

Significance of Renewable Energy for Sustainable Development of India's Agriculture: Current Situation

Heena.B.Dasyal

Ph.D. Scholar

P.G. Department of Studies and
Research in Economics Karnataka state
Akkamahadevi Women's
University, Vijayapura
heenadashyal78@gmail.com

R.V.Gangshetty

Research Guide and Chairman

P.G. Department of Studies and
Research in Economics Karnataka state
Akkamahadevi Women's University,
Vijayapura-
rvgshetty@gmail.com

Abstract

Renewable Energy is energy obtained from natural sources that regenerate at the most consumption. Renewable and non-renewable energy are the two main categories of energy. The formation of fossil fuels like coal, oil, and gas, on the other hand, takes hundreds of millions of years. Burning fossil fuels releases dangerous greenhouse gases, such as carbon dioxide, into the atmosphere. The global Moving away from fossil fuels, which nowadays produce the majority of emissions, is the answer to the global warming challenge. The usage of renewable energy sources significantly lowers the amount of greenhouse gas emissions. Sustainable development is made possible by utilizing sustainable energy and making sure that every citizen has access to affordable, dependable, sustainable, and modern energy. This essay tries to summarize significant advancements, prospects, projections, and electricity production in India as well as challenges, investment opportunities, and employment opportunities.

Keywords: *Sustainable, Renewable Energy, Production, Solar Energy, Wind Energy.*

Introduction

The significant role of renewable energy in economic and social development and improved quality of life in our country. Wind, solar, hydropower, geothermal energy, biomass, and hydropower are some examples of the sources of renewable energy. These sources were previously referred to as "alternative energy sources." At the beginning of the twenty-first century, the world is running out of usable energy from fossil

fuels (oil, gas, coal, natural gas, and nuclear power), while renewable energies (wind and solar) are still too immature to offer a full and flexible alternative.

The country will quickly change to renewable energy technology on a worldwide scale to achieve sustainable growth and prevent catastrophic climate change. The use of renewable energy sources enables a sustainable energy supply with a decrease in greenhouse gas emissions. Recent estimates indicate that by 2047, the potential for solar and wind energy will surpass 750 GW. To achieve its ambitious target of producing 175 GW of renewable energy by 2022, the government must create 330,000 new jobs and livelihood opportunities. This shift in economic activity between the nations has an impact on the nation's energy use.

Objectives

To understand the present Renewable Energy Production Capacity in India.

To examine the sector-wise distribution of Renewable Energy in India.

Methodologies

To Achieve its Goals, This Study Uses Secondary Data Sources from Yearly Reports of the State and Union governments, including those from the Department of Renewable Energy, the Indian Economic Survey, statistics databases, publications, and magazines. Additional Sources of data from the CEA and MNRE were used to create this analysis.

Review of Literature

Sidharth Jain (2020): Renewable Energy for Sustainable Development India: Current Status, Prospects, Challenges, Employment, And Investment Opportunities. In This Paper, India Will Analyze Renewable Energy Supply. Renewable Energy Refers to Economic Social and Environmental Impact Factors. The Study of This Paper's Main Objective is to Point Out the Challenges Related to Renewable Energy and Suggest Some Recommendations for Promotion.

Some of the Benefits of Renewable Energy Use in India

A smaller amount of global warming.

Enhanced public physical condition.

Inexhaustible energy.

Jobs and other economic benefits.

Stable energy prices.

Reliability and flexibility.

Renewable Energy in India

The population of India is growing at a pace of 1.6% yearly. Indeed, fossil fuel energy will soon run out, and India may experience severe energy shortages as a result of rising energy prices and unpredictability. Fossil fuel use is growing, which causes environmental issues. Renewable energy sources can be employed to combat the energy crisis. Renewable energy can potentially offer solutions to India's sensitive energy issues because it is a clean, sustainable energy source that is drawn from nature. This is a consequence of the role that fossil fuel use plays in climate change.

