

RENEWABLE ENERGY IMPACT ON SUSTAINABLE DEVELOPMENT IN INDIA: OPPORTUNITIES & CHALLENGES

¹Dr. Sunita Pachar, ²Dr. Shaifali Garg

ABSTRACT--*For every developing country energy is a very important source for economic & industrial development. India is a growing economy and it would need an assured supply of 3–4 times than the whole energy consumed today. Environment issues which are related with coal, oil and crude oil as non –renewable energy can be resolved by renewable energy (RE) sources like wind, solar and thermal which are sustainable and have a huge potential to satisfy Indian energy consumption need. This research paper discussed about renewable energy sources, drivers, challenges and policies. It can be concluded from review of literature and other information provided in paper that Renewable energy have a huge potential in India and with effective technologies use it can fulfill India’s energy demand in future. Quality of life can be improved with the help of energy. The paper also focused on Government regulations and institutions which are contributing in renewable energy up-gradation. It is predictable that large number of domestic jobs can be created in future in green energy and RE. This paper shows achievements and future potential of India in energy sector. The study found that renewable energy can reduce environment pollution issues, carbon emission and scarcity of nonrenewable energy sources .RE has a positive relation with economic growth, job creation and welfare.*

Keywords-- *Sustainable Development, Renewable energy, Policymakers, Investors, Economic development, biomass and solar energy, Green energy.*

I. INTRODUCTION

Energy is the key factor in any country for industrialization, Urbanization and economic growth. It affects many development issues like economic, livelihoods & agricultural productivity. Expected goal of renewable power is 175GW by 2022.Up to 100% FDI is allowed for the green energy or RE creation and circulation. It is estimated that RE sector can make a investments of up to US\$ 80 billion within the next four years. In country nonrenewable sources like coal, oil etc is used for its energy demand fulfillment or consumption. In India there is huge potential in green energy or RE like solar energy, geothermal energy, biomass energy and fuel cell technology and it can be used to tackle shortage of energy. Today RE accounts for almost more than half energy needs execution. Sustainable development is a big challenge for any country nowadays. Electronic vehicles are a buzz word nowadays because of its eco friendly nature approach .Now days Consumers are also interested to purchase green products. New technology adoption like e-vehicles is going to

¹ Assistant professor, IBM, GLA University, Mathura

² Assistant professor, IBM, GLA University, Mathura.

be a trend near future. To reduce carbon emission in the environment governments also help the manufacturers and customer to adopt these vehicles so that an alternate transit system to the population can be provide having a less dependency on the fossil fuels. Strong long term strategies and policies are needed to proliferate the initiative to gain sustainability by the governments. By Investing more and more in Renewable Energy can improve India's social and economical development .India can improve environmental issues like global warming and pollution control by using green energy sources solar and biomass. Indian Government is making large investment in renewable energy.

II. REVIEW OF LITERATURE

2.1 Renewable energy sources and sustainability

Hák et al (2016) focused mainly on The Sustainable Development Goals (SDGs) of India, which mainly focused on energy supply and green energy issues. For Any country development and sustainability, green energy can be the best strategy. This can help in development and need fulfillment. Millennium Development Goals also includes issues like climate change, renewable energy and modeling. Tester (2005) mentioned in his report that sustainable energy is dynamic harmony between people need and supply which can help in future generations need fulfillment. Nowadays Government is more concerned for country future need fulfillment. Recently launched SDGs main goals for India is to help in climate change. To provide sustainable resources to future generations.

2.2 Renewable Energy & Economic Development

Edenhofer et al., (2011) stated in their study that Renewable energy sources are available everywhere as compared to Non renewable sources .Economy can grow by reducing imports of petrol and coal on which every year lots of fund is speeded by government. Sustainable development can be implemented in economic productivity by only using green energy which have a positive impact on human development as well. Country economic development main key is only enriched infrastructure and its energy sources. There is direct relationship in economy development and growth of energy utilization. Globally per capita income has a positive association with energy use and financially viable development .Green energy and renewable energy have a huge potential to provide employment. Worldwide green energy and RE contributed 2.3 million jobs. This also helped in improved health and better education facility.After reviewing all above studies it can be concluded that green and renewable energy is only the option which can make any country future progress safe and secure for its coming generation. It can help in employment generation which can contribute in per capita income.

