



Why Renewable Energy Gained Attention and Demand Globally?

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Nat. Env. & Poll. Tech.
Website: www.neptjournal.com

Received: 30-06-2023

Revised: 11-08-2023

Accepted: 20-08-2023

Key Words:

Renewable energy
Fossil fuels
Energy security
Environmental issues
Sustainability
Climate change

ABSTRACT

Energy security and stable supply are the most important aspects for any nation. The rising need for energy, caused by both population growth and economic activity, is a problem for many nations throughout the world. Consequently, they have to find a way to meet energy demand while also making sure it is inexpensive and sustainable. The use of renewable energy has gradually become one that is being given a lot of attention since it does not cause any harm to the environment. On the other hand, renewable energy is gaining popularity for a variety of different reasons. A paradigm shift toward renewable resources is relevant, as they have the ability to lessen reliance on fossil fuels and decrease environmental consequences; this article will provide several reasons why renewable energy is attracting attention on a global scale. Indeed, renewable energy is plentiful, clean, and might one day provide all of our energy needs. A country's carbon footprint and reliance on fossil fuels may be reduced by investing in renewable energy sources. In addition, there are several health and environmental problems associated with air and water pollution; nevertheless, renewable energy may assist decrease these problems.

INTRODUCTION

Energy may be thought of as the power that drives the planet. It allows for the creation of new technologies, provision of communication, powering of industries, transportation, and essential community services, as well as fueling the heating of buildings. Resources such as solar, wind, hydropower and geothermal are examples of renewable energy. These types of energy sources are replenished naturally, yet they do not run out of energy when they are consumed. Renewable energy is capable of delivering a substantial quantity of energy to generate heat and to provide cooling for both residential and industrial sectors. The use of renewable energy technology is becoming more widespread in a variety of nations all over the globe.

Renewable energy is now in the interest of different countries for various reasons, it is considered a vital instrument for fighting the global warming phenomenon and mitigating CO₂ emissions. It is also considered as an opportunity to diversify the economy and lessen reliance on costly foreign fuels. Additionally, renewable energy is often cheaper than fossil fuels in the long run and can provide reliable power during times of crisis. In contrast, nonrenewable energy is energy derived from resources that are not naturally replenished on a human timescale, such as oil, natural gas, and coal. These resources are finite, meaning that they will eventually be depleted.

Nonrenewable energy has traditionally been the dominant source of energy production in many countries, but its use is becoming more contentious due to environmental impacts.

It is worth mentioning that the oil embargo that took place in 1973 triggered widespread interest in alternative energies, which stimulated several approaches to extracting power from renewable sources (Berasaluce & Mendoza-Palacios 2022). It was a major impetus behind the development of renewable energy and increased investment in energy efficiency. Among them, photovoltaic panels began to be regarded as a practical choice for usage in commercial settings. The purpose of this paper is to underscore the significance of making a paradigm shift to renewable resources and to explain why renewable energy is gaining traction on a worldwide scale by offering various explanations.

FOSSIL FUELS ARE FINITE RESOURCES

Oil, in particular, is a finite resource. This means that it is not renewable and will eventually run out. The amount of oil left in the world is decreasing as it is used up, and when it is gone, it will not be available again. The world has proven reserves equivalent to 46.6 times its annual consumption levels. This means that it has about 47 years of oil left (at current consumption levels and excluding unproven reserves) (WorldoMeters 2016). However, it's worth mentioning

that some countries that produce oil have strategic plans to increase their production of oil in the near future.

Furthermore, it is anticipated that the oil demand will rise from almost 97 million barrels a day (mb.d^{-1}) in 2021 to over 110 mb.d^{-1} in 2045. As a result, oil is expected to retain the largest share in the energy mix throughout the outlook period, with almost a 29% share in 2045 (OPEC 2022). Accordingly, the period of 47 years will shrink and get shorter.