Indian Renewable Energy Current Situation

Next to China, the United States, and Russia, India is now the world's fourth-largest energy consumer. India's ability to produce electricity has been significantly impacted by the renewable energy sector. This plays a vital part in the nation's electrical supply while assisting the government in achieving its objective of sustainable development. India has started the largest undertaking in the world to expand the usage of renewable energy. Since 2010, the Indian government has promoted the concept of solar parks, developed a sizeable grid-connected rooftop solar panel and solar pump program to build 120,000 solar pumps, and introduced a program to train 1 lakh individuals for solar installations under the Surya Mitra scheme.

Table No.1
Installed Capacity of Renewable Sources Of Energy In India

Renewable Energy	MW	% of Total
Hydro	46,850	11.3%
Wind, Solar & Other RE	125,160	30.1%
Wind	42,633	10.2%
Solar	66,780	16.1%
Biopower /Cogen	10,248	2.5%
Waste To Energy	554	0.1%
Small Hydro Power	4,944	1.2%
Nuclear	6,780	1.6%
Total Capacity	178,790	43%

Source: CEA (As of 12 April 2023)

The installed capacity of renewable energy sources, which includes significant hydropower, is 178,790 MW. In the table above, it is shown that there are 42,633 MW of wind power, 66,780 MW of solar power, 10,248 MW of biopower/cogeneration, 4,944 MW of small hydro, and 554 MW of energy from waste. The capacity for renewable energy in India has grown annually as seen in the table above, and this rise has complemented the economic growth of India. India wants to reduce its economy's carbon intensity to below 45% by the end of the decade, reach net zero carbon emissions by 2070, and reach 50% installed cumulative renewable electricity by 2030. By 2030, the Indian government projects that the market for carbon technologies will be worth \$80 billion.

Solar power in India

The Indian government's initial target of 20 GW capacity for 2022 was met four years earlier than anticipated. By 2022, the target was raised to 100 GW of solar electricity, 40 GW of which would come from rooftop solar, with a target expenditure of US\$100 billion. The rooftop sector's poor output resulted in a 40,000 MW shortfall, which made the aim virtually unattainable. Solar energy is a quickly increasing business in India. The country's solar capacity was 67.82 GWAC as of May 31, 2023. India will produce the fourth-most solar energy in 2021.

In FY2023–2024, India plans to release 40 GW of solar and hybrid project tenders. India has created around 42 solar parks to make land accessible to individuals who are promoting solar projects. Between 2010 and 2019, solar energy projects in India received investments from abroad totaling around 20.7 billion US dollars.

The International Solar Alliance (ISA), which has its headquarters there, was proposed by India. India has also proposed the "World Solar Bank" and "One Sun One World One Grid" ideas as means of utilizing abundant solar energy on a global scale.

Table No.2
Installed Solar Capacity: National And State Wise (Mw)

State's	2016	2017	2019	2021	2023
Rajasthan	1,317.64	1,812.93	3,226.79	5,732.58	17,055.70
Punjab	545.43	793.95	905.62	959.50	1,167.26
Uttar Pradesh	239.26	336.73	960.10	1,712.50	2,515.22
Uttarakhand	45.10	233.49	306.75	368.41	575.53
Haryana	53.78	81.40	224.52	407.83	1,029.16
Karnataka	327.53	1,027.84	6,095.56	7,355.17	8,241.41
Total India (MW)	6,762.85	12,288.83	28,180.66	40,085.37	66,780.36

Source: Various Annual Reports (2016 to 2023)

Wind Power in India

The emergence of Wind Energy as the upcoming alternative energy technology that offers the greatest promise. Due to recent advancements in turbine technology, the quantity of power produced by wind-driven turbines has significantly increased over time. Although India's wind industry is still relatively young compared to Denmark's or the US's, local governmental support for wind energy has resulted. As of December 31st, 2018, the total installed capacity was 35,138.15 MW, falling short of the target of 60 GW by 2022. India ranks fourth globally in terms of installed wind power capacity at present.

