



The Impact of Renewable Energy on Climate Change: A Literature Review

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ABSTRACT

Background: As in the current topic of discussion, namely climate change, where long-term climate change is one of the major environmental concerns. If we look ahead to what is happening in our surroundings, both in terms of weather and temperature, as well as the water we consume, we will notice changes over time. Higher wildfires have resulted from these changes, which have resulted in losses to living creatures on Earth, ranging from increased heat, drought, and insect outbreaks, all linked to climate change. Additional worries include dwindling water supplies, lower agricultural yields, heat-related health effects in cities, and coastal flooding and erosion. As a result, it provides renewable energy that can help mitigate the worst effects of climate change. **Objectives:** When discussing climate change, we are addressing alterations in weather patterns. Climate change denotes a protracted modification in climate conditions extending over decades, or even longer periods. It emerges as a consequence of global warming, which ensues from both natural phenomena such as fluctuations in solar radiation, volcanic activities, or intrinsic variability within the climate system, and anthropogenic factors including alterations in atmospheric composition or land use. Climate change is contingent upon meteorological variables such as temperature, humidity, wind patterns, precipitation, drought occurrences, aridity levels, and solar radiation impacting the Earth. **Method and results:** The sources utilized for this composition encompass articles and journals sourced from online social media platforms, alongside a comprehensive review of articles and journals published by international and national agencies, focusing on pertinent issues related to the subject matter. Renewable energy emerges as a formidable tool in combatting climate change, exhibiting promising potential for success. **Conclusion:** After we investigate and learn about renewable energy in order to discuss the impact of climate change, we can learn about the advantages it offers, such as the advantages of using renewable energy in the environmental and economic sectors, such as generating energy that produces no greenhouse gas emissions from fossil firing and reduces some types of air pollution, as well as the advantages of diversifying energy supply and reducing reliance on imported firing.

KEYWORDS: climate change; renewable energy; environmental concerns; meteorological variables.

1. Introduction

Where human life is our earth the place where we grow and develop with everything on earth and also with everything that can be made to be controlled by humans everything exists and happens on our earth. There is the case that not everything, everything that happens is due to human intervention, while what does happen is destiny from the almighty, the almighty maker and the source of all our lives in this world. As in the topic of discussion this time, namely about climate change, in which long-term climate change is one of the big issues in environmental issues. If we look ahead to what is happening in our environment,

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both from the weather and temperature or the water we use and experience changes over a long period of time. These transformations, resulting in adverse effects on terrestrial organisms, encompass heightened temperatures, prolonged droughts, and escalated insect infestations, all of which are intricately linked to climate change and have led to an upsurge in wildfires. Additionally, diminishing water reservoirs, diminished agricultural outputs, urban health ramifications attributed to heatwaves, and amplified occurrences of flooding and coastal erosion serve as further areas of concern. Nonetheless, amidst these challenges, renewable energy stands out as a potential mitigator against the direst consequences of climate change. Renewable energy sources, including wind, solar, biomass, biogas, geothermal, hydroelectric, and various marine-based energy forms such as offshore wind, wave, and tidal energy, offer promise in alleviating the impacts of climate change. However, it's worth noting that climate change also exerts an influence on the viability of these renewable energy sources. The positive impacts of clean energy, spanning wind, solar, geothermal, hydroelectric, and biomass sources, are manifold. In a recent study featured in *Nature Climate Change*, researchers have sought to quantify the effects of global warming on the availability of eight key renewable energy technologies. The team did not present a very surprising result, and that is actually good news. The role of renewable energy in climate change is very influential and has many impacts, not only for the environment but also for living things. It does not erase all the negative impacts that occur as a result of this long-term climate change, but renewable energy aims to be able to reduce the impact of climate change that occurs on this earth. Because, with this renewable energy, the environment will have a chance to begin to heal. Renewable energy also has the aim of repairing environmental damage caused by this long-term climate change. Renewable energy has a positive impact, some of which are reducing global warming emissions, where we know these gases act like a hot cloth that covers the earth and confines the earth to that hot temperature for a long time. So with that, this is where the role of renewable energy is to reduce the heat that surrounds the earth for a long time which over time has damaged the earth, both the environment on earth and living things.

2. Methods

The writing methodology employed herein is that of a comprehensive literature review, enriched by an assortment of scholarly journals and articles meticulously scrutinized to address the central theme of the role of renewable energy in the context of climate change. The sources under consideration encompass articles and journals sourced from online social media platforms, supplemented by a thorough exploration of Google Scholar to peruse articles and journals emanating from reputable international and national institutions, focusing on topics germane to the subject matter.

