

The Impacts of Climate Change on Renewable Energy Sector: A Review

Muhabat Safiullah^{1*} and Rahmani Bahirullah²

¹Department of Basic Science, Spinghar