Small Hydropower

Since they avoid the problems connected with substantial land acquisition, deforestation, and relocating human groups, small hydropower (SHP) projects are particularly eco-friendly. The many types of hydro projects include large hydro, small hydro (2 to 25 MW), micro-hydro (up to 100 KW), and mini hydropower (100 KW to 2 MW). Compared to the estimated potential of SHP of 20 GW, India's goal in SHP for 2022 is 5 GW. As of December 31, 2018, the country produced 4.5 GW, and this production is constantly increasing. The NITI Ayog's three-year action agenda (2017-2018 to 2019-2020), which was published on January 1 of that year, included a description of the main objective. It was planned that funds for infrastructure improvements and tariff relief would fulfill it.

Table No. 3
Shp Target, Achievements, And Cumulative

Year	Target (MW)	Achievement (MW)	Cumulative (MW)
2012-2013	350	237	3643.17
2013-2014	350	252	3803.68
2014-2015	300	408	4055.36
2015-2016	250	218	4273.47
2016-2017	250	105.9	4379.86
2017-2018	100	105.95	4485.80
2018-2019	205	31.65	4517.45

Source: CEA (As of 2012 to 2019)

Biopower

A significant source of energy for the nation for a long time due to the advantages it provides. It can significantly increase employment in rural regions, is renewable, broadly accessible, and is carbon neutral. Vital energy could be produced from biomass. Approximately 32% of the nation's total primary energy consumption still comes from biomass, and more than 70% of the people there rely on it for their energy needs.

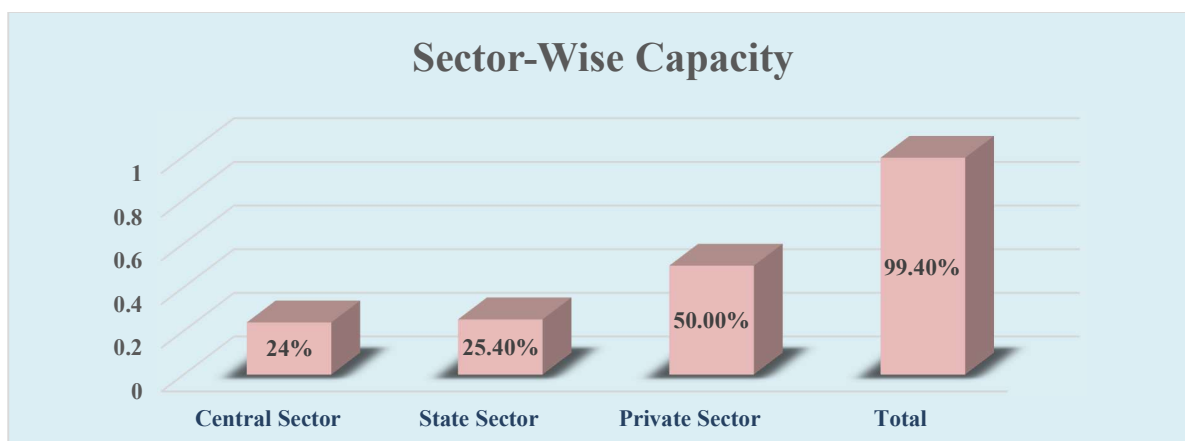
Nuclear

The country now has 22 functional nuclear reactors with a total installed nuclear capacity of 6780 MW. One further reactor, KAPP-3 (700 MW), was integrated into the power in January 2021. By 2031, the 6780 MW nuclear power capacity will have expanded to 22480 MW thanks to projects that are currently being built and approved. There are plans to build more nuclear power facilities in the future.

Table No.4
Installed Generation Capacity (Sector-Wise)

Sector	MW	% of Total
Central Sector	1,00,055	24%
State Sector	1,05,726	25.4%
Private Sector	2,10,278	50.0%
Total	4,16,059	99.4%

Source: CEA



Figar-1

Installed Generation Capacity

Table No. 5

Indian Government (2022) Achievements: Program/ Scheme-Wise Cumulative Physical Progress as of March 2023.

