

## ARTICLE

# RENEWABLE ENERGY ON THE SOCIAL AND ECONOMIC GROWTH OF INDIA

Mudit Mishra\*, Shaurya Sindhu

Department of Civil Engineering, Manav Rachna International Institute of Research & Studies, Faridabad, INDIA

## ABSTRACT

India is a vast country and has second largest population in the world. In recent years, India has become a very fast growing economy in the world. To fulfill the human and infrastructural requirements a huge amount of energy will be required in near future. Presently the major source of energy in India is through thermal power plants. It is the approximately 65% of total energy generated. Rest of energy is being generated from hydro, wind, solar and nuclear sources. However, the production of energy from these sources is quite low so far. In thermal power plants coal is used as a fuel and burning of coal creates a lot of environmental and health problems. Also efficiency of thermal power plants is less and it produces a larger quantity of waste material such as fly ash. The disposal of these materials is a matter of serious concern. Further the reserve of coal is limited. Hence to produce clean and green energy, the focus has come on the renewable energy. The renewable energy may be derived from natural resources like water, wind, sun and plants as mentioned before, conserving the natural resources at the same time. Also, it contributes in welfare and growth of the society and country. The present paper summarizes the discussion on different sources of renewable energy and their effect on the social and economic growth of India

## INTRODUCTION

In the modern world, India is being emerged as the fastest growing economy. To meet the human and infrastructural requirements a lot of energy is needed in future decades. The main source of energy in India is coal based thermal power plants. It generates power more than 65% of the total production. The reserve of coal in India is limited and till 2050 more than 90% of its reserve will be consumed. The coal based thermal power plants generate huge amount of pollutants and solid waste. The effective disposal of generated pollutants and wastes a matter of serious concern. Also, it releases the huge amount of hot gases into the atmosphere which increases the global warming. To avoid this situation, one can switch to alternate or renewable energy sources. Renewable energy comes directly from the natural sources and is very less hazardous. Based on the birth sources, it can be classified in different categories like solar energy, wind energy, hydro energy, geothermal energy and fusion nuclear energy. Unfortunately, the production of the energy from these sources is quite low. The main advantage of the renewable energy is that it uses the natural sources which are available at free of cost. Further, no harmful pollutants are emitted during the production. It conserves the degradation of natural resources and produce green energy. The social impact of renewable energy is very high and it can be contributed towards the growth of the economy. In the present paper the social and economic growth of the renewable energy are summarized [1].

### KEY WORDS

Renewable energy,  
Economic growth, Social  
impact

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## DIFFERENT SOURCES OF ENERGY

### Solar energy

Sun is a major source of energy and its energy available throughout the year. Solar energy comes from the sun in the form of solar radiation. By using solar panels and photovoltaic cells the radiation is converted in electricity. Solar energy can be generated in any part of the earth and it reaches at remotely located places, where other sources of energy are not feasible. The initial cost of installation of solar panels is comparatively high but the maintenance cost is low. For individual installation, no grid formation is required [2].

### Hydropower energy

Hydropower comes from energy of water and now-a-days becomes the major source of energy after the thermal power. By constructing dams over the rivers, the power of water can be utilized. A hydro power plant consists of a dam, a reservoir and a production unit. The construction of hydropower plants is a tedious and challenging job and it requires a lot of technical expertise. Its social impact is too high as compared to others sources of energy [3].

### Geothermal energy

Geothermal energy is generated from the earth's crust, which has a lot of potential. It found deep below the surface of the earth. Hot molten magma produces a lot of heat, which are converted to electrical

\*Corresponding Author

Email:  
mudit.mishra2607@gmail.com  
Tel.: +919971898822

energy. However, it is not available at all over the earth but can be found at certain places. It is a clean and renewable form of energy because it does not contribute to any greenhouse emission [4].

### Wind energy

Wind energy is also a source of renewable energy. The power of wind is extracted to produce green and clean energy. Air current flowing across the earth's surface is utilized and using wind turbines, kinetic energy of the wind is converted to electric energy. Generally individual wind turbines are small in capacity, but as a whole it can produce huge amount of energy [1].

