

**The Role Of Renewable Energy In Achieving Sustainable Development****Sunita Nagpal****Associate Professor****Department Chemistry****Dr. Bhim Rao Ambedkar Govt College****Sriganganagar****Rajasthan****(Received:15August2024/Revised:25August2024/Accepted:10September2024/Published:28September2024)****Abstract**

Long-term action is required to find effective solutions to global environmental issues. The power industry has been driven to devise innovative decarbonization strategies because of climate change. Sustainable development incorporates cultural, physical, and economic factors to provide perfect balance and a high standard of living. The students of the engineering college in Coimbatore can focus on safeguarding the environment through sustainable development by utilising renewable energy.

As the world struggles to reduce its reliance on limited and polluting fossil fuels and mitigate the negative effects of climate change, renewable energy technologies have gained importance. In order to promote sustainable development, which attempts to meet the demands of the current era without compromising the future, it has been realised that the utilisation of renewable energy sources is a critical component. This article covers the role of renewable energy in sustainable development and how it helps safeguard the environment.

**Keywords- Sustainable Development, Environment, Climate Change, Renewable****Introduction**

In order to assure a better future for everyone, sustainable development attempts to balance economic, social, and environmental factors. The goal is to develop a society where everyone has access to the resources they require to lead respectable lives without endangering the environment. As an engineer at the best m.e. power systems engineering college in Coimbatore, you might be involved in network infrastructure, efficient recycling implementation, and environmental impact evaluation of energy-producing projects. The objective is to make sure that development's social, economic, and environmental components are interconnected and mutually supportive of one another. Let's discuss a few of the most important ways that technologies for renewable energy contribute to sustainable development.

1. Reducing emissions of greenhouse gases:

Greenhouse gas emissions can be reduced, and the effects of climate change can be mitigated, by using renewable energy sources. The usage of fossil fuels and the damage caused by the carbon dioxide that is released into the environment can be reduced with the help of clean renewable energy sources like solar and wind power. This sustainable development will help India's financial sector experience exceptional growth.[1,2,3]

#### 2. Further developing energy security:

Renewable energy sources can boost energy security by reducing the need for imported fuels and boosting the reliability of the energy supply. By using readily available resources like solar and wind power, nations can increase their energy independence and decrease their reliance on foreign energy sources.

In the contemporary world, renewable energy is a trustworthy source of power. Fuel diversification reduces the likelihood of fuel spills and reduces the nation's reliance on imported fuels.

#### 3. Providing energy access:

Especially in poor countries, previously powerless groups can now use renewable energy sources. While having access to energy is essential for many parts of daily life, like lighting, cooking, and heating, it also has the potential to lower hunger rates and raise living standards. The Indian government has initiated a number of measures to bring electricity to all areas. Investment policies in renewable energy have boosted energy accessibility to a larger level and helped people all around the country, even those in distant places.

#### 4. Promoting the growth of rural areas

By providing rural people with access to energy, renewable energy technologies can support the development of rural areas by enhancing agricultural output, driving economic growth, and enhancing the quality of life. It is vital to consider how our environment is impacted by everything in it. It is everyone's responsibility to protect the environment and natural resources. Over many years, severe climatic shifts have resulted from the uncontrolled utilisation of non-renewable resources. As a result, adopting renewable energy will contribute to reducing climate change and ensuring a sustainable future for future generations.[4,5,6]

#### 5. Creating Job Prospects:

Particularly in the production and installation of renewable energy systems, renewable energy technologies have the potential to boost economic expansion and create jobs. For instance, the expansion of the solar power industry has resulted in the creation of a large number of jobs in the fields of solar panel manufacturing and system installation.

Since carbon is an essential component of the earth's ecosystem, a sustainable equilibrium is required, which is not the case right now. Between the earth's surface and the ozone layer, carbon atoms have become stuck in the atmosphere. This is insulating and warming our planet, resulting in catastrophic effects: sea levels are rising, extreme weather is getting worse, and glaciers are melting. Climate change can only be stopped by using renewable energy.

## **Discussion**

Renewable energy technologies have become increasingly important as the world faces the challenge of mitigating the negative impacts of climate change and reducing the dependence on finite and polluting fossil fuels. The use of renewable energy sources has been recognized as a key factor in promoting sustainable development, which aims to meet the needs of the present generation without compromising the future.

Herein, we shall explore the role of renewable energy technologies in sustainable development and their potential to contribute to a more sustainable future.

