



An exploration of the contribution of renewable energy to sustainability and the betterment of socioeconomic conditions in India

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ABSTRACT

Faced with rising climate change and environmental deterioration, the world is turning to renewable energy to minimize carbon emissions and practice sustainability. Energy production requires a lot of water. Air pollution kills 4.2 million people annually. Fossil fuels produce 80% of all energy and 60% of all power, and the entire process—from extraction to finished product - generates substantial air pollution. The development of electronic vehicles and the use of green energy to power houses are examples of how non-renewable energy is being replaced with green energy to reduce carbon footprint. Vancouver is one of many cities building zero-emission, low-energy passive homes. Green hydrogen is replacing blue and grey hydrogen in areas with large carbon footprints. Recycling waste reduces air pollution by creating new products. In India, solar panels have delivered electricity to communities with poor connectivity. Renewable energy promotes rural development, reduces urban-rural migration, creates jobs, and improves health care and education. It has problems. To reduce electrical subsidies, build renewable energy hubs for wind and solar. Biomass fuel is widely available, effective, clean-burning, and environmentally friendly. Building biomass centres may improve waste management, employment, cost-efficiency, and energy use. Wind energy is free, but wind uncertainty and turbine noise can threaten public safety and biodiversity. To boost energy output and environmental sustainability, tiny, lightweight wind turbines for urban and rural regions are needed. For a cost-effective, clean environment, each person should use one or two renewable energy sources daily. Without biofuel, scientific equipment can improve human lifestyle. Geo thermal energy is expensive to build and operate, requires a lot of water and difficult underground circuits, yet it produces jobs, economic benefits, almost zero carbon emissions, and a minimal environmental footprint for maximum sustainable growth. Solar energy storage requires a lot of area and is weather-dependent. We need low-cost technology to improve storage and long-term resistance.

Keywords

Renewable energy, lost – cost technology, passive houses, solar energy, geo thermal energy, environment, climate change

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1. Introduction

Every year, approximately 4.2 million people die as a result of air pollution. 80% of the global energy and 60 % of electricity is generated from fossil fuels; from the mining to the end product the whole process itself produces extreme air pollution. Non-renewable energy has a huge impact on the environment, climate change is a product of extreme exploitation of these non-renewable energy source. Coal, Petroleum and natural gas take years to form, it is estimated that by 2040 we will have no reservoir left, the way we are using non-renewable energy for industrial purpose.

The amount of greenhouse gases released by various non-renewable energy fuels varies. For instance, carbon dioxide emissions from coal are thought to be the worst. According to calculations of CO₂ emissions from the US electric power sector from 2015, coal accounted for 71% of those emissions. While, for instance, natural gas generated around 28% of the emissions of carbon dioxide [1]. When used to fuel a vehicle, natural gas does indeed produce significantly less carbon dioxide than coal—by a factor of 50 to 60—as well as 15 to 20 percent less of the gases that trap heat than gasoline. However, this does not imply that natural gas can help slow down global warming because digging for and extracting natural gas from wells causes the leakage of methane, a far more powerful greenhouse gas that has a 34 times more capacity to trap heat than carbon dioxide. In order to reduce our dependency on non-renewable sources of energy and to reduce greenhouse emission, we are adopting green energy which is environment friendly and are produced from natural sources like sunlight, air and water and can be renewed.

The use of green energy is helping us to save a huge amount of water, eliminating poverty, reduce pollution. Every sector is working on reducing carbon emission through the use of green technology. Electric vehicles are one such example. Non-renewable source of energy is responsible for the rise in air pollution, acid rain, waste generation, water pollution which is affecting the lives of people as well marine life Fossil fuels accounts for 80 % of the global energy.

