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Sustainable Development through Renewable Resources

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Abstract: ***India has a massive demand for energy to drive its rapidly growing economy and developmental needs. Since Independence India heavily relied on conventional form of energy among them coal dependency was highest for energy production. However India has always been committed to adopt alternative form of energy sources (Renewable energy like Solar, Wind, Tidal etc) for Sustainable development. India has been promoting clean energy resources through multipronged policies, National and International collaboration. India also making active efforts to deal with the climate change by enhancing the acceptance of renewable energy technology and R&D in renewable energy technology.***
Keywords: Sustainable Development, Greenhouse Gases, R&D

I. INTRODUCTION

As a developing nation India has a massive demand for energy to fuel its rapidly growing economy and developmental needs. However, the country has always been committed to looking for more alternative energy sources for sustainable development. Therefore, it has been promoting clean energy resources and making efforts to deal with climate change. Sustainable Development, as defined by the United Nations, is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The scale, spread and pace of development has posed an inevitable challenge of balancing the spirit of human endeavour to conquer new heights without compromising the fundamental principles of sustainable development. The ever−increasing need for energy for both human and economic growth has coincided with an increase in the variety of sources that may be used to generate energy. The generation and use of these energy resources are the primary contributors to the release of greenhouse gases all around the planet. Since, emissions of greenhouse gases are one of the primary causes of climate change, nations all over the globe are making concerted efforts to transition to cleaner forms of energy by altering the processes by which energy is generated. The shift towards renewable energy has the potential to make countries self−sufficient in terms of energy security. Considering its possibility to de-carbonise the energy system and ensure self-sufficiency, recent years have seen a rise in interest in clean energy as various economies and nations seek to reduce their reliance on highly polluting fossil fuels.

II. ENERGY SECTOR

1) The progress and development targets achieved by the human civilization rest upon the wide and extensive use of energy in different forms.
2) While discussing the sustainable alternatives it is largely accepted that choosing an energy strategy inevitably means choosing an environmental strategy.
3) As on today India is consuming about 9000 billion units of energy for various purposes.
4) About 47% of the total energy is sourced from coal and lignite, 31 per cent from crude oil, about 15 per cent from electricity (hydro, nuclear and other renewable sources) and 8 per cent from natural gas.

A. *Impact of Fossil Fuels*

1) Other than the never−ending fear of extinction and carbon emission the fossil fuels also pose many strategic and health challenges.
2) The changing climate is affecting the spread of infectious diseases, putting populations at higher risk of emerging diseases and co−epidemics and coastal waters are becoming more suitable for the transmission of vibrio pathogens (a major food−borne pathogen that causes life−threatening diseases in humans after the consumption of raw or undercooked seafood).
3) These facts clearly indicate that the development achieved through burning of fossil fuels cannot be sustainable and that we must explore renewable energy options.
4) India has updated the Nationally Determined Contributions which embody efforts by each country to reduce national emissions as stipulated in Paris Agreement.

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5) India now stands committed to reduce Emissions Intensity of its GDP by 45% by 2030 from 2005 level and achieve about 50% cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030.

III. RENEWABLE ENERGY

Today, India is a power surplus nation with a total installed electricity capacity of over four lakh Mega Watt (MW). Keeping in mind the sustainable development goals, India's power generation mix is rapidly shifting towards a more significant share of renewable energy.

1) Today, India is the world's third largest producer of renewable energy, with about 42 per cent of our installed electricity capacity coming from non-fossil fuel sources.
2) Estimated renewable energy potential of India (other than large hydro) is about 1.5 million MW, of which 50 per cent is from solar, 46.7 per cent from wind, and the remaining from small-hydro, biomass and waste to-energy. Status
3) Contribution It currently contributes about 10% of India's electricity needs.
4) Price of renewable energy has plummeted.
5) The cost of solar power has dropped roughly sixfold from 12 rupees (14 cents) per kilowatt hour in 2011 to 2.5 rupees (0.03 cents) per kilowatt-hour.
6) Economic savings The planned buildout of 76 GW of solar and wind power by 2025 will avoid the use of almost 78 million tons of coal annually and could lead to savings of up to 1.6 trillion rupees ($19.5 billion) per year.