2.3 Renewable energy and climate change or Energy security

Twidell & Weir, (2015) discussed in their study that Renewable energy can help to solve the issues related with emission of greenhouse gases significantly. Its supplies are obtained naturally so it is sustainable and it is the best source for environmental protection. Energy supply should not affect the biodiversity of any country. Panwar, Kaushik, & Kothari, (2011) mitigation of green house emission and global warming is the main issue

today that every development and developed country is facing. Renewable energy sources provide opportunities in energy security. Edenhofer et al., 2011; Lu et al., (2015) fossil fuel energy should be replaced with green energy sources which consist solar energy, Hydropower, ocean energy (tide and wave), geothermal energy and wind. Panwar, Kaushik, & Kothari, (2011) considered Renewable energy technologies as clean sources of energy. Future economic and social needs can be fulfilled by it and it can also make our environment pollution free. Renewable energy technologies are better solution for greenhouse gas emission and reducing global warming. So adopting renewable or green energy policy is best strategy to overcome the challenges related with environmental factors. Renewable energy technologies will improve energy supplies.

III. METHODOLOGY OF THE STUDY

This study has formed an attempt to review the India renewable energy potential. This study is based on Exploratory cum descriptive type. Available secondary data was broadly used for the study. The data were collected from a wide variety of sources like web policy documents, reports, research articles including on renewable and green energy sources. This research paper is outcome of a review of a substantial number of secondary data sources and personal experience and observation on the current scenario and challenges of renewable energy in India.

3.1 Objective of the Study

The present paper is an effort, to identify and discuss renewable energy status and potential in India. To be specific research paper has following objectives:

1. To know the renewable energy sources status & potential in India
2. Discussion on Issues and Challenges for renewable in India.
3. The paper also analyses regulatory framework, issues concerned with renewable sources
4. To provide workable measures and suggestions to improve green energy production

IV. RENEWABLE ENERGY SOURCES AND TECHNOLOGY

The dedicated Ministry of New and Renewable Energy (MNRE) is in charge of the development of policies for renewable in electricity, transport and heat in India. It undertakes activity related to R&D, testing, certification, standardization, skill development, resource assessment and awareness. The MNRE contains the all activities of green energy production. The government is working on special plans to set up an indigenous manufacturing capacity grid till 2022. In RE 75 % contribution is from wind program which is fastest contributing. Government is working on many incubation schemes to set up enterprise in green energy.

Figure 1.2 shows the status of renewable energy in India. Solar energy can contribute a major part in energy need fulfillment and it is available almost in every state of India. Then comes wind energy which is also sustainable source of energy which can contribute in 2022, 302 GB of India's energy supply but now only it almost one fifth of capacity India is utilizing. Thus there is a strong need of better policies related with energy development which can help India to fulfilling energy need. Indian Ministry has started many training programmes to fulfill human resource requirements in renewable area.