Subsequently, the findings and discussions section will delineate the impacts and benefits of renewable energy factors vis-à-vis climate change, elucidating upon their multifaceted interplay and implications. Finally, the conclusions and recommendations segment will encapsulate the insights gleaned from the literature review, offering insights and propositions for the future trajectory of renewable energy initiatives in the face of evolving climate dynamics.

3. Results and Discussion

When we speak of climate change, we are referring to the occurrence of a change in the weather. Climate change denotes a protracted alteration in climatic conditions, persisting over decades or potentially up to three decades. Global warming stands as one of the primary drivers of climate change. Both natural phenomena, including variations in solar radiation, volcanic activities, or intrinsic fluctuations within the climate system, and

anthropogenic influences, such as alterations in atmospheric composition or land utilization, contribute to the occurrence of climate change. Weather parameters such as temperature, humidity, wind patterns, precipitation, drought occurrences, aridity levels, and solar radiation impacting the Earth's surface collectively influence climate change dynamics. Addressing and averting the adverse impacts of climate change, including escalating maximum and minimum temperatures, rising sea levels, elevated ocean temperatures, intensified precipitation events (such as heavy rainfall and hail), glacier retreat, and permafrost thawing, necessitate proactive measures for the future.

3.1 Renewable energy

Renewable energy encompasses energy derived from naturally replenishing yet flow-limited sources, including solar energy, wind power, hydroelectric power, geothermal energy, tidal power, and biofuels. Renewable resources are virtually inexhaustible in duration but limited in the amount of energy available per unit of time. Biomass, wood and wood waste, municipal solid waste, landfill gas and biogas, ethanol, biodiesel, hydropower, geothermal, wind, and solar are all examples of sustainable energy. Here, we will employ renewable energy as a response to the climate change that our planet has been experiencing, in an effort to both prevent and mitigate the long-term effects of climate change. Renewable energy plays an important part in mitigating the effects of climate change, which we will examine later. We can make a difference on the planet if we grasp the function of renewable energy.

3.2 Benefit renewable energy

Renewable energy stands out as one of the most potent tools at our disposal in combating climate change, with compelling incentives for refinement and advancement. Moreover, as renewable technologies gradually supplant fossil fuel emissions, consumers stand to benefit from potential cost savings. Talking about benefits, it means that there is an utilization given by something that can bring change and goodness from that thing. That's what renewable energy will do in climate change events. Climate change brings a lot of bad changes made by it, therefore, renewable energy has a good impact on improving and preventing the impacts given by climate change. Renewable energy offers a myriad of benefits, ranging from mitigating global warming and enhancing public health to providing limitless energy, creating jobs, and fostering economic growth. This has been underscored by numerous journalists and publications. Notably, wind and solar energy have experienced remarkable growth and cost reductions over the past decade, with no signs of slowing down. As a result, renewable energy is increasingly competitive with fossil fuels nationwide, with significant price reductions observed.

In certain regions, new renewable energy sources are already cheaper than operating aging, inefficient, and polluting fossil fuel or nuclear power plants. Incorporating wind and solar energy into strategic planning is imperative for achieving the necessary reductions in emissions, and policies like the Clean Power Plan play a crucial role in prioritizing low-carbon sources over higher-emitting alternatives. Renewable portfolio standards, which mandate a specific percentage of a state's electricity to be sourced from renewables, have been shown to yield a wide array of economic, health, and environmental benefits.

According to recent research from the Department of Energy and Lawrence Berkeley National Laboratory (LBNL), renewable standards across the nation resulted in significant savings for consumers, including up to \$1.2 billion in reduced wholesale electricity rates and \$1.3 billion to \$3.7 billion in lower natural gas prices in 2013 alone. Moreover, renewable energy contributes to substantial non-market benefits. LBNL researchers estimate that renewable energy supported approximately 200,000 jobs, generated \$5.2 billion in health benefits from improved air quality, and produced \$2.2 billion in global climate benefits. Another study by DBL Investors found that between 2002 and 2013, the

top 10 states leading in renewable energy adoption experienced lower increases in power prices compared to the bottom 10 states.

3.3 How renewable energy works

The energy landscape is undergoing rapid transformation, necessitating an expedited transition to renewable energy sources across various sectors to curb global temperature rise. This transition is crucial not only in electricity generation but also in heating, construction, and transportation. Projections suggest that by 2050, renewables could potentially supply four-fifths of the world's electricity, thereby substantially reducing carbon emissions and contributing significantly to climate change mitigation efforts.

Indeed, the successful transition to renewable energy hinges upon the proper integration of solar and wind power into existing energy systems. These two renewable sources provide significant potential for clean and sustainable electricity generation. Furthermore, the utilization of sustainable biofuels presents an additional avenue for reducing reliance on fossil fuels and mitigating the adverse impacts of climate change. By incorporating these diverse renewable energy sources into our energy mix, we can accelerate the transition to a more sustainable and low-carbon future. All of this entails accelerating commercial and technological innovation. Above all, it entails taking immediate steps to encourage renewable energy.

