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Extensively Admiring Renewable Energy For Safer Future

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ABSTRACT

A large chunk of the greenhouse gases that blanket the Earth and trap the Sun's heat are generated through energy production, by burning fossil fuels to generate electricity and heat. Fossil fuels, such as coal, oil and gas, are by far the largest contributor to global climate change, accounting for over 75 percent of global greenhouse gas emissions and nearly 90 percent of all carbon dioxide emissions. we need to end our reliance on fossil fuels and invest in alternative sources of energy that are clean, accessible, affordable, sustainable, and reliable. Renewable energy sources, which are available in abundance all around us, provided by the sun, wind, water, waste, and heat from the Earth are replenished by nature and emit little to no greenhouse gases or pollutants into the air. Replacing the current fossil fuel-based energy system with a renewables-based system is the most urgent and efficient way to tackle harmful emissions and air pollution. Since renewable energy can be produced locally and thereby reduces the need for energy imports, it is less affected by geopolitical crises, price spikes, or sudden disruptions in the supply chain. The deployment of renewables can therefore benefit households and businesses by reducing energy bills, especially in the face of high energy prices, and enhance national and regional energy security. It draws on a wide array of existing solutions and best practices globally to maximise the benefits of renewables while minimising their negative impacts. Establishing these benchmarks is crucial for guiding a sustainable shift towards renewable energy and fostering the trust and support needed from society.

Keywords : renewable energy, fossil fuel, climate , sustainable.

INTRODUCTION

Renewables do not emit greenhouse gases in energy generation processes, making them the cleanest, most viable solution to prevent environmental degradation. Compared to conventional energy sources such as coal, gas, oil and nuclear - reserves of which are finite - clean energies are just as available as the sun from which they originate and adapt to natural cycles, hence their name “renewables”. This makes them an essential element in a sustainable energy system that allows development today without risking that of future generations. The indigenous nature of clean sources gives local economies an advantage and brings meaning to the term “energy independence”. Dependence on fossil fuel imports results in subordination to the economic and political short-term goals of the supplier country, which can compromise the security of energy supply. Everywhere in the world there is a renewable resource – whether that be the wind, sun, water or organic material – available for producing energy sustainably[1].



TYPES OF RENEWABLE ENERGY

Renewable energies include:

- **Wind energy:** the energy obtained from the wind.
- **Solar energy:** the energy obtained from the sun. The main technologies here are solar photovoltaic (using the light from the sun) and solar thermal (using the sun's heat).
- **Hydraulic or hydroelectric energy:** energy obtained from rivers and other freshwater currents.
- **Biomass and biogas:** energy extracted from organic material.
- **Geothermal energy:** heat energy from inside the Earth.
- **Tidal energy:** energy obtained from the tides.
- **Wave energy:** energy obtained from ocean waves.
- **Bioethanol:** organic fuel suitable for vehicles and obtained from fermentation of vegetation.

- **Biodiesel:** organic fuel for vehicles, among other applications, obtained from vegetable oils.

Nowadays renewables, specifically wind and photovoltaic, are cheaper than conventional energies in much of the world. The main renewable technologies, such as wind and solar photovoltaic are drastically reducing their costs, such that they are the most economically efficient way to generate electricity in a growing number of markets. Economies of scale and innovation are already resulting in renewable energies becoming at lightning speed the most sustainable solution, not only environmentally but also economically, for powering the world. The conventional energy sources such as coal, oil, and natural gas, also known as fossil fuels, have been explored and exploited for power generation in power plants through the past few centuries. The most significant benefit of these energy sources is that they have high energy density. However, they emit carbon and other greenhouse gases when they are used. The global energy demand is rising each year and it is forecasted that the energy demand will have increased by 56% from 2010 levels by 2040. To reduce carbon emissions and fight global warming, it is essential to reduce the consumption of fossil fuels and increase the utilization of the more readily exploitable renewable energy sources (RESs) in the energy sector. RESs are often considered to be emission free and environmentally friendly energy sources[2]. Although RESs are far better than fossil fuels, research shows that they can have adverse effects on the environment. If the whole idea of adopting RES is to save the environment, their improper handling may do the opposite.