What is Sustainable Development?

Sustainable development is a concept that emerged in the 1980s, which seeks to balance economic, social and environmental aspects to ensure a better future for all. The idea is to create a world in which everyone has access to the resources they need to live a decent life, without harming the planet. It is about ensuring that the economic, social and environmental aspects of development are interdependent and mutually reinforcing.

India's need for energy is constantly surging to quench the country's current economic growth initiatives. A vital pre-requisite for a nation's economy to grow is the availability of growing amounts of energy. With the aim of providing energy across the nation, the National Electricity Plan [NEP] defined by the Ministry of Power (MoP) has created a thorough 10-year action plan. It has also developed a different strategy to make sure that power[7,8,9] is distributed to the public efficiently and affordably.

**Role of Renewable Energy Technologies in Sustainable Development** Renewable energy technologies play a crucial role in sustainable development by reducing greenhouse gas emissions, improving energy security and providing access to energy to communities that previously lacked it. For instance, when compared to coal-fired power plants, electricity from renewable energy sources emits between 90 and 99% less greenhouse gases (GHGs) and produces 70 to 90% less pollutants.

These technologies also create jobs and stimulate economic growth, which is essential for sustainable development. Listed below are some of the key ways in which renewable energy technologies contribute to sustainable development:

**Reducing greenhouse gas emissions:** The use of renewable energy sources can reduce greenhouse gas emissions and help mitigate the effects of climate change. By relying on clean, renewable sources of energy, such as solar and wind power, we can reduce our dependence on fossil fuels and decrease the amount of harmful pollutants like carbon dioxide that are emitted into the atmosphere

**Improving energy security:** Renewable energy technologies can increase energy security by reducing dependence on imported fuels and improving the reliability of the energy supply. By relying on locally available resources, such as solar and wind power, countries can reduce their dependence on foreign energy sources and become more self-sufficient.

**Providing access to energy:** Renewable energy technologies can provide access to energy to communities that previously lacked it, particularly in developing countries. This can help to reduce poverty and improve quality of life, as access to energy is essential for many aspects of daily life, such as lighting, cooking, and heating.

**Creating jobs:** Renewable energy technologies can create jobs and stimulate economic growth, particularly in the manufacturing and installation of renewable energy systems. For example, the growth of the solar power industry has created a large number of jobs in the production of solar panels and the installation of solar systems.

**Supporting rural development:** Renewable energy technologies can support rural development by providing access to energy to rural communities, which can help to improve quality of life, increase agricultural productivity and stimulate economic growth.

With the adaptation of clean, renewable sources of energy, we can ensure a sustainable future for all, with economic, social and environmental benefits for the present and future generations. Governments, businesses and individuals must work together to accelerate the transition to a more sustainable energy future, which will help to mitigate the negative impacts of climate change and ensure a better future for all.

## **Results**

Sustainable development has emerged as a global priority in the 21st century, with the United Nations' Sustainable Development Goals (SDGs) serving as a comprehensive framework to address pressing global challenges. These goals encompass a wide range of objectives, including ending poverty, ensuring access to clean water, reducing inequality, and combating

climate change. One key driver of sustainable development is the transition to renewable energy sources. In this article, we will explore the pivotal role of renewable energy in achieving the SDGs, highlighting its potential to transform economies, mitigate climate change, and improve the quality of life for billions of people around the world.[10,11,12]

#### Access to Clean and Affordable Energy (SDG 7)

SDG 7, which aims to ensure access to affordable, reliable, sustainable, and modern energy for all, underlines the fundamental role of renewable energy. Approximately 789 million people worldwide lack access to electricity, with even more relying on dirty and inefficient energy sources like kerosene and biomass. Renewable energy technologies, such as solar, wind, and hydroelectric power, have the capacity to bring clean and affordable energy to remote and underserved

Solar energy, in particular, has witnessed remarkable growth in off-grid and decentralized applications. Solar panels can be installed in rural areas to power homes, schools, and healthcare facilities, bridging the energy divide and improving the quality of life for those who have been left behind by traditional grid expansion efforts. Moreover, renewable energy technologies are often scalable and adaptable to the needs of communities, making them a versatile tool for addressing energy poverty.

#### Climate Action (SDG 13)

SDG 13 centers on urgent action to combat climate change and its impacts. The burning of fossil fuels for energy production is a leading driver of greenhouse gas emissions, which are the primary cause of global warming and climate change. Transitioning to renewable energy sources is essential in mitigating the adverse effects of climate change and achieving the targets set by SDG 13.