### Nuclear energy

Nuclear energy is produced by the fission or fusion process of the material. However, a fusion process can be treated as a source of renewable energy because it comes from the Hydrogen. Compared to fission reactors, fusion reactors are more environmentally friendly. It produces a lot of energy by using few amount of hydrogen fuel. It can be a major source of energy in future if utilized properly [1].

A comparison of different types of renewable energy resources is presented in [Table 1].

**Table 1:** Comparison of different Renewable Energy Sources

Description	Solar Energy	Hydro Energy	Geothermal Energy	Wind Energy	Nuclear (Fusion)
Source	Sun	Water	Hot magma present in the earth crust	Wind	Hydrogen
Environmental Effect	Pollution free, no emission of pollutants	Pollution free, no emission of pollutants	Pollution free, very less amount of pollutants emission	Pollution free, no emission of pollutants	Pollution free, very less amount of pollutants emission in the operation phase
Waste Generation	No waste is generated	No waste is generated	No waste is generated	No waste is generated	No waste is generated
Fuel requirement	No	No	No	No	Yes
Storage	Can be stored through batteries	No storage	No storage	No storage	No storage
Initial Installation Cost	High for individual installation, Medium for power plant installation	Very High	Medium	Low	Very High
Maintenance Cost	Low	Medium	Low	Low	High
Coverage Area	Medium	Very Large	Medium	Low	Very Large
Special Technology Requirement	No	No	Yes	No	Yes
Safety and Security Requirement	Low	High	Low	Low	Very High
Major Advantage	Can be reached at remotely located places, where other sources of energy is not feasible	Multipurpose utility, power generation, irrigation, storage of water	Requires very less maintains and releases the pressure of earth, reduces the chance of unwanted volcanic eruption	Requires very less installation and maintenance cost and no special arrangement are required, best suitable in coastal areas	Provides massive amount of energy using small amount of fuel
Major Disadvantage	Depends upon the	Construction cost and	Not available at	Depends upon the	Highly specialized

	availability of sun light, not useful in area where the availability of sun light is rare	time is too large, also heavy machinery and manpower are required	all the places, available only at its potential locations	speed and availability of wind, not available at locations where wind power is low	techniques are required for construction and operation of fusion reactors, research is still going on
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**Social and Economic impact**

India is a fast growing economy and has the 2nd largest population in the world. To fulfil the infrastructural and human requirements the energy requirement is mandatory. The social and economic impact of renewable energy resources is different and depends upon the situation and locations. Presently in India total power generation is approximately 1, 11, 901 MW, in which only 18.2% comes from the renewable energy sources which is low [Table 2]. The most power comes from thermal power plants which are about 66%. However, the reserve of coal is limited and till 2050 most of it reserve will be consumed. So that focus must be on the production of energy through renewable energy [1].

As discussed renewable energy comes from natural sources and generates clean and green energy. Due to thermal power plants a large amount of pollutants diffuses into the atmosphere which is harmful for human life. Generation of hot air by the thermal power plants, also increase the temperature of the earth and contributed in greenhouse emission. Huge amount of waste is generated by the burning of coal and its disposal is a matter of serious concern. Gases released from the thermal plants cause several diseases. It influenced the growth of the human being which indirectly affects the growth and economy of the country. If due to diseases, or health concern people are not efficient, the overall growth of the country will be affected badly. Hence, to avoid such situations the focuses should be on 'increase the energy generation by renewable energy sources' [1].

**Table 2:** Total installed capacity in India (Up to December 2017)  
(Source: Ministry of Power, Government of India, [1])

Type of Plant	Total generation in MW	Percent of total Production (%)
Thermal	2,18,960	66.2%
Hydro	44,963	13.6%
Nuclear	6,780	2.0%
Other renewable energy sources (Small Hydro, Solar, Wind etc.)	60,158	18.2%
Total	1,11,901	

The impacts of different types of renewable energy sources are different. It depends upon the following factors

- i. Requirement
- ii. Social impact
- iii. Investment cost
- iv. Benefits
- v. Safely and Security.