IMPORTANCE OF RENEWABLE ENERGY

Renewable energy comes from natural sources that are constantly replenished, so they never run out. This includes sunlight, wind, rain, tides, waves, biomass, and heat from the Earth [3]. One of the major advantages of green energy is that, unlike fossil fuels (oil, coal, and gas), which take millions of years to form and are limited, renewable energy sources are sustainable and much less harmful to the environment.

- **Environmental Protection**

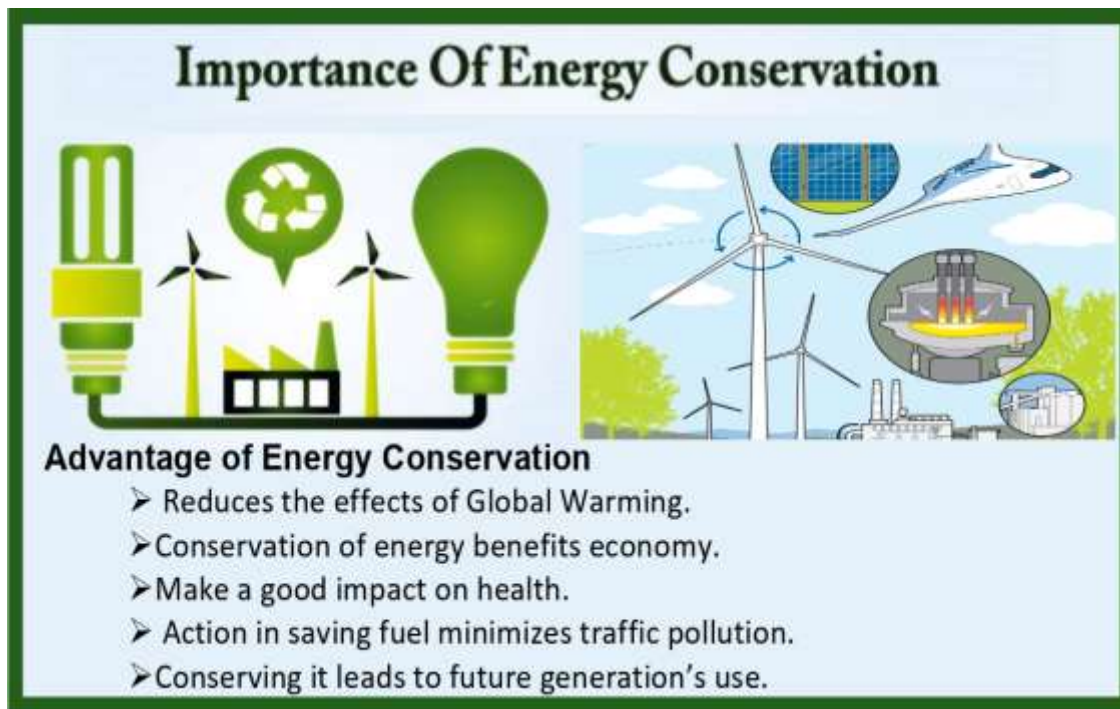
Renewable energy significantly cuts down on carbon emissions, helping to mitigate climate change. In 2023, India's renewable energy initiatives helped avoid approximately 2 billion tons of CO₂ emissions, contributing to the goal of net-zero emissions. By reducing pollution and the need for resource extraction, renewable energy helps protect ecosystems and wildlife habitats.

- **Cleaner Air and Water**

Renewable energy sources like wind, solar, and hydropower don't produce air pollutants or greenhouse gases. This means cleaner air for us to breathe. As of 2024, renewables accounted for approximately 41.4% of India's total installed capacity, significantly reducing air pollution and improving public health. Unlike fossil fuel power plants, renewable energy systems don't produce toxic waste or require large amounts of water for cooling, keeping our water sources clean.

- **Health Benefits**

Reduced air pollution from renewable energy means fewer cases of asthma, bronchitis, and other respiratory diseases. Around 99 percent of people worldwide breathe air that is polluted and poses a health risk, according to the World Health Organisation (WHO), and more than 13 million people die from preventable environmental causes, such as air pollution, each year. Transitioning to renewable energy can mitigate these health risks. Cleaner environments lead to healthier communities, with lower healthcare costs and better quality of life[4].