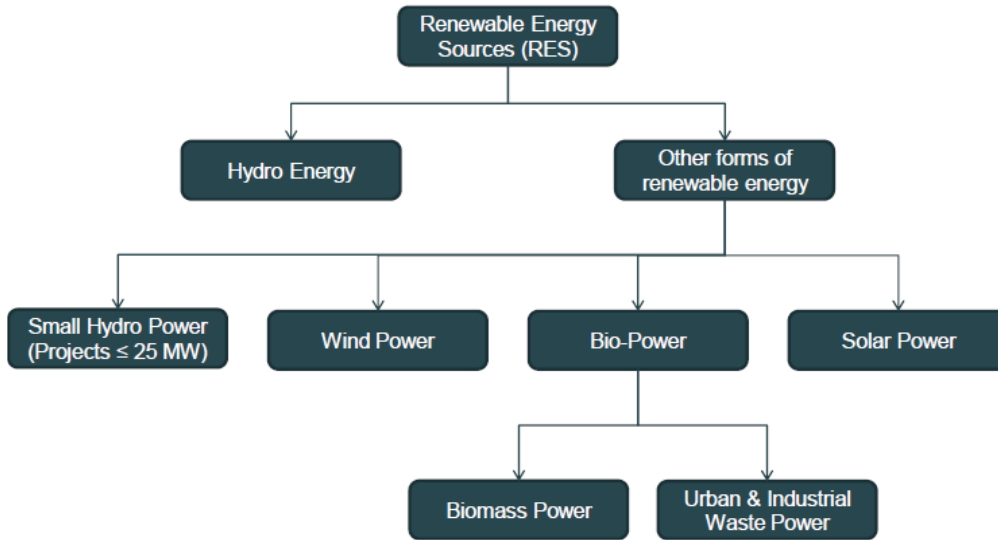
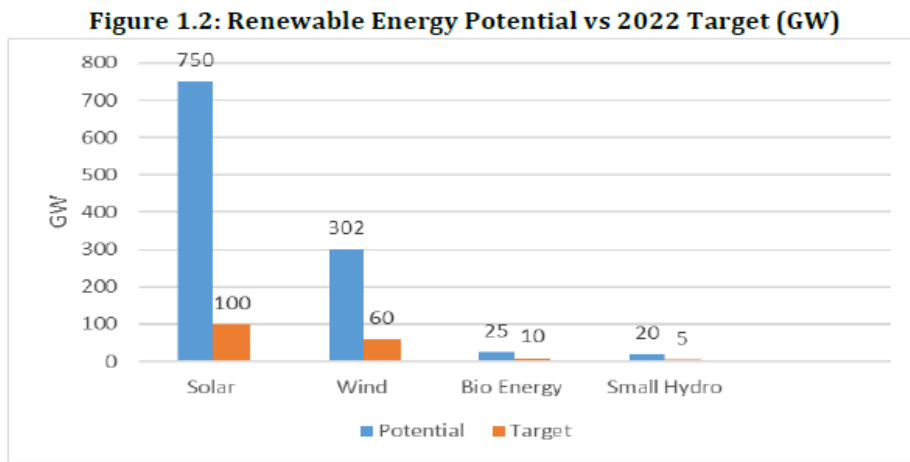


Figure 1: Types of Renewable Energy



Source: WISE, 2017 (compiled from MNRE Annual Report 2017)

Figure 2: renewable energy potential vs 2022 target(gw)

**Table 1.3: Year-wise and Technology-wise Capacity Addition Targets to 2022
 (Grid-connected RE only)**

Year	Rooftop Solar	Ground-Mounted Solar	Solar	Wind	Small Hydro	Biomass	Total
	(GW)	(GW)	(GW)	(GW)	(GW)	(GW)	(GW)
Cumulative installed capacity by 2014-15			3	24	4.1	4.4	35.5
2015-16	0.2	1.8	2	3.2	0.14	0	5.3
2016-17	4.8	7.2	12	3.6	0.14	0.9	16.7
2017-18	5	10	15	4.1	0.14	0.9	20.2
2018-19	6	10	16	4.7	0.14	0.9	21.8
2019-20	7	10	17	5.4	0.14	0.9	23.5
2020-21	8	9.5	17.5	6.1	0.14	0.9	24.7
2021-22	9	8.5	17.5	8.9	0.14	0.9	27.5
Total	40	60	100	60	5.08	9.98	175

Source: Report on 175 GW RE by 2022, NITI Aayog, 2015

Above table 1.3 represent a brief data about 7 years targets in energy sector by Niti Aayog in sector like solar energy, wind energy, Hydro energy and biomass energy .After 2016 there is continuous increase in green energy source capacity building which is targeted 27.5 GB in 2022.As by above table we can check that Solar energy and wind energy are the greatest contributor in India in renewable energy and it is most sustainable source of green energy. In India hydro energy is having least contribution is energy supply. Biomass energy also can play a significant role in energy supply.