FLUCTUATION OF OIL PRICES

In regards to global energy supplied by the source, oil supplied 9% of new demand in 1900-20, accelerating to 17% in 1920-40, 29% in 1940-80 (Fattouh et al. 2019), and it reached 34% in 2019 (Haider 2020). However, Oil prices are subjected to unpredictable fluctuations due to a variety of factors. These include shifts in the global economic conditions, supply and demand, geopolitical tensions, speculation, and trading. In addition, weather patterns, technological advances, and the discovery of new oil reserves can also impact oil prices.

The forces of supply and demand determine oil prices in the global oil market. Supply is determined by how much oil is produced by the Organization of the Petroleum Exporting Countries (OPEC), non-OPEC producers, and how much is in inventory. Demand is determined by the amount of oil that is consumed globally. When the demand for oil increases, the price of oil rises. When the demand for oil decreases, the price of oil falls. There is no way to accurately predict the future price of oil, so it is important

to be prepared for the possibility of price volatility in the market.

Consequently, this fluctuation in the price of oil can have a significant impact on the government budget and can have a negative impact on Gross Domestic Product (GDP). In extreme cases, price volatility can cause economic hardship and even the collapse of governments. However, this can be offset by investing in renewable energy sources, which will help to stabilize government budgets and create economic growth. Fig. 1 illustrates the price of oil in the past decades. Fig. 1 reveals that there have been several falls and rises in the oil price from 1998 to the beginning of 2023 (Lin & Bai 2021).

FUTURE ENERGY DEMAND

According to the United Nations, the world population is currently estimated to be 7.7 billion people, and the global energy demand is estimated to grow by 28% from 2017 to 2040 (World Energy Outlook 2018). This represents an average annual growth rate of 1.3 percent. The International Energy Agency (IEA) states that the growth in energy demand will be driven mainly by increases in population and economic activity. In particular, emerging economies will be the main drivers of energy demand growth, accounting for 70% of the total increase in global energy use by 2040. The growing demand for electricity and transportation fuels will drive the increase in energy demand.

However, approximately 1.2 billion people, or 17% of the world's population, living in rural areas do not have



Fig. 1: Dynamic change trend of Brent crude oil price from 2000 to 2023 (US Energy Information Administration. 2023). (FOB free on board)

access to electricity (World Bank). Developing an electrical infrastructure in such areas is usually not feasible due to the extreme distance from existing electric grids. Further, building new power plants in remote areas is not cost-effective due to the relatively low electricity consumption. In these cases, alternative solutions must be sought to provide electricity to these remote areas. One potential solution is to utilize renewable energy sources, such as solar, wind, or hydropower. By using these renewable sources, electricity can be generated and supplied to such areas, as well as providing hot water and energy for cooking without the need for costly infrastructure investments or upgrades.

ENERGY SECURITY

Energy is the essence of any production process, and it must be secured for the economic growth of the nations (Gökgöz & Güvercin 2018). Energy security concerns raise global awareness of renewable energy. High and volatile fossil fuel prices in the wake of Russia's invasion of Ukraine highlight the risks inherent in today's energy system as well as the significance of energy security to the economies and daily lives (World Energy Outlook 2022). In the current energy scenario, energy security is a big issue.

Energy transitions present an opportunity to construct a more secure, long-term energy infrastructure that lessens reliance on volatile fuel prices and lowers monthly utility bills. Renewable energy has been shown to enhance energy security in many ways. It can reduce reliance on imported

fuels, which are increasingly expensive and insecure due to geopolitical instability, help stabilize energy prices, and support local economic development. As the world transitions away from the use of fossil fuels, renewable energy sources will play an increasingly important role in ensuring a stable energy supply for the future.

Norway is a leader in energy security due to its abundant natural resources and its commitment to renewable energy production. Norway is one of the world's top oil and natural gas producers. However, the country has invested heavily in renewable energy sources through setting ambitious goals to reduce its emissions and has committed to achieving carbon neutrality by 2050. Additionally, the government has instituted a number of programs, including subsidies, tax incentives, and public investments to boost the proportion of renewable energy sources in the overall energy mix. It should be noted that around 98% Norway's electrical generation comes from renewable sources (Razmjoo et al. 2022).