- **Energy Independence and Security**

By using renewable resources available locally, communities can reduce their dependence on imported fuels, enhancing their energy security. India is working towards increasing its domestic renewable energy capacity to ensure greater energy independence. Distributed renewable energy systems, like rooftop solar panels, make energy infrastructure more resilient to natural disasters and outages.

- **Sustainable and Endless**

Renewable energy sources are naturally replenished. The sun will shine, the wind will blow, and rivers will flow regardless of how much we use them. In 2024, India's renewable energy capacity reached nearly 446.2 GW, with a substantial increase in solar and wind energy. Unlike oil, coal, and gas, which are finite, renewable sources will always be available, ensuring a sustainable supply of energy for future generations.

- **Flexibility and Scalability**

Renewable energy systems can be scaled to fit different needs, from small home installations to large power plants. Renewable energy can be used for electricity, heating, cooling, and even transportation, offering versatile energy solutions.

- **Cost-Effective Over Time**

The cost of renewable energy technology, like solar panels and wind turbines, is steadily declining. 2024 solar PV prices continued to fall, making renewable energy more affordable. Solar power accounted for 67.1% of new capacity additions in the first half of 2024. Renewable energy prices are less volatile than fossil fuels, which are subject to market fluctuations and geopolitical tensions[5].

- **Technological Innovation**

Technological innovation is one of the key advantages of renewable energy technologies. The push for renewable energy drives innovation and technological advancements, leading to more efficient and effective green energy solutions. Innovations in renewable energy can benefit other sectors, such as battery technology improvements aiding electric vehicles.

- **Economic Growth and Job Creation**

The renewable energy sector creates jobs in manufacturing, installation, maintenance, and research, boosting local economies. In India, the renewable energy sector is expected to create millions of jobs as it expands. Renewable energy industries have seen a boom in green-centric jobs, but the International Energy Agency (IEA) says the number of workers pursuing degrees or certifications relevant to energy sector jobs is not keeping pace with growing demand.

Governments, industry and educational institutions need to put in place programmes to deliver the expertise needed in the energy sector to keep pace with growing demand, particularly to manufacture and build the clean energy projects necessary to meet our energy and climate goals. Growing demand for renewable energy technologies attracts investments, leading to further economic development.