Oil spills discarded into the oceans and seas is contributing to the rise in marine pollution, killing the mammals. The unprecedented increase in temperature on our planet, known as global warming, is primarily caused by carbon pollution. Carbon dioxide is the main pollutant at play in this. Although all living things exhale carbon dioxide when they breathe, it is usually seen as a hazardous pollutant when it is released by factories, vehicles, aircraft, and other human activities like burning fossil fuels and natural gas [2]. Figure 1 shows the impact of non-renewable source of energy on society

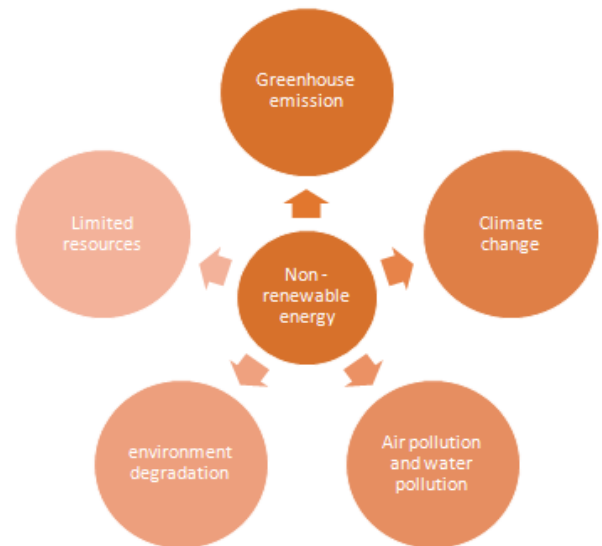


Figure 1. Impact of non-renewable source of energy on society

Due to negligent human behavior, global warming has become a reality. Our world is getting hotter and hotter as a result of the sun's energy being trapped in the atmosphere due to the rising levels of carbon dioxide. The negative effects of carbon pollution are well established; these include respiratory issues in people, disruption of polar ecosystems, melting glaciers, and increasing sea levels. According to research, the world has warmed by 1.69 degrees Fahrenheit since the turn of the 20th century. As a result, the urgency of the situation has never been felt with the same intensity as it is now. Climate change has resulted in rise in sea levels, natural disaster like floods, cyclone and drought, heat waves, cold waves and uneven pattern of rainfall.

Here where green energy is resolving the problem of energy and contributing towards the achievement of sustainable development goal. Energy is the most important component in our life, we require energy in different sectors. Even for food production and purification of water. The energy sector is undergoing rapid change. However, the transition to renewable sources must go more rapidly in all industries, including heating, construction, and transportation, if we are to limit the rise in world temperatures. It is possible that by 2050, half of the world's electricity will come from renewable energy sources, greatly decreasing carbon emissions and helping the effort to combat global warming. On the other hand, it is crucial to fully include renewable sources of energy such as solar, wind, and sustainable bioenergy [3].

2. Green energy

Renewable energy sources are a remedy for climate disruption brought on by carbon emissions. The use of renewable energy sources is thought to improve our health, our economy, and our climate. Some examples of these sources are solar, wind, geothermal, biomass, and hydroelectric power. In order to address challenges related to climate change, countries

around the world are moving toward renewable sources of energy. For instance, solar energy was installed about ten years ago in Vancouver, British Columbia stalling solar panels with the intention of decreasing their environmental impact, and the growth has increased by.

In order to reduce greenhouse gas emissions by 40% annually, electric cars were launched. These vehicles run on renewable sources, California has completely shifted to electric vehicles as a source of energy that emits no greenhouse gases and is environmentally good and pledged to cut greenhouse gas emissions by 80%. On top of a building in South Korea, solar panels have been erected. Solar panels become more efficient due to the cooling impact of the filtering reservoir of the water purification facility. Normal electricity generation hours in Seoul are 3.1 or 3.2 hours per day, however because of the cooling impact, this has changed.

Compared to the average of 3.7 or 8 hours a day, the production of renewable energy has generally reduced energy use. To provide the best possible envelope for passive designs, specific glass, unique curtain walls, and a lot of insulation are needed. Due to the properties of green walls, energy does not escape through the walls. Solar panels are installed on all roof tops, so the building generates a significant amount of renewable energy to supply the building with power, Tasmania, the Australian island, totally powered by renewable energy, and Diu Smart City is the first city in India to do so.