For production of energy 'requirement' is must. To fulfil the requirement feasibility study is carried out to understand whether it is feasible or not. The study consists social and environmental factors, benefits, cost and safety issues. However, in these factors requirement and social impact has the most impact. For implementation of a renewable energy project there are two sides one is social impact and other is economical effect. Social impact can be termed as the influence of the project on the life of the mankind. It covers the following points

**a. Routine life of public:** Energy plays a vital role in every human life. Hence, impact of energy on its daily life is crucial. Also, pollutants from thermal power plants cause health issues. Hence he has full right to take clean and green energy. Renewable energy is environmental friendly and hence it is best suitable as per health concern. Except hydro and nuclear energy all the other sources are best suited to daily life of public in India [1].

**b. Total influenced area:** For generation of large amounts of power, a power plant and grid is required. For installation of it a large area will be required and it evacuated some populated areas. Installation of hydro and nuclear plants wants a wider area. Also, the area around it should be covered in

'population free zone' due to proper operation, maintenance and security reasons. Wind, solar and geothermal plants are comparatively small in nature and generally installed in the non-populated areas. The impact of hydro and nuclear power on the social life is higher because it involves the shifting of population, which is very difficult to achieve in Indian situation. India is the second largest pollution in the world and shifting of small amount of people is a tedious job due to political and economic reasons [1].

**c. Safety and securities:** All the renewable energy plant should be safe against failure and must have higher degree of securities. Due to improvement in research and technology, it can be achieved and implemented. Hydro and nuclear power plants require extra safety feature because if they meet any accident larger casualties will be happening. In geothermal plants, sometimes eruption of magma is occurred due to large pressure and temperature. It causes the adverse effect on the environment and the health of human. Hence extra safety features should be enabled to protect the human life [1].

Similarly, social impact & economic impacts can be defined. However, economical aspect is the most dominating factor in India. India has high potential of renewable energy sources, but unfortunately due to lack political willpower and unawareness the resources are not fully utilized. Because of this dependency increases on the thermal power plant which is costlier than renewable energy resources. Per unit cost of power production of thermal power plants is higher as compared to renewable energy sources. Hence, by using renewable energy resources a lot of money can be saved which will be utilized in other constructive works. In India most of the power plants are running on coal. Extraction of coal from mine also causes health issues. Further, during the production of energy a lot of gases and waste is generated. It causes the lot of health issues and huge amount of money is required for treatment. A lot of money also spends on the disposal of waste produced by the thermal power plants. If the amount of money spend on these problems are saved, the economy will be boosted up. Use of renewable energy sources can reduce this problem and hence contributes to the growth of the economy [1].

The installation cost of the some of the renewable energy plants i.e. hydropower and nuclear power is higher, but if we see at growth point of view it contributed higher in economy. It provides us the power at cheaper rates. Special technology is required for geothermal and nuclear (fusion) power plant which is achievable. All the renewable energy has different impacts. Some of them has higher impact and some of have low impact. In [Table 3], impacts of different renewable energy on social and economic growth are listed.

Solar energy has low social impact because it requires less resources, area and mobilization. Similar to this wind and geothermal energy has low social impact. Hydro and nuclear energy have high impact due to larger mobilization of people, consummation of larger area and utilization of higher resources. However, they contribute higher in the economic growth. Wind energy has least impact on social and economic growth because it requires very less mobilization and generates small amount of energy compared to others. Geothermal energy requires very less mobilization because it's available at remote location which is far away from the populated area. All the available renewable energy sources contribute in their own way and their little contribution; also boost up the economy of the country. For the growth of the country, it is necessary that the renewable energy resources are fully utilized. Potential of renewable energy resources should be identified and feasibility study must be carried out. This leads our step towards the green and clean India [1].

**Table 3:** Impact of different renewable energy on Economy and Social Growth of India

Type of Renewable Energy	Social Impact	Economical Impact
Solar Energy	Low	Medium
Hydro Energy	High	High
Geothermal Energy	Low	Medium
Wind Energy	Low	Low
Nuclear (Fusion)	High	High

## CONCLUSION

Renewable energy has significant social and economic effects. If the potential of renewable energy resources is identified and fully utilized, it will boost up the economy and social growth of the India. It provides clear and green energy and can fulfill the future energy requirements. Due to this, global warming and relative health issues will be diminished. Also, dependency on the thermal power plants will be substantially reduced, which help us to conserve the natural resources.

### CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None.

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