RENEWABLE ENERGY IS COST COMPETITIVE

The oil shortages that occurred in the 1970s played a role in promoting the need to come up with alternative energy sources and increasing investment in energy conservation. Ongoing research and development efforts to enhance energy scalability and improve efficiency have the potential to make renewable energy more affordable in the future. (Timilsina & Shah 2022).

The price of energy has been decreasing over the past few years due to the evolution of technology in this sector

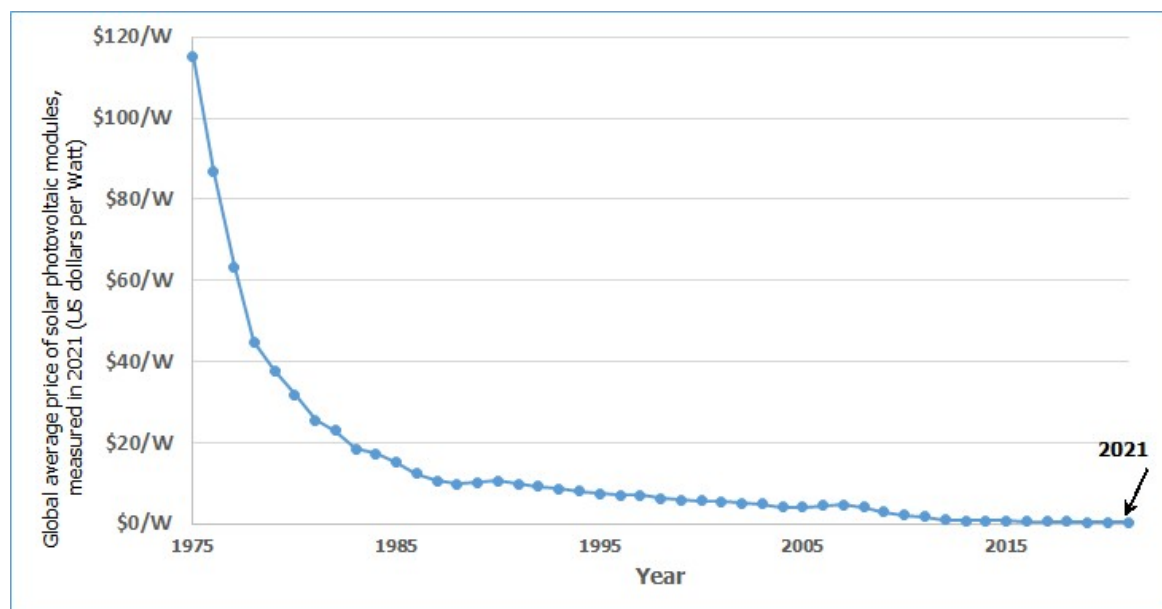


Fig. 2: Global average price of photovoltaics - US\$ per Watt.