Achievements (April -March 2023)	Cumulative Achievements (As of 31.03.2023)	
Installed RE Capacity (Capacities In MW)		
Wind Power	2275.55	42633.13
Solar Power	12783.82	66780.34
Biomass (Bagasse) Cogeneration	0.00	9433.56
Biomass (Non-Bagasse) Cogeneration	42.40	814.45
Waste to Power	25.00	248.14
Waste to Energy(off-Grid)	52.29	305.89
Total	15274.26	12519.81

Source: MNRE (Ministry of New and Renewable Energy).

India saw the largest increase in renewable energy additions year-over-year in 2022, with a 9.83% increase, and as of February 2023, installed solar energy capacity had increased by a factor of 24.4 over the preceding nine years, reaching 63 GW.

Government of India's Target

India has set goals to develop net-zero carbon technologies that could create a market in the country worth up to \$80 billion by 2030, reduce the carbon intensity of the economy by less than 45% by the end of the decade, and achieve 50% cumulative installed renewable electric power by 2023. India wants to manufacture five million tonnes of green hydrogen by the year 2030. The target for green hydrogen is for India's Electrolyze production capacity to rise to 8 GW yearly by 2025.

India had 168.96 GW of total renewable energy capacity as of February 28, 2023, with 82 GW currently at various stages of execution and 41 GW currently in the tendering stage. This consists of up to 42.02 GW of wind energy, 10.77 GW of biopower, 64.38 GW of solar energy, and 51.79 GW of hydropower.

59 solar farms in India with a total capacity of 40 GW have been allowed.

Pava Gada (2 GW), Kurnool (1 GW), and Bad-II (648 GW) solar parks are among the top 5 7 GW-capacity effective solar farms in the country.

Gujarat is currently constructing the world's largest renewable energy farm, a 30 GW solar-wind hybrid project.

Union Budget for 2023 Highlights

Green Growth is identified as one of the nodes in the SAPTARISHI (7 Priorities).

\$ 2.4 Billion National Hydrogen Mission for production of 5 MMT by 2030. \$36 Million additional in Budget.

4 GW battery energy storage systems supported through viability Gap Funding.

Pumped storage projects have received a push with a derailed framework to be formulated.

Central sector support of \$1.02/2.50 billion for ISTS infrastructure to provide 13 GW of Ladakh-sourced renewable energy.

Conclusion

Renewable energy is India's largest and most important source of economic development. The installed capacity for renewable energy will rise from 11.9 GW in 2021 to 14.21 GW in 2022. As one of the Five Hundred Goals, the Indian government has decided to aim for 500 non-fossil fuel-based installed capacity plants by 2023. The final result of this paper was an evaluation of the potential for renewable energy as it is at the moment, with the introduction of solar, wind, bio-energy, and other renewable energies. The energy produced from renewable sources has already made a significant contribution to sustainable development. It has resulted in the creation of multiple employment opportunities in India's rural and urban areas. It Has a Significantly Impact on India's Economic Growth.

References

Annual Report 2019-2020 Ministry of New and Renewable Energy, Government of India. Pg 28. Retrieved 28 June 2021.

Sidharth Jain, Anupama Verma (2020) "Renewable energy for sustainable development in India: Current status, prospects, challenges, employment, and investment opportunities" Journal of Critical Reviews vol 7 issue 3

State-wise installed Capacity of Grid Interactive Renewable Power as of 31.03.2021.

Planning Commission of India, 2002, Indian Government report.

Economics/statistical -review-2016/Bp-Statistical-review of world energy 2016 full report.

<https://www.Bp.com/content/dam/bp/pdf/energy>

Charles Rajesh Kumar. J and M.A.Majid " Renewable energy for sustainable development in India: current status, prospects, challenges, employment, and investment opportunities 2020
<https://doi.org/10.1186/s13705-019-0231-1>