India is the fourth-largest energy user in the world, and it is gradually switching to renewable energy sources to satisfy its energy needs the climate change issue. India is a tropical country with high radiation levels, which increase its high sun radiation. India has set a goal of producing 175 GW of renewable energy, of which 73 GW has already been acquired. The Indian government has started a new hydropower policy for the years 2018–2028, and Indian railways will implement it. By 2030, they must reduce their emissions by 33% in order to switch to clean energy. Initiatives have been launched to scale back. The private sector is heavily involved in the installation of solar energy, sustainable power projects, and the promotion of green energy. They have invested 95% of the money [4].

3. Green energy in India

Renewable energy may play a significant role in expanding energy security, increasing capacity, and creating new markets. Renewable energy can help reduce carbon footprints as the power sector is responsible for more than half of the nation's carbon emissions. Renewable energy is widely available and has low marginal costs for generation, all of which can increase energy security by diversifying supply, lowering reliance on imports, and reducing fuel price volatility. [Figure 2](#) Shows that the green energy can transform the world towards sustainability.

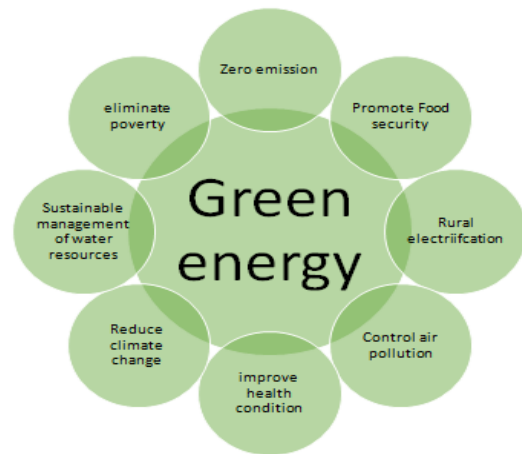


Figure 2. Green energy transforming the world towards sustainability

India can feasibly provide 90% of its renewable energy needs through wind, biomass, and hydropower. While biomass has a huge potential in the Indian Argo economy, the cost of production is comparable to wind energy, making hydropower one of the most interesting and cost-effective forms of energy. Hydropower's maximum production is during summers, which peak with India weather, and Uttarakhand has 65% of India's small hydropower resources. India has a high installed potential for wind energy, which is 705. When it comes to total known potential and currently installed capacity, wind energy is the biggest contributor.

Wind energy has received 99% of its funding from the private sector. The growth of a state's economy can also be facilitated by renewable energy. By encouraging the private sector to invest and making the use of renewable energy mandatory, the Indian government is actively promoting the use of renewable energy. In order to increase the cost-competitiveness of renewable energy technologies compared to fossil fuels, equipment and technology advancements have led to a decrease in the cost of renewable energy.

The cost of wind turbines has decreased by 25% while the cost of solar modules has decreased by 80% since 2008. Because it is a scalable and distributed resource, renewable energy can offer electricity in rural locations with poor transportation infrastructure. By authorizing 100% direct investment, the government has established a climate for foreign investment in renewable energy projects, encouraging international investors to establish renewable power-based generation projects in India.

India has an abundance of unrestricted renewable energy resources, receives the most radiation due to its tropical location with year-round sunshine, a sizable coastline, and significant wind speeds in several regions. India has many opportunities to put solar panels and on-shore wind farms because of its abundance of rivers and waterways, which can provide

hydropower and biomass energy from agricultural and forested areas.

Alternative energy has been produced using agricultural waste, such as coffee grounds, and organic waste, such as fruits and vegetables [5]. Food security and the sustainable management of water resources have benefited from green technology. Solar panels are being installed in villages to provide electricity to every home, which has led to the construction of sturdy, permanent homes with fewer mud huts, the building of food storage warehouses, the creation of employment opportunities, the building of schools and health care facilities, the provision of clean drinking water, and the installation of toilets in every home [9]. To increase production and income, farmers are using community-based farming techniques.