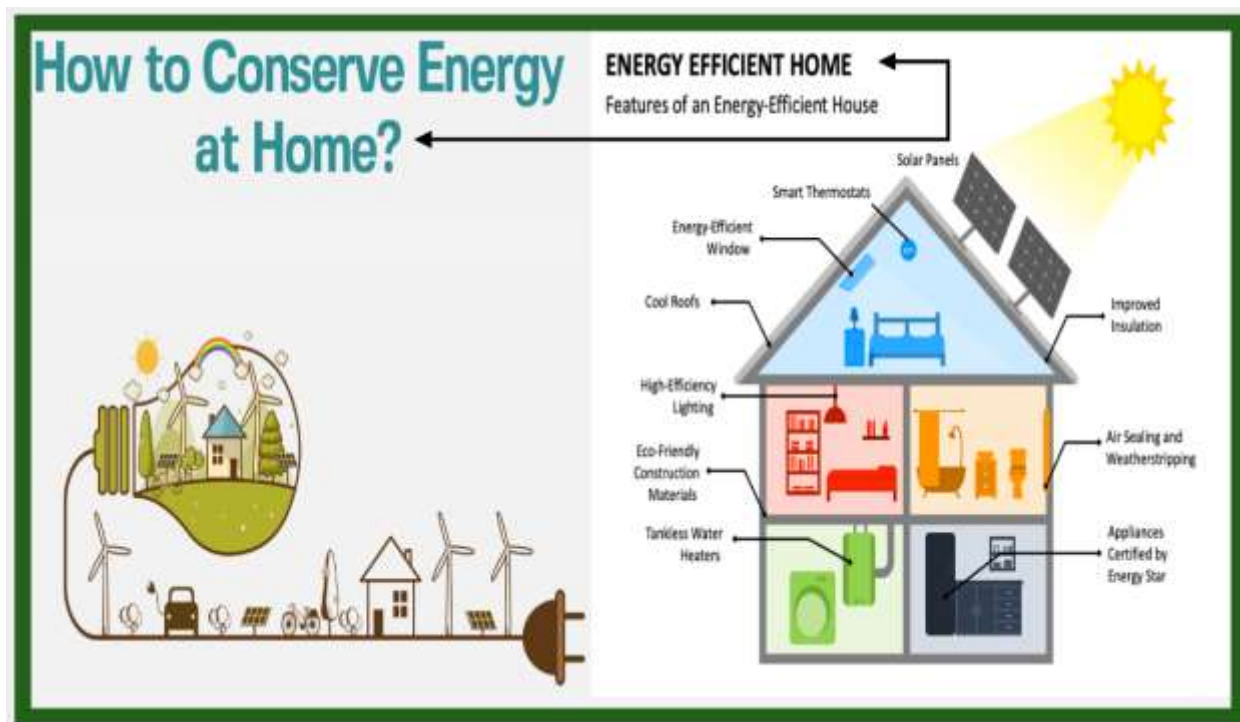
- **More inclusive**

Renewable energy promotes inclusivity by decentralising energy production, offering opportunities for participation and ownership by diverse communities. Community-owned projects enable local engagement and economic empowerment, fostering social equity. Access to efficient and reliable renewable energy can also provide significant climate, development and equity benefits. Transitions to

clean energy are compatible with sustainable economic development and women's economic empowerment.

Utilization of Renewable Energy: Renewable energy can be utilized in various sectors to provide power and heat[6].

- **Buildings:** In residential and commercial buildings, renewable energy sources such as solar panels, wind turbines, and geothermal systems can be used to generate electricity and provide heating and cooling. Solar water heaters can supply hot water, while solar photovoltaic (PV) systems can power lighting, appliances, and other electrical needs. Reducing the energy demand of buildings and industry is key to transitioning to a renewables-based energy system.



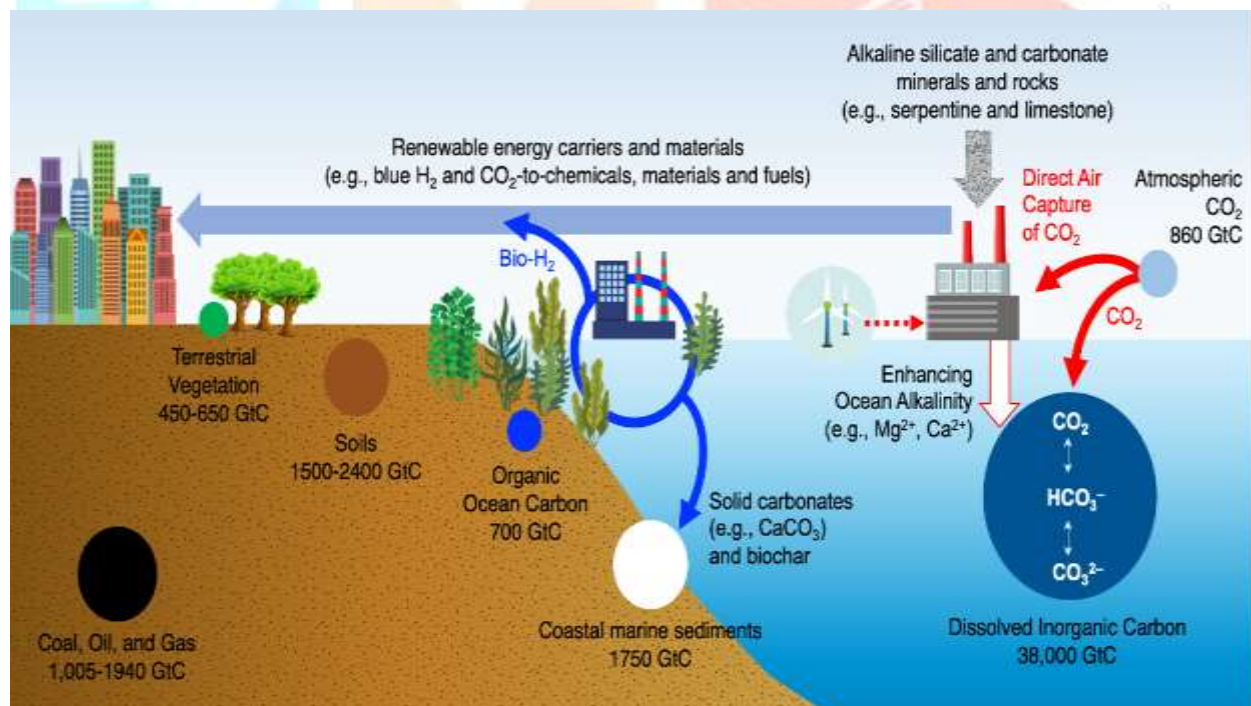
- **Industry:** Renewable energy can be integrated into industrial processes through the use of biomass, solar thermal energy, and wind power. These sources can provide electricity for machinery and production lines, as well as heat for processes like drying, melting, and steam generation. Renewable energy can also help industries reduce their carbon footprint and meet sustainability goals. Industries, such as food processing and pulp and paper, can also be run on renewable energy. Hydrogen produced with renewable electricity can meet the needs of high-intensive industrial processes in the iron and steel and chemical industries.
- **Agriculture:** In agriculture, renewable energy sources can be used to power irrigation systems, greenhouses, and farm equipment. Solar energy can be utilized for drying crops and powering livestock operations, while biogas from organic waste can provide heat and electricity for farms.
- **Transport:** The transportation sector can benefit from renewable energy through the use of biofuels, electric vehicles (EVs), and hydrogen fuel cells. Biofuels, derived from organic materials, can replace conventional fossil fuels in internal combustion engines. EVs can be charged using electricity generated from renewable sources like solar and wind, reducing emissions and reliance on fossil fuels.