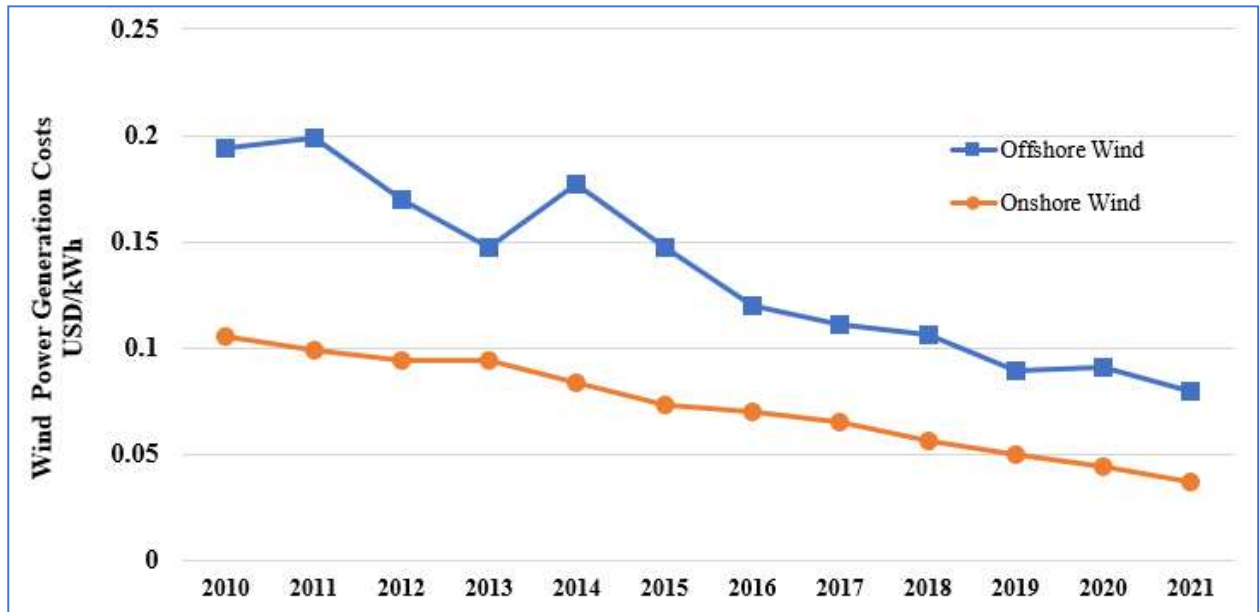


Fig. 3: Costs of onshore and offshore utility-scale - US\$ per kWh.

and market competition. For instance, during the period from 2010 to 2018, electricity from utility-scale photovoltaic and wind sources dropped by 77% and 35%, respectively (He et al. 2020). This trend is expected to continue in the new era as more renewable energy sources are brought online and more efficient technologies are developed against traditional sources of electricity. In addition, renewable energy is more cost-competitive when compared to traditional sources of energy on a life-cycle basis. While the upfront costs of renewable energy may be higher than those of traditional sources, the long-term costs are lower because these sources of energy produce zero emissions and require little or no maintenance.

Fig. 2 shows the average price of photovoltaic modules from 1976 to 2021. It is important to note that in 1976, the price was 115.28 US\$/W, but in 2021, the price was only 0.27 US\$/W (Hannah et al. 2022). Similarly, from 2010 to 2021, utility-scale onshore wind power costs dropped 68%, and offshore wind power dropped 60%. With electricity savings from various renewable energy sources, IRENA estimates that people around the world could save \$55 billion in 2022 (IRENA 2022). Fig. 3 illustrates the falling cost of both onshore and offshore wind power.

HUMAN DEVELOPMENT INDEX

The index that is used to measure the human development level of a country in regards with UN Charter as outlined under HDI or Human Development Index. This is an index that includes other indicators such as life expectancy or health, education, and per capita income. It is a classical indicator

of welfare, and it equals to the three-dimensional indicators' arithmetic average, thus ranging between 0 and 1. HDI is a very useful indicator since it can be used in comparing development levels between countries and overtime for measuring improvement. Those countries having an HDI rate of 0.8 or above are said to belong under the classification of developed countries, and other counterparts with a below amounting up to only about 0.5 magnitude will generally be designated as developing countries.

Electricity consumption and economic growth, as measured by monetary metrics like Gross National Product (GNP) and GDP, have been subjected to several studies for numerous nations around the world. The studies have shown a causal relationship and long-run co-integration between national economic performance and electricity use. (Lu 2016, Aviral et al. 2021, Eras et al. 2022, Hassan et al. 2022).

Fig. 4 depicts the positive correlation between the HDI and the annual per capita consumption of electricity because a higher HDI indicates a higher standard of living, which is associated with increased access to electricity. Consequently, economic growth in a country might be enhanced with social welfare and broader access to electricity and other services, and this can be attained through utilizing low-cost energy resources, renewable energy in particular.