Women have developed kitchen gardens in the villages, which helps with food security. India is becoming a smart and sustainable nation because of green energy. Green energy will improve health, create jobs, eliminate poverty, and pave the way for the development of a sustainable rural village through the installation of solar panels in villages which also reduce the household air pollution caused by traditional method of cook, using wood and earth stove, around 4 million people die each year due to household air pollution [6]. Green technology also reduces waste burning in landfills by disposing of it in a more environmentally friendly manner. Use of nanotechnology to reduce air pollution through the use of nano particles, nano technology also contributes to reduction of water pollution and food security, nano fertilizers, nano pesticides contribute to better crop health and yield [7].

Use of green energy has reduced the impact of climate change in the agriculture sector, reduce poverty and provide people with basic access to living. Demand for Green hydrogen is rising which is 100 % sustainable, the use of green hydrogen in vehicles will result in zero contribution. The 830 million tonnes of CO₂ that are emitted each year when this gas is produced with fossil fuels might be avoided by employing green hydrogen. Similarly, replacing all of the world's grey hydrogen would require 3,000 TWh/year from new renewable sources, which is equal to Europe's current demand. However, due to the high cost of production, there are some genuine reservations regarding the practicality of green hydrogen that will dissipate as the earth's decarbonization process advances and, as a result, the cost of producing renewable energy decreases [8].

Green hydrogen will also replace the other hydrogen used in industries. Green hydrogen has the potential to replace fossil fuels. However green technology has certain disadvantages which include solar waste generation, lack of power battery storage infrastructure, use of agriculture land for wind energy will affect the lives of farmers and people living near that region.

4. Way Forward

For reduced electricity subsidies, we must establish renewable energy hubs for various renewable resources like wind and solar. By constructing a biomass centre, we may have a significant impact on waste management, employment, cost-effectiveness, and reduce power consumption. Biomass fuel is widely accessible, effective, clean burning, and has no impact on the environment. Although wind energy is entirely free, its variability and noise pollution from wind turbines can pose risks to public safety and biodiversity. As a result, we need to develop small, lightweight wind turbines for urban and rural areas in order to improve energy production, environmental sustainability, and this advantage-free strategy.

As is common knowledge, geo thermal energy is extremely expensive to install and maintain, requires challenging underground loops and uses a lot of water, but it also creates job opportunities, economic benefits, almost zero carbon emissions, and leaves a minimal environmental footprint for maximum sustainable growth. Since solar energy storage requires a lot of space and is inconsistent due to weather, we must combine two or three renewable energy sources at once.

We also need to create low-cost technologies that will improve storage capacity and long-lasting resistance mechanisms. A chain-link organisation that can defy geographical restrictions and ensure a steady flow of energy when needed needs to be developed. To better manage and use renewable energy sustainably, we need to develop renewable energy centres in every district or region. For the sake of the human race and resources in contemporary India, we must convert small deserts and mountain ranges into energy installation centres. To do this, we can establish a modest nuclear energy facility. In order to establish a habit of its use in urban areas for sustaining modest energy needs such as mobile charging points, e-vehicle charging, etc., we need to create mobile renewable energy units.

5. Conclusion

To stop future environmental damage and address the issue of climate change, we need green policies, an eco-friendly economy, and green energy. Poverty, hunger, and health problems can all be solved in society thanks to green technology. There is potential for green energy to employ thousands of people. Every country's rural areas can generate alternative energy from agricultural waste. It is necessary to increase urban mobility, the development of renewable energy hubs, and the production of electric automobiles. Logistics must be taken into account to enhance supply chain management, spur economic expansion, and guarantee sustainability in the field of renewable energy. We need to heal the earth, where the covid 19 pandemic has shown that zero emission of greenhouse gas can heal nature heal itself quickly, and green technology and green hydrogen can do the work. We need to put an end to air pollution and water pollution brought on by non-renewable

sources of energy. We must adopt a sustainable lifestyle that uses clean energy for everyone.

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