Renewable energy technologies, such as advanced biofuels for transportation, play a crucial role in our efforts to mitigate global warming. The escalating temperatures associated with climate change pose severe and far-reaching consequences for both humanity and the environment. Transitioning to renewable energy sources, such as biofuels, is imperative in addressing this challenge. The increasing frequency and intensity of extreme weather events, attributed to rising global temperatures, further underscore the urgency of adopting sustainable energy alternatives.

Over the past decade, the United States has witnessed a notable uptick in extreme weather events, with six of the ten most costly occurrences occurring during this period. The economic toll of these events has been substantial, amounting to over \$411 billion in damages. This underscores the pressing need for concerted efforts to transition towards renewable energy sources to mitigate the impacts of climate change and build resilience against future environmental challenges. Furthermore, the World Health Organization (WHO) estimates that climate change causes approximately 150,000 fatalities annually worldwide. This alarming statistic is attributed to various factors exacerbated by climate change, including the proliferation of illnesses, diminished food supplies, and a myriad of other associated issues. Transitioning to renewable energy presents a viable strategy for mitigating the consequences of climate change and reducing reliance on fossil fuels.

While renewable energy technologies were historically more costly, recent advancements have significantly reduced costs, facilitating the transition away from fossil fuels. For instance, between 2009 and 2015, the prices of solar panels plummeted by 75 to 80 percent, making solar energy increasingly accessible and cost-effective. Similarly, other renewable energy sources such as wind and hydropower have experienced comparable cost reductions, contributing to their widespread adoption.

Since 2011, renewable energy generation technologies have consistently accounted for more than half of all new power generation capacity installed worldwide. This trend underscores the growing dominance of renewables in the global energy landscape and highlights their pivotal role in shaping the future of sustainable energy production.

Biofuels represent a promising solution for decreasing dependence on petroleum-based fuels, particularly in the transportation sector, including cars and airplanes. The benefits offered by biofuels position them as a viable option for future energy needs. Biofuels are derived from the breakdown and conversion of plant materials into usable fuels, such as ethanol or biodiesel. For instance, corn ethanol is already being utilized to mitigate greenhouse gas emissions in gasoline blends. However, it's essential to note that ethanol production is not entirely carbon-neutral, and while supplementing with corn

ethanol can reduce carbon emissions by nearly 40% compared to conventional gasoline, it still entails environmental trade-offs. Furthermore, the production of corn ethanol requires significant land resources that could otherwise be utilized for food crop cultivation, raising concerns about competition for land use.

To address these challenges, researchers are exploring avenues to develop the next generation of biofuels. This includes investigating the use of invasive species and plants that require minimal water, fertilizer, or land to thrive. By focusing on sustainable and environmentally friendly biofuel production methods, we can harness the potential of biofuels while minimizing their ecological footprint and maximizing their contribution to reducing greenhouse gas emissions in the transportation sector.

There are several plant species showing promise as potential raw materials for biofuels. Recent advancements in biotechnology have led to the development of more efficient methods for breaking down biomass into sugars, which can then be converted into biofuels by bacteria. Additionally, efforts are underway to engineer microorganisms capable of directly converting plant material into biofuels. Furthermore, there are ongoing initiatives to enable microbes to produce long-chain, energy-dense hydrocarbons suitable for use in heavy-duty vehicles and airplanes.

In support of the biofuels industry, the Information Technology and Innovation Foundation (ITIF) has put forth a series of proposals aimed at advancing the adoption and utilization of biofuels. These proposals are intended to foster innovation, increase investment, and create a supportive policy environment conducive to the growth of the biofuels sector. By implementing these recommendations, it is hoped that biofuels will gain traction as a viable and sustainable alternative to traditional fossil fuels, thereby contributing to efforts to combat climate change and reduce carbon emissions in the transportation sector.

4. Conclusions

After we explore and find out and also get to know about renewable energy to discuss the impact of climate change we can find out from the benefits it provides such as the The use of renewable energy brings numerous benefits to both the environment and the economy. Firstly, it generates electricity without emitting greenhouse gases, thus combating climate change and reducing air pollution. Additionally, it diversifies the energy supply, reducing dependence on imported fuels and enhancing energy security. Moreover, renewable energy fosters economic growth and job creation, particularly in manufacturing and installation sectors. By exploring information from various sources such as the internet, newspapers, and social media, we can deepen our understanding of renewable energy's role in addressing climate change and its associated benefits.

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