V. BENEFITS OF RENEWABLE ENERGY

Green energy or renewable energy most important feature is that it is accessible in abundant supply. It is unlimited. RE sources are natural and sustainable that have no harmful impact on nature. RE can be used in household and industrial functioning.

➤ **Eco friendly environment:** Green energy sources and technologies are clean source of energy than conventional energy technologies.

➤ **Sustainable Source of Energy:** Solar energy, thermal energy, winds energy and ocean energy all can be created by natural sources which are available vast quantity .rather than nonrenewable sources which are finite and will sometime be depleted.

➤ **Employment opportunity:** Government is investing lots of funds on green energy R& D and infrastructure facilities which will create many jobs for people.

➤ **Improved healthy life:** green energy uses natural resources for energy making process like solar, thermal or ocean, which does not create any health issues or air pollution. Renewable energy is very clean energy which can save even cost as well health.

VI. CHALLENGE OF ADOPTING RENEWABLE ENERGY

Renewable energy sources have many benefits but it has also certain limitation exists such as: seasonal disparity as most RE resources are affected by seasons. In main challenge lack of information to access the green energy comes .it means people are not aware of green energy importance and its use. Major hindrance towards the use of RE energy depends on any nations strategic future policy and technological innovations. Main challenge can also include lack of infrastructure support, no financial viability and stringent regulatory approval.

VII. CONCLUSION

In this paper many issues have been discussed related with India's future possibilities of green and RE .India can be a hub of green energy supply if India will work on a strong strategy base plan .India's many states have geographic advantage by which India can be in top no. country in self sustainability in green energy and can reduce carbon emissions .By combination of the proper technology and proper human behavior attitude for RE, India can achieve its target.

Government should mandate for insurance companies to make better policy to invest in RE sector. The government should focus on Innovative latest techniques use in energy sector.

Thus to conclude it can be said that looking at the present situation, a self sufficient better energy scheme in nation like India is vital for future growth & require fulfillment in energy consumption. RE has a scope to decrease dependence on traditional energy consumptions fuels which are harmful for environment and people health .By investing in RE India can improve environment and can create new industries and job related with green energy or renewable energy (RE).

REFERENCES

1. Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Seyboth, K., Matschoss, P., Kadner, S., von Stechow, C. *Renewable Energy Sources and Climate Change Mitigation*. Cambridge: Cambridge University Press, 2011.
2. Tester J. W. *Sustainable energy: Choosing among options*. London: MIT Press, 2005.
3. India energy portal (www.indiaenergyportal.org)
4. Twidell, J., & Weir, T. *Renewable energy resources*, 2015,
5. Hák, T., Janoušková, S., & Moldan, B. Sustainable development goals: A need for relevant indicators *Ecological Indicators*, 2016, 60: 570–572.
6. Panwar, N., Kaushik, S., & Kothari, S. (2011). Role of renewable energy sources in environmental protection: A review. *Renewable and Sustainable Energy Reviews*, 15, 1509.
7. Ajanovic, A. Biofuels versus food production: Does biofuels production increase food prices, *Energy*, 2011, 36: 2069–2071.

8. Umair Shahzad. The Need for Renewable Energy Sources, International Journal of Information Technology and Electrical Engineering, ISSN: -2306-708X, pp-1-2
9. S. Pachar, R. Singh (2013). A Study on Stakeholder Perspective Regarding CSR Model for Indian Organizations: Some key Issues. Indian Journal of Management, 6(11), 23.
10. S. Pachar, R. Singh (2013). The pyramid of corporate social responsibility model: Empirical evidence from India, JIMS8M: The Journal of Indian Management & Strategy 18 (3), 19.
11. Preeti h. Narnaware, Ramesh g. Surose & swati v. Gaikwad, Current Status and the Future Potentials of Renewable Energy in India- A Review. International Journal of Advances in Science Engineering and Technology, 2015, 1: 1-3.
12. 12.Garg Shaifali & Pachar Sunita(2020), Future of Electric vehicles: Empirical study in relations to Potential Factors ,International Journal of Advanced Science and Technology Vol. 29, No. 03, (2020), pp. 5849.