the next level.

**i. Technology**

While solar is becoming an important contributor to energy need sin India, there is still huge gap to be filled. Rooftop solar solutions for example, can add large capacities but certainly need a push from respective state governments. Newer advancements in the field like floating solar (solar panels mounted on structures that float on water bodies), the BIPV (wherein the conventional materials used for facades and roofs of buildings are replaced by photovoltaic systems) can play a vital role in increasing capacity. Considering the huge potential in the sector, both the government and private entities must emphasize and support R&D and adoption of latest technology and innovation in this area.

**ii. Policy Push**

Thanks to the technology evolution and government policy, solar power tariffs have decreased over the past few years making solar energy more accessible to common man. However, tariff margins discovered in reverse auctions have been pushed lower in recent years leading to a squeeze in profit margins. Considering that tariffs are now significantly lower than other sources of energy, we need to move towards healthier tariffs to help private players work with sustainable business models, and attract a higher capital inflow. This will eventually lead to augmented supply and further lowering of prices for common people.

**iii. Discom Health**

Despite the government's initiatives to reinvigorate power distributing companies, the health of state discoms has not improved much over the years. These distribution companies form a crucial link in the cycle of energy generation and have an impact on the overall process. Hence, maintaining in good shape forms and extremely important link on the road to 2022.

**iv. Financial Reforms**

Reforms in banking systems will go a long way assisting the renewable energy sector. As of now, sector categorization of banks sees, renewables as part of the power sector, due to which for most banks, the loan limit is majorly consumed by thermal plants and only a small fraction only remains available for the renewables sector. Considering the above, renewables should be categorized as a separate sector. This will help widen access to funds and simplify the process of loan procurement for the companies. The government can also consider according private sector status to renewable, given its strategic importance.

**v. Enabling ease of doing business**

The government's pursuit of reforms has created a more conducive environment for investments in India, reflected in our steady rise in Ease of doing business rankings over the past couple of years. However, faster processing of approvals for project implementation across the value chain, especially conversion approvals of land in different states would be of great help to the renewable sector.

Government should work on building more robust transmission systems. This will not only increase investor faith in the overall process but will ensure no MW loss/leakage during power distribution.

The government has a key role to play – not only by providing the required policy support but also acting as a central coordinator – guiding and synchronizing efforts from various stakeholders, to catalyze the solar industry's growth.

## Biogas – A story Untold

India generates about 1,45,128 tonne of waste daily and on an average 46 per cent of it is processed daily, according to Ministry of New and Renewable Energy (MNRE).

For a country like India that is heavily dependent on expensive imported oil and gas as imports as well as coal for meeting its energy requirements, it definitely makes more sense to look at alternative resources. And this is where the Waste of Energy programme propagated to recover energy in the form of Biogas/BioCNG/ Power from urban, industrial and agricultural wastes gains importance. Besides, it also promotes off-grid connectivity.

While a programme of this kind requires government support, the challenge is to ensure that various ministries work in synergy. Another, challenge for Waste of Energy management is, how various schemes can become revenue generator for small players.

But, there is a hitch here – shifting social dynamics.

Maintaining cattle is becoming difficult for an individual. Therefore, individual biogas plants are seeing a decline. However, scope for larger plants is growing with more private dairies coming into business. So, the effort should be to promote larger projects.

About 184 Waste to energy plants based on urban, industrial and agricultural wastes have been set up in private sector with an aggregate capacity of 315.24 MWeq. However, there are still many challenges remaining to promote this programme as it also means undoing a social mindset.

It also needs to be ensured that Waste to Energy plants themselves do not violate any environmental norms particularly for municipal solid wastes. Market of the concepts is another uphill task which requires governmental involvement as well as financial support is needed in setting up a m=plant, which is not cheap.

Biogas can be used for transport fuel. In fact, oil refining and marketing companies have got in to act in to make it a reality. According to experts, Compressed Biogas, has the potential to boost the availability of more affordable transport fuels, better use of agricultural residue, and cattle dung, as well as to provide an additional revenue source to farmers.

Called Sustainable Alternative towards Affordable Transportation (SATAT), it is expected to benefit vehicle users as well as farmers and entrepreneurs. Besides, CBG will also help bring down dependency on crude oil and Gas imports. The potential for CBG production from various sources in India is estimated at about 62 million tonnes annually.

CBG can be produced from various bio-mass/waste sources, including agricultural residue, sugarcane press mud, distillery spent wash, cattle dung and sewage treatment plant waste. The other waste streams like rotten potatoes from cold storages, rotten vegetables, dairy plants, chicken/poultry litter, food waste, horticulture waste, forest residues and treated organic wastes from industrial Effluent Treatment Plants (ETPs) can be used to generate biogas.

In fact, CBG is similar to the commercially available natural gas in its composition and energy potential and can be used as an alternative, renewable automotive fuel. Given the abundance of Biomass in the country, CBG has the potential to replace CNG in automotive, industrial and commercial uses in the coming years.

There are multiple benefits of converting agricultural residue and cattle dung into CBG on a commercial scale:

- Responsible waste management, reduction in carbon emissions and pollutions
- Additional revenue source for farmers
- Boost to entrepreneurship, rural economy and employment
- Support to national commitments in achieving climate change goals
- Reduction in import of natural gas and crude oil
- Buffer against crude oil/gas price fluctuations

While solar and wind did develop a glam quotient, they can only be intermittent to coal or others fossil fuel. What can actually work in favor of India is Biogas. Biogas cannot succeed without governmental support as it is still at a very nascent stage here. But, once it takes off, the government can play the role of a facilitator and allow private sector to run the business.

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