A. *Gujarat*

1) Coal's share in producing electricity for Gujarat fell from 85% to 56% in the last six years, according to analysis by London-based energy think tank Ember
2) The share of renewable energy for Gujarat grew from 9% to 28% in the same period.
3) Gujarat is one of four of India's 28 states that met their renewable energy targets for 2022. • Other states: Most states have installed less than 50% of their targets and some states such as West Bengal have installed only 10% of their target.

B. *Solar Power*

1) The last decade has witnessed surge in the use of solar energy based decentralized and distributed applications. Millions of Indians are now using solar power for lighting, cooking, mobility, and other energy needs.
2) The solar power-based cooking has significantly improved quality of life, especially of rural women and girl children, by reducing the drudgery of long haul of fuel woods and risk of lung and ailments caused by kitchen smoke.
3) Easy access to power in remote areas have boosted economic activities and employment opportunities, and thus helped in mainstreaming the under-developed zones.

C. *Wind Power*

1) The Government has been promoting wind power projects by incentivizing the investments through Accelerated Depreciation Benefit, which allows an investor to claim higher rate of depreciation in wind power infrastructure than that for the general assets.
2) The allowed rate of depreciation was 100% when the scheme was first introduced in 1994 and later rationalized to 80% and to 40% in a phased manner.
3) In 2015, Government of India notified National Offshore Wind Energy Policy with the primary objective of exploring and promoting deployment of offshore wind farms in the Exclusive Economic Zone (EEZ) of the country, including those under Public Private Partnership.

D. *Hydro Power*

1) According to the assessment made by Central Electricity Authority (CEA), India has the potential of economically exploitable hydropower to the tune of 1,48,700 MW.
2) If the probable capacity of pumped storage of 94000 MW and that of about 6700 MW from small, mini and micro hydel projects are considered, India's hydro power potential will be about 2,50,000 MW.
3) However, only less than 30 per cent of this is presently exploited despite having long life, low cost and high efficiency among many other advantages.

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E. Biofuels

1) Ethanol and biodiesel are the two most common types of biofuels in use today.
2) Ethanol is a renewable fuel that can be made from various plant materials, collectively known as biomass.
3) Government has been implementing Ethanol Blended Petrol (EBP) Programme wherein the Oil Marketing Companies (OMCs) sell petrol blended with 10 per cent ethanol.
4) Biodiesel is a liquid fuel produced from renewable sources, such as new and used vegetable oils and animal fats and is a cleaner−burning replacement for petroleum−based diesel fuel.
5) The National policy on Biofuels announced in 2018 is aimed at accelerated promotion of biofuels with indicative targets of achieving 20 percent blending in petrol and 5 percent blending in diesel by 2030.

F. Green Hydrogen

1) The National Hydrogen Mission launched on India's 75th Independence Day aims to make India a green hydrogen hub which will help in meeting the target of production of 5 million tonnes of green hydrogen by 2030 and the related development of renewable energy capacity.
2) National Thermal Power Corporation (NTPC) has commissioned India's first green hydrogen blending project in the piped natural gas (PNG) network of NTPC Kawas township, Surat, to supply H2−NG (Hydrogen −Natural Gas) to the households in the township.

G. Ocean and Geothermal

1) The technology development in these areas is at research and development stage.
2) The estimated theoretical power potentials for Tidal and Wave energy are 12,455 MW and 41,300 MW respectively. Renewable Powered Airport
3) Cochin International Airport Limited (CIAL) has successfully turned their disadvantage of power deficit to an advantage to become the world's first solar powered airport.
4) The CIAL ventured into the Solar PV sector in early 2013 by installing a 100 kWp solar PV Plant on the roof top of the arrival terminal block. Following this, one MWp solar PV power plant was installed partly on the roof top and partly on the ground in the aircraft maintenance hangar facility.
5) As on today CIAL has an installed solar power capacity of 50 MWp.

