

# Adverse Environmental and Economic Impacts of Solar and Wind Energy

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**Abstract:-** The negative effects of traditional energy sources have long been the center of concern worldwide. Contrarily, alternative energy sources, particularly those that are renewable, such as solar and wind power, have always had a positive reputation. It is often thought that solar and wind energy are environmentally friendly and economically cheap. However, these energies also create problems that may be overlooked or unnoticed. The current research aims to illustrate the negative environmental effects of solar and wind energy, as well as describe the economic disadvantages of renewable power plants. To accomplish this paper, data, and evidence from several research papers were analyzed. It was discovered that renewable energy may cause biodiversity loss and create natural disasters. It is also responsible for microclimate change. In addition, renewable energy plants are not economically beneficial both in the long and short run. This paper should make people and policymakers aware before launching renewable energy projects.

**Keywords:-** Renewable Energy, Solar Power Plant, Wind Energy.

## I. INTRODUCTION

### ➤ Adverse Environmental and Economic Impact of Solar and Wind Energy

“The United Nations projects global population to grow from about 7 billion today to 9.3 billion in 2050 and 10.1 billion in 2100” (Lee, 2011, p. 569). With this exponential rise in the global population, energy generation is seen as a key obstacle in industrial evolution. This massive population growth is causing communities to move into formerly deserted areas. For example, since the population grows, more people are moving to the American West. In the previous 25 years, the population of the West increased by 32% (Fort, 2002, pp. 17-18). As a result, new technologies are emerging to alleviate the increased need for resources along with the electrical energy load (de Amorim et al., 2018, p. 9; Rabaia et al., 2021, p. 2). Therefore, a healthy and viable society needs energy sources that are safer, eco-friendly, and economically more fruitful than ever. Considering these aspects, renewable energy sources, particularly solar and wind easily could be thought of as the best alternative. Although it is thought of as green energy and cost-effective, renewable energy like solar and wind energy has several drawbacks that should be addressed, especially the environmental and economic impacts.

## II. BACKGROUND

### ➤ The Recent Rise of Concern for Renewable Energy

Statistics show that there is a significant interest in renewable energy systems across the world. For instance, 60% of newly installed energy plants in 2019 were powered by solar and wind energy worldwide (Ghenai et al., 2020, p. 582). For example, in 2018, Jordan had to spend 10% of its GDP (Gross Domestic Product) to import 94% of its needed energy. So the government aims to produce 10% of its energy needed by establishing new renewable plants (Abu-Rumman et al., 2020, p. 1). Thus, it is essential to take the necessary safeguards for the environment and economy given the enormous interest in renewable energy sources, particularly solar and wind technology. Hence it is an obligation to research the environmental credentials of such renewable technologies, as well as environmental evaluation, to prevent any further environmental damages brought on by the newly added energy generation systems.

### ➤ Popular Sources of Renewable Energy

Renewable energy is produced using resources that are found in nature and neither limited nor depleted, such as wind, sunshine, and water flow. Alternative energy sources, such as renewable energy, are thought to be less damaging to the environment than traditional energy sources that rely on fossil fuels. Though there are different types of renewable energy, *solar power*, *wind energy*, *hydropower*, and *geothermal* are the most popular. This paper mostly discussed the adverse environmental and economic impacts of solar and wind energy.

“Solar Power Plant: Types, Technology & All about Solar Power System” (2022) defines, a solar power plant as a collection of various solar components that work together to create a functional system, such as photovoltaic panels or solar cells to capture and transform energy from the sun, solar inverters to monitor the system and convert electricity from DC into AC, solar batteries, and other solar accessories. *Solar energy systems*, *solar systems*, *solar power systems*, and *solar plants* are other names for solar power plants.

Whereas, engineers and scientists are exploiting the kinetic energy of the wind to produce power since anything that moves has kinetic energy. A wind turbine is a device that harnesses the strength of the wind to produce electricity, which is how *wind energy*, also known as *wind power*, is produced. The turbine's blades, which are affixed to a rotor, are blown by the wind. A generator is then spun by the rotor to produce power (“Wind Energy,” n.d.).