Renewable energy technologies produce little to no greenhouse gas emissions during operation, making them a cleaner alternative to fossil fuels. Solar and wind power, in particular, have the potential to significantly reduce carbon emissions in the energy sector. As countries shift away from coal, oil, and natural gas and invest in renewables, they contribute to a global effort to limit global warming to well below 2 degrees Celsius above pre-industrial levels, as outlined in the Paris Agreement.

#### Economic Growth and Decent Work (SDG 8)

SDG 8 emphasizes the promotion of sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. The renewable energy sector has become a significant driver of economic growth and job creation in many regions. As

investments in renewable energy projects increase, they create employment opportunities in manufacturing, installation, maintenance, and research and development.

Countries that invest in renewable energy technologies can experience a "green jobs" boom, as workers are needed to manufacture solar panels, construct wind farms, and maintain renewable energy infrastructure. These jobs are often locally based, providing opportunities for communities to thrive. Additionally, the renewable energy sector can attract investment and foster innovation, further contributing to economic development.

#### Affordable and Clean Energy (SDG 7)

SDG 7 also emphasises the importance of affordable energy. Renewable energy sources offer a unique advantage in this regard. While there are initial costs associated with the installation of solar panels, wind turbines, and other renewable technologies, the ongoing operational costs are significantly lower than those of fossil fuel-based power generation. Once installed, renewable energy systems can produce electricity for decades with minimal maintenance, reducing long-term energy expenses for individuals, businesses, and governments.

Furthermore, the decentralisation of energy production through renewable sources can enhance energy security. Communities and nations that rely on a diverse portfolio of renewable energy resources are less vulnerable to disruptions in energy supply and price volatility associated with fossil fuels.

#### Sustainable Cities and Communities (SDG 11)

SDG 11 focuses on making cities and human settlements inclusive, safe, resilient, and sustainable. Cities are hubs of energy consumption, and their energy choices have a substantial impact on environmental sustainability. Renewable energy plays a crucial role in making cities more sustainable by reducing air pollution, lowering carbon emissions[13,14,15], and improving the overall quality of life for urban residents.

Renewable energy technologies, such as rooftop solar panels, can be integrated into urban landscapes, generating clean energy at the point of consumption and reducing the strain on centralised power grids. Additionally, electric vehicles, which can be charged using renewable energy sources, offer a sustainable transportation solution for urban areas, reducing air pollution and promoting cleaner, more liveable cities.

#### Life Below Water and Life on Land (SDGs 14 and 15)

SDGs 14 and 15 address life below water and life on land, respectively, aiming to protect and sustainably manage these ecosystems. The transition to renewable energy sources is critical in

achieving these goals as well. Fossil fuel extraction and combustion have significant impacts on ecosystems, from oil spills in oceans to habitat destruction on land.

Renewable energy projects, when designed and implemented with care, have a lower ecological footprint. For example, offshore wind farms can provide clean energy without disturbing marine life and habitats to the same extent as offshore drilling for oil. Similarly, solar power projects can be built on previously developed land, reducing the need for land conversion and preserving natural landscapes.

#### Partnerships for the Goals (SDG 17)

SDG 17 emphasises the importance of partnerships to achieve the other 16 goals. The transition to renewable energy requires collaboration among governments, the private sector, civil society, and international organisations. Public-private partnerships can drive investment in renewable energy projects, improve energy infrastructure, and facilitate technology transfer to developing countries.

International cooperation is crucial for advancing renewable energy adoption, as many renewable technologies require significant research and development efforts. Collaborative efforts can accelerate the deployment of renewable energy solutions and ensure that no country is left behind in the transition to a sustainable energy future.

Renewable energy is a linchpin in the pursuit of the Sustainable Development Goals (SDGs). Its potential to provide clean and affordable energy, mitigate climate change, drive economic growth, create jobs, and enhance the quality of life for urban and rural communities alike makes it an indispensable tool for achieving the global vision of sustainable development. However, realising this potential requires concerted efforts from governments, businesses, and individuals to invest in renewable energy infrastructure, research, and technology development. By harnessing the power of renewable energy, the world can move closer to a future where the SDGs are not just aspirational but achievable.