RENEWABLE ENERGY IS CREATING UNIQUE JOBS

The shift to renewable energy is creating a wide range of

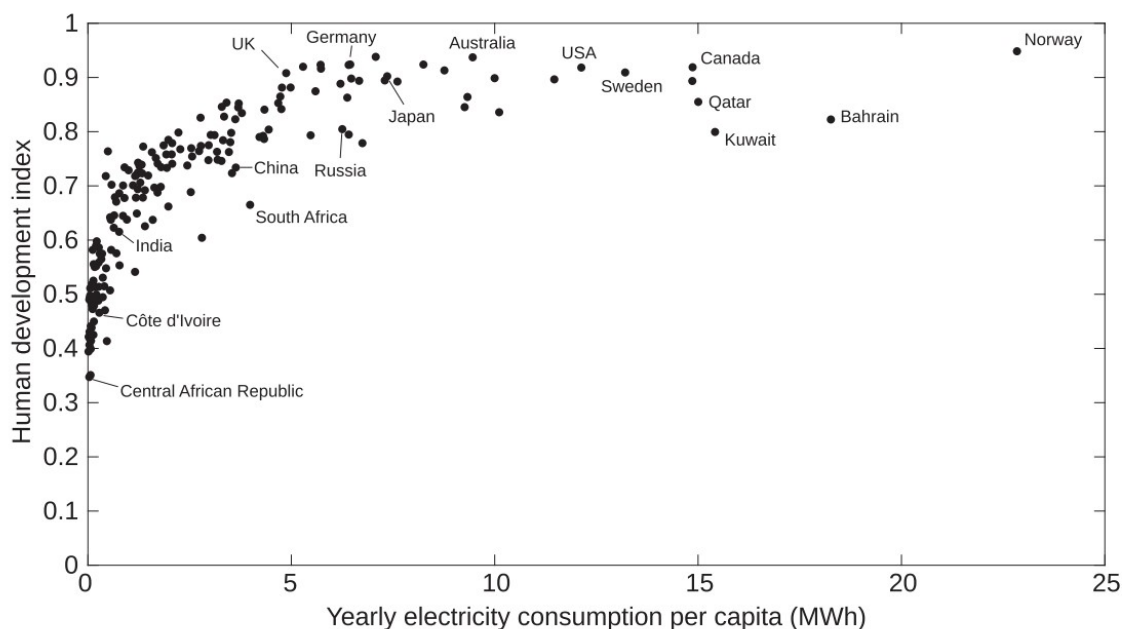


Fig. 4: HDI vs. Electricity consumption (Jahan 2016).

new jobs, from research and development to engineering and manufacturing. For instance, solar photovoltaic installers, wind turbine engineers, and energy storage technicians are some of the most in-demand jobs in the renewable energy sector. Other areas of job growth include energy efficiency advisors, environmental advocacy, and policy analysis. Renewable energy is also creating jobs in finance, legal services, marketing, and communications. Many of these jobs are new and unique to the renewable energy field.

Electricity generated by Renewable Energy generally creates many times more direct work opportunities in the Developing World than fossil or nuclear energies. For example, solar thermal ($10.4 \text{ jobs.GWh}^{-1}$) creates 35 times more than current coal ($0.3 \text{ jobs.GWh}^{-1}$). When nuclear energy and gas are compared with PV, 620 times more direct jobs will be created. This excludes significant numbers of indirect and induced jobs (Detlef & Scherer 2013). According to a report from the International Renewable Energy Agency, renewable energy sources such as solar and wind created more than 10 times more direct jobs in 2015 than fossil fuels. This is because renewable energy sources require more specialized skills, hands-on maintenance, and installation than fossil fuels. Moreover, an analytical job creation assessment for the global power sector from 2015 to 2050 on a regional basis has shown that the number of direct jobs in electricity would grow from over 21 million to nearly 35 million. The primary technologies that will create new jobs are solar photovoltaic, batteries, and wind power (Ram et al. 2020).

SEVERE HEALTH AND ENVIRONMENTAL PROBLEMS

Fossil fuels pose a huge threat to environmental balance and are a cause of a wide variety of ecological hazards (Shahzad 2012). Emissions released into the atmosphere include carbon dioxide, nitrogen oxides as well sulfur dioxide. Such undesired pollutants of the air contribute highly to environmental pollution, in that they can cause some sicknesses including asthmatic attack and bronchitis as well as other forms of respiratory related ailments. In addition, mining of these sources can cause heavy metals to be released into the environment and contaminate waterways, while the burning of these sources can release toxic chemicals into the air, which can then fall back to the earth in the form of acid rain, causing land and water pollution. Consequently, these factors would strain the environment.