IV. FOOD SECURITY AND RENEWABLES

1) After land, water and energy are the two paramount resources in ensuring food security and thereby, catalyzing the human centric development.
2) Ratio of volume of ground water extracted every year to the annual ground water recharge, referred as stage of groundwater development, in the country is 61.6 per cent.
3) The stage of ground water extraction is very high in the states of Delhi, Haryana, Punjab and Rajasthan, where it is more than 100 per cent, which implies that in these states the annual ground water consumption is more than annual extractable ground water resources.
4) The decline of ground water table leads to the consumption of more energy every year to meet the irrigation requirements. Use of renewables plays a major role in ensuring gains for the water− energy−food nexus.

A. Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan Yojana (PM-KUSUM)

1) The objective of the scheme is to provide clean energy to more than 3.5 million farmers and to enhance their income by providing the option to sell the energy generated more than their pumping requirement to the power distribution companies (DISCOMs).
2) The scheme has three components viz., o Addition of 10,000 MW of solar capacity through installation of small solar power plants of capacity up to 2 MW. o Installation of 2.0 million standalone solar powered agricultural pumps. o Solarization of 1.5 million existing Grid−connected Agriculture Pumps.
3) Scheme has helped in spreading awareness among farmers about advantages of using solar pumps.

V. RENEWABLE ENERGY PROMOTION: THE INDIAN CONTEXT

1) To promote the use of renewable energy sources, an exclusive institution, the Department of Non−Conventional Energy Sources (DNES), was created in the Ministry of Energy in the year 1982. It was upgraded into a separate Ministry of Non−Conventional Energy Sources (MNES) in 1992 and was re−named as Ministry of New and Renewable Energy (MNRE) in October 2006. The Ministry is being supported by five institutes, namely, o National Institute of Solar Energy (NISE) o National Institute of Wind Energy (NIWE) o Sardar Swarn Singh National Institute of Bio Energy (SSS−NIBE) o Indian Renewable Energy Development Agency (IREDA) o Solar Energy Corporation of India (SECI).
2) IREDA, a Non−Banking Financial Institution under the administrative control of this Ministry, provides term loans for renewable energy and energy efficiency projects.
3) To enhance efficiency and responsiveness to people and to make people aware, the Ministry has brought out a Citizens'/Clients' Charter (CCC), incorporating its mission, main services/transactions and commitment to its clients and the people of India in general. It also aims at addressing problems of the interface between the Ministry and its Clients/ Citizens and continuously improving the quality of public services for the people at large to make them responsive to their needs and wishes.

VI. SPECIAL SCHEMES

1) National Solar Mission is one of the most important schemes of Government of India, being implemented by the Ministry of New and Renewable Energy. It aims to increase the share of solar energy in the total energy mix.
2) The Pradhan Mantri Kishan Urja Suraksha evam Utthan Mahabhiyaan (PM−KUSUM) is another important scheme in this regard. It aims to add solar capacity of 30,800 MW by 2022.
3) The National Mission on Strategic Knowledge for Climate Change is another initiative to make people aware. It seeks to build a knowledge system that would inform and support national action for ecologically sustainable development.

VII. WAY FORWARD

To be able to mitigate the negative impact of climate change and adopt renewable energy sources, individuals, households, communities, organizations, government, and other stakeholders must be engaged at relevant scales. This can be accomplished through a variety of approaches, such as education and outreach campaigns, financial incentives, and rules requiring the usage of renewable energy. Renewable energy technologies need to be strengthened by education and training programs (knowledge awareness).

Renewable energy sources are in a less competitive position in terms of ease of maintenance and useful life as compared to conventional energy sources. Research and development must be augmented in the direction of generating more energy with less space. Moreover, there should be an international cooperation, synergy and harmony in tapping the renewable resources by way of exchange of technology, sharing the benefits of advancements in scientific research and space technology, in assessing the global risks and making informed choices.