#### **Conclusion**

Finding effective solutions to global environmental concerns necessitates long-term action. The urgency of climate change has pushed the power industry to find innovative ways to decarbonize. With global economies coping with the impact of the pandemic and gradually moving toward the new normal, it has become imperative for industries and commercial facilities to rethink the scale of existing efforts to combat climate change.

Renewable energy qualifies as one of the foremost means to minimize the worst impacts of the climate crisis. Economic developments and technological advancements in renewables, such

as carbon capture and storage, are directly impacting the strategies for sustainable development. This article gives you a detailed insight into the different types of renewable energy sources for sustainable development.

Sustainable development as a concept emerged in 1987 and was defined as the development that is able to meet the needs of the present without jeopardizing the ability of the future generations to do the same.[16,17,18]

Sustainable development takes into account the societal, environmental, and economic factors to ensure optimal balance while pursuing an enhanced quality of life. While sustainability is a long-term objective, sustainable development includes the various methods and strategies that can be effectively leveraged to achieve the goal of sustainability.

### Renewable Energy Sources for Sustainable Development

Renewable energy sources for sustainable development come from natural and consistent energy flow in the environment. Here is a look at some of the renewable energy sources for sustainable development:

**Bioenergy:** Derived from biological sources, bioenergy can be used to generate electricity, heat, cook, and produce biodiesel for transportation. Bioenergy has great potential to minimize greenhouse emissions and ensure adequate fuel supply in the future.

**Direct solar energy:** Direct solar energy is a term used to describe all renewable energy sources for sustainable development that make use of direct sunlight[1]. Ocean thermal and wind energy leverage solar energy once it is absorbed in the Earth and transformed into other forms. Solar energy makes the use of solar irradiance to produce electricity to meet the lighting needs. Moreover, solar energy is also used to produce fuel that can be leveraged for transportation or other suitable purposes.

**Hydropower:** One of the crucial renewable energy sources for sustainable development, hydropower is generated by manipulating the elevation of water from a higher to a lower level. The energy is harnessed to produce electricity or move turbines. Powered by mature technologies, hydropower does not involve the production of any greenhouse gas and is therefore termed a green source of energy.

**Wind energy:** Ever since the advent of wind energy, it has taken centre stage and become one of the most reliable renewable energy sources for sustainable development. Wind energy focuses on harnessing the kinetic energy from flowing air and is primarily used to move large turbines and produce electricity.

Geothermal energy: Acquired from the interior part of our planet as a source of heat, geothermal energy is a reliable renewable energy source for sustainable development. While the Earth's crust has heat in abundance, the heat is unevenly distributed. The heat is mined from reservoirs with the help of a well or other means. Once the heat reaches the surface, it can be used to produce electricity or for any other purpose that requires heat energy.[19]

Tidal energy: Waves on the ocean surface are created with the passage of wind. The higher the intensity of the wind and the longer the intensity is sustained, the energy produced increases significantly. The ocean accounts for 71% of the global surface and has the potential to meet the power requirements of the world population. Energy can be obtained from oceans with the help of thermal differences between shallow and deep seawater, wind, tides, and waves

Renewable Energy and Sustainable Development: The Interrelation

Renewable energy shares a direct relationship with sustainable development. The impact that renewable energy sources have on productivity and human development allow it to open fresh opportunities in climate change mitigation, access to clean energy, social and economic development, minimizing the health and environmental impacts, and energy security.

Sustainable Development with Green Yodha

With our planet facing one of the worst crises of all time, change can only be realized with a collective effort from individuals, organizations, and the government. Green Yodha is a sustainability initiative by Schneider Electric that supports individuals and businesses in ascertaining their carbon footprint and making impactful contributions toward a greener future. Businesses across the world are working towards propelling their progress toward clean energy and sustainability; however, are the efforts enough considering the adverse effects of climate change?

The targets set under the Schneider Sustainability Impact (SSI) 2021-2025 are in line with the United Nations Sustainable Development Goals. We firmly believe that the focus of large organizations should be on making a positive climate impact by minimizing carbon emissions, making effective contributions toward societal developments, and doing everything without sacrificing profits. Our climate commitments are directed toward reducing carbon emissions for our customers as well as our own organization. We strongly believe that the secret to remaining consistent on the decarbonization trajectory is by propelling the modernization of the economy. The target of limiting the global temperature increase to 1.5 degrees can only be achieved by giving way to human progress instead of limiting it. Bold steps are required to

reduce carbon emissions and achieve the sustainability objectives as set by enterprises across the globe.[20]

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