Countries are required to mitigate CO_2 emissions by implementing strict measures. The most important step the world is currently emphasizing is to shift the industrial structure to renewable energies. To serve this purpose, renewable energy is seen as a key investment opportunity for countries looking to break into the global low-carbon economy (Chen et al. 2022).

CLIMATE CHANGE

The Intergovernmental Panel on Climate Change (IPCC) and other international groups are demanding drastic cuts in greenhouse gas (GHG) emissions due to the severity of

human-caused climate change (Metz et al. 2007). By 2050, global GHG emissions should be roughly cut to 50% of the emission level of the year 2000 (Hohmeyer & Bohm 2015). As mentioned before, burning fossil fuels releases large amounts of carbon dioxide, methane, and other greenhouse gases into the atmosphere. These gases absorb and trap heat in the atmosphere, causing temperatures to rise. This process is called the greenhouse effect, and it contributes a major part of Global warming. There is a change in climate patterns as temperatures rise, which escalates to more droughts, floods, hurricanes, and many other extreme weather events. Such occurrences cause destruction to ecosystems, human health and cripple the economy.

Considering that the majority of electricity is derived from nonrenewable resources, the reduction of environmental impact could be accomplished through renewable energy technology (Biekša et al. 2021). There are also other environmental problems related to fossil fuels like air pollution, water contamination, and land degradation. Switching to renewable energy and reduced reliance on fossil fuels would mitigate all these negative effects. In other words, encouraging renewable energy sources' development has been a critical strategy of energy strategy for most governments across the globe in order to combat climate change effects (Zhao et al. 2022).

RENEWABLE ENERGY IS SUSTAINABLE

As the world moves towards a low carbon future, renewable energy sources are gaining in importance and viewed as central to sustainable development. The United Nations in 2015 releases a number of Sustainable Development Goals (SDGs) to address the major global issues by 2030 that include poverty, climate change impact, inequalities and economic problems. The sustainable energy is the centerpiece of these SDG's (UN DESA 2017).

However, it is crucial to note that the global evaluation of sustainability effects within countries as a result of renewable energy was used globally from 1990 through 2014. It was determined that the most important factor to have a positive influence on sustainability, regardless of whether it is measured from economic prosperity or environmental protection viewpoint would be share of renewable energy in total domestic energy consumption. This also shows that renewable energy has made a substantial positive impact on improving world sustainability (Sueyoshi et al. 2022).

CONCLUSIONS

In conclusion, renewable energy has become a major talking point in recent years, as many countries around the world

are considering it in their energy strategy to make a push to transition away from fossil fuels and towards a greener energy source. It's an eco-friendly and long-term solution to many energy generation problems. Solar and wind energies are just a few examples of renewable energy that have the potential to meet the growing electricity demand. Reflecting this trend, the majority of success in raising the percentage of renewables in the energy supply has been made in the power sector, with renewable energy supplying almost 30% (with solar and wind power accounting for 12.1%) of global electricity generation in 2022, compared to 21.3% (with solar and wind power accounting for 2.8%) in 2012.

This means that the renewable share of global electricity generation increased by almost 9 percentage points in the past decade. In addition to being cost-competitive, renewable energy also provides other economic benefits. For example, it can help reduce the need for expensive infrastructure upgrades and maintenance, such as the modernization of power plants, which can be costly. It can also create new jobs and stimulate economic growth in communities that adopt renewable energy technologies. Governments should offer tax breaks, subsidies, and grants for research and development to encourage people and businesses to use renewable energy sources since it would be a great option for the new generation.

They can also help reduce our dependence on foreign sources of energy, making us more secure and self-sufficient. Overall, this article demonstrates that renewable energy is a win-win situation and emphasizes the need for a paradigm change from traditional to renewable resources for the reasons stated. If the proper laws and policies are put in place, renewable energy can indeed contribute to the development of a better and more sustainable future.

ACKNOWLEDGEMENTS

The author is grateful to the Middle East University, Amman, Jordan, for the financial support granted to cover the publication fees of this research article.

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