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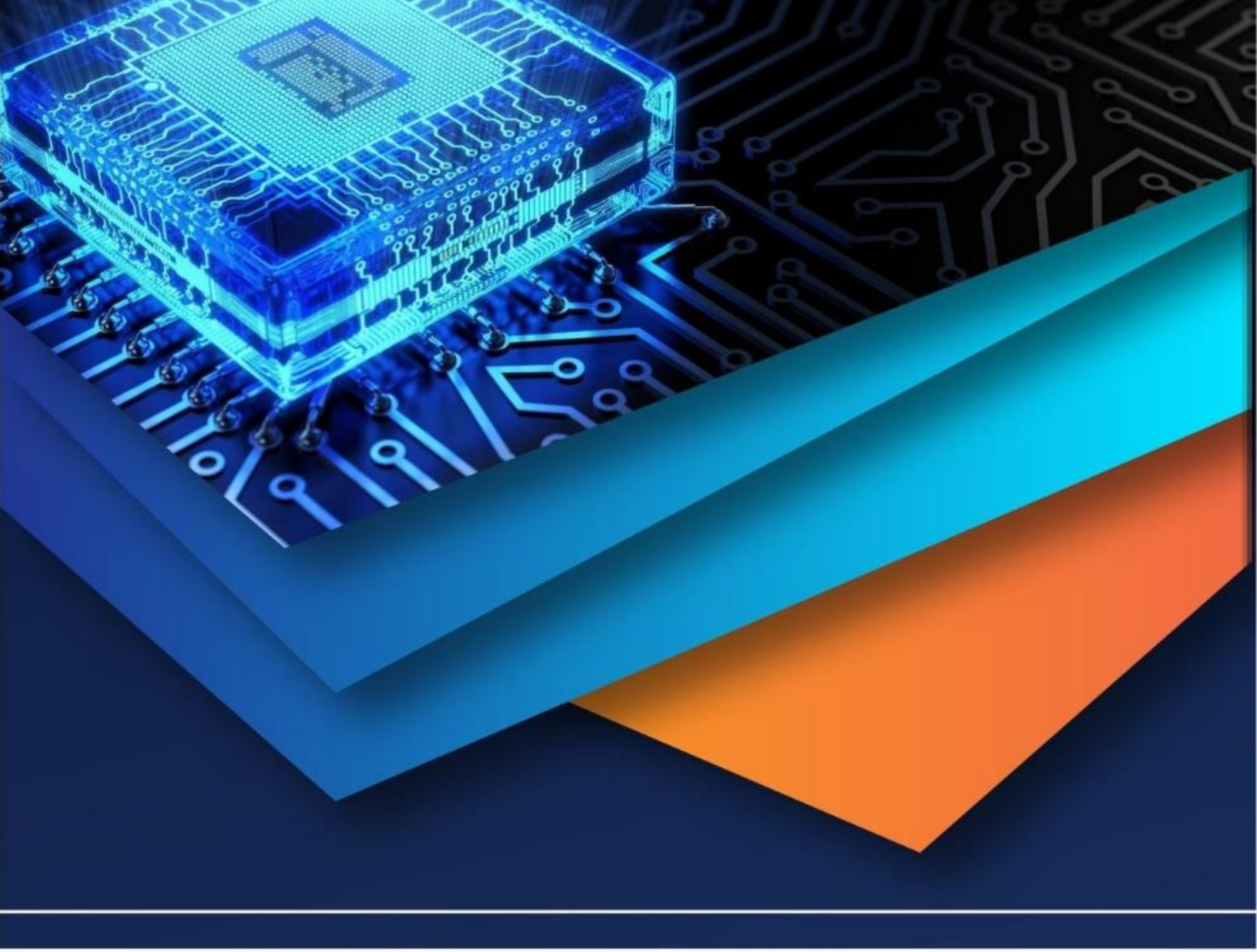

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