Hydrogen fuel cells, powered by renewable hydrogen, can provide a clean and efficient alternative for transportation[7].renewable energy can be used in the form of sustainable biofuels, high-percentage biofuel blends and drop-in biofuels. Renewable electricity can power the world's growing fleet of electric vehicles. Car batteries can be used to store electricity for later use.

By leveraging renewable energy in these sectors, we can reduce greenhouse gas emissions, enhance energy security, and promote sustainable development.

CONCLUSION

Renewable energy are sources of clean, inexhaustible and increasingly competitive energy. They differ from fossil fuels principally in their diversity, abundance and potential for use anywhere on the planet, but above all in that they produce neither greenhouse gases, which cause climate change nor polluting emissions. Their costs are also falling and at a sustainable rate, whereas the general cost trend for fossil fuels is in the opposite direction in spite of their present volatility. Growth in clean energies opens in a new tab is unstoppable, as reflected in statistics produced annually by the International Energy Agency (IEA)opens in a new tab: according to IEA forecasts, the share of renewables in global electricity supply will increase from 28.7% in 2021 to 43% in 2030, and they will provide 2/3 of the increase in electricity demand recorded in that period, mainly through wind and photovoltaic technologies[8].



Clean energy development is vital for combating climate change and limiting its most devastating effects.2023 was the sixth warmest year since records have been kept and the ninth consecutive year in which global temperatures have increased by at least 1 degree Celsius compared to pre-industrial levels. Meanwhile, some 1.1 billion inhabitants (17% of the world population) do not have access to electricity. Equally, 2.7 billion people (38% of the population) use conventional biomass for cooking, heating and lighting in their homes at serious risk to their health[9].

The transition to an energy system based on renewable technologies will have very positive economic consequences on the global economy and on development. According to the International Renewable Energy Agency (IRENA) and the IEA (International Energy Agency), tripling the renewable energy share in electricity generation of 2022 until it reaches 90 % worldwide by 2030 will be necessary for meeting the Paris Agreement targets. This requires raising annual investments in renewable energy from the current USD 1.3 trillion to USD 5 trillion, thereby boosting job creation and growth linked to the green economy[10].

While the use of RESs is essential for decarbonizing the power sector and to combat global warming, an obvious question arises as to whether this has any negative consequences on the environment. Research shows that many RESs have some adverse effects that are detrimental to the environment and nature. RESs are used to reduce harmful emissions for the betterment of the environment. However, the same environment can be harmed if the adverse effects of RESs are ignored. There is a dilemma where reliance on fossil fuels increases global warming and improperly regulated RESs can be detrimental for the environment.

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