➤ *Negative Environmental Impacts of Solar Energy*

The construction of solar energy facilities has both direct and indirect negative effects on neighboring ecosystems and the habitats of wildlife. Land removal, necessary to build plants, harms vegetation and animals because it causes habitat loss. According to Lovich and Ennen (2011), solar installation is dependent on location but can cause increased erosion and changes in water that impact flora and fauna (p. 984-985). In addition, dramatically altering the landscape impacts the quality of wildlife habitat and migration pathways. Studies have also shown that solar energy can cause bird deaths both because of solar radiation as well as collision with structures. In regards to insects, solar installations cause an environmental trap and disrupt reproduction and egg-laying. This creates a feedback loop, because the dead insects also attract more birds which causes further deaths (Gasparatos et al., 2017, p.163). For example, scientists have found that every year all types of solar energy generation cause between 37,800 to 138,600 birds' deaths annually in the United States (Pratiwi & Juerges, 2020, p. 224). Bukhary et al., (2018) also noted that 173 birds were killed while building the 550-megawatt Desert Sunlight solar facility in the Mojave Desert (p. 3300). This evidence proves that there is no doubt “[u]tility scale solar energy development which is often referred to as *USSED*” (Lovich & Ennen, 2011, p. 982) has tremendous negative impacts on wildlife and local biodiversity. As hundreds or thousands of solar panels are used in solar photovoltaic installations, which turn sunlight directly into energy. Large energy system fields can trick birds into altering flight direction since they seem like lake or water from far. Waterbirds made up the majority of the birds that were killed at these gigantic solar installations, which suggests that such species may have flown to the solar fields and discovered so late that the solar panels are not made of water as they were falling. The waterbirds then run onto the solar panels, where they either suffer grievous or fatal injuries. Some waterbirds also struggle to take off from surfaces other than water, which might leave them stuck in arid regions without access to food, water, or shelter (“Impact of Solar Energy on Wildlife Is an Emerging Environmental Issue” n.d.). Apart from the mortality rate of wildlife solar power plants also minimize the land for vegetation and food production. According to Tanaka et al., (2022), by 2050, the demand for food is anticipated to increase by 60%. Furthermore, land cannot be used for both food cultivation and solar energy development (p. 1). van Zalk and Behrens (2018) also corroborated that countries like the USA and the UK that are developing solar energy facilities to generate electricity may lose 10% of their food production due to massive land utilization of solar energy development. Solar energy plants need a great surface area to produce a significant amount of electricity because of their low power density (pp. 87-89). This means that solar plants can also be responsible for less food production in the future, although the world population is increasing at an alarming rate. However, the increased population will boost the demand for both food and energy. Solar energy construction is responsible for numerous environmental drawbacks. Soil erosion, changes in water, and biodiversity loss caused by solar plant construction are indirectly responsible for altering the climate. However, solar energy development directly

increases the mortality rate of wildlife like birds and desert tortoises (Rabaia et al., 2021, p. 14). So the implementation of solar energy should wait for the further advanced development of solar energy technology to mitigate the existing environmental issues.

➤ *Negative Environmental Impacts of Wind Energy*

Wind energy is also closely associated with biodiversity loss and detrimental impacts on wildlife. Renewable energy is various in forms, but all of them cause biodiversity loss when implemented on a large scale. Some types of renewable energy such as windmills, and solar energy plants cause the loss of biodiversity directly by destroying the habitats of animals and indirectly by polluting the environment and emitting harmful elements to the area (Gasparatos et al., 2017, pp.162 -169; Pratiwi & Juerges, 2020, pp. 223-228). To produce energy turbines are propelled by gigantic spinning blades. They have significantly grown in size (blade radius) and height above the ground since widely used in the 1980s. The largest blades can have diameters of more than 100 m and rotate between 100 and 120 m above the ground. These enormous devices kill birds and other creatures every year in large numbers. For example, according to Gasparatos et al., (2017), in the United States alone, it is estimated that wind turbines kill 234,000 birds each year. He also noted that when it comes to habitat modification, The main threat to biodiversity is posed by animal collisions with wind generators and also by the *downdraught* and *barotrauma* caused by the revolving blades. Wind energy usage frequently poses the greatest harm to rare, endangered species of birds with long life expectancies and slow reproduction. Birds like geese and swans who are bigger and less agile are also at great risk since they are fond of flying in the low-light area especially in the early morning or after sunset when the blades are harder to spot and avoid for them (pp. 163- 164). According to Morgan (2022), it was determined that an average of 366,000 birds were killed by wind turbines in the US in 2012. At that time, there were 44,577 turbines in use at that time in the US. However, as of 2021, there are now about 65,548 wind turbines. Researchers calculated that windmills will kill about 538,000 birds yearly using data from 2012. This shows that windmills are directly and indirectly associated with reducing the number of birds. Apart from that, there are additional aspects to take into account when evaluating how these wind farms affect bird populations in addition to the harm caused to birds by the blades of wind turbines. The majority of wind farms are located outside of cities and distant from populated areas. New high-voltage overhead power lines must be built to get the electricity to the places where it is required. It creates an additional cost and according to Morgan (2022), every year about 184300 birds die in the USA due to power lines. If the power lines increase this number would increase. Researchers also have discovered that wind turbines have some acoustic and visual effects on nearby homes and wildlife, which increases the likelihood that they will be struck by lightning. Wind generators also produce electric and magnetic fields. By altering the heat and moisture levels in the area around the wind farm, the wind turbine also leads to microclimate problems. It can cause weather modification and the potential for climate change due to changes in wind speed, turbulence,

and rugged terrain. (Delicado et al., 2016; Landenburg, 2016, as cited in Pratiwi & Juerges, 2020 p. 225). It proves that, except for killing birds directly, wind power plants can also play an important role in climate destruction. Moreover, To generate enough electricity for them to be profitable, economically successful wind farms require large tracts of land. This land purchase frequently results in the loss of crucial bird habitats and food production, which can further reduce bird populations in these locations and raise the price of food. Not to mention the requirement for road upkeep and the resultant loss of other animal areas. In conclusion, wind power plants create several major problems, such as killing both endangered and common birds, and destroying the land for food production. To lessen the possible adverse effects on the biodiversity of wind energy installations, it would be desirable to install them in low-biodiversity areas. Gasparatos et al., (2017) proposed halting the generation of electricity during critical migratory times or times of high activity, such as just after dusk, before sunrise, and times when endangered species are identified or expected (p. 164). An initiative for this step is "Bird-Smart Wind Energy," a project started by the American Bird Conservancy in the US. Through this effort, they hope to inform wind energy development firms on the most effective ways to set up wind farms and significantly lower the number of bird fatalities across the nation. However, according to Morgan (2022), advanced artificial intelligence technology is being made as well, to shut down the blade immediately if birds are detected. As this is clear that wind energy has numerous environmental disadvantages, for the betterment of humankind and nature, it should not be implemented or wait for the advancement of technology to mitigate the detrimental environmental effects.

#### ➤ *The Negative Economic Aspects of Solar and Wind Energy*

Renewable energy plants like solar, and wind energy each year produce a great amount of waste, recycling this waste is not economically beneficial, but environmentally important. Solar panels and wind blades are made of various hazardous elements like aluminum, copper, plastic, silicon, and glass. These metals could be very dangerous for the environment, but the recycling process costs money as well. In the year 2017, solar panels in the United States alone created 227,506.96 tons of waste (Barbose et al. 2017 as cited in Vargas & Chesney, 2021 p. 83). That means that around the world, more waste is being created every year by solar and wind energy generation, and this large amount of waste can pollute the environment if they are not recycled properly. Even after recycling, the quality of the component could be degraded and become harmful to the environment for further use. Every year, solar and wind energy produce thousands of tons of waste. Usually, recycling waste is not very financial, even sometimes exceeding the price of produced electricity. However, some elements like plastic add more cost to the recycling process but deteriorate the quality of itself for further utilization. (Mahmoudi et al., 2021, p. 5; van Zalk & Behrens, 2018, p. 87 ). Although the recycling process would cost money even after recycling there is a chance of pollution. Moreover, it is only possible sometimes to collect all the waste of solar and wind energy for recycling, one way or another, they must pollute the environment. On the one hand,

solar and wind energy would create a significant amount of rubbish every year and it would cost money to recycle them for reuse. On the other hand, even after recycling the reuse of all materials is not possible. There is also a high chance that the emitted gas and oil from the recycling process could pollute the environment (Dhar et al., 2020, p. 28). So proper management or recycling of waste created by solar and wind energy farm is not economical. Nonetheless, during and after the recycling process there are still some pessimistic environmental consequences.

### III. CONCLUSION

Solar and wind energy have many issues that need to be resolved before it is used more frequently, notably those that affect the economy and the environment even if it is considered green energy and cost-effective. People and governments are interested in renewable energy because they think implementing renewable energy would be a step to save the environment and be financially sufficient. But this paper shows a different scenario. Renewable energy such as solar or wind energy is not any miracle as they are thought of like all other energy systems renewable energy also comes with numerous disadvantages. This paper highlights how renewable energy (basically solar and wind energy) harms biodiversity, wildlife, and vegetation. This paper also puts light on the fact, although people think renewable energy is financially beneficial because nature will not ask for money. But the building, maintenance, and recycling of these plants cost a lot of money. As these energy plants are not beneficial environmentally and economically as well, the implementation should wait for further technological advancement to mitigate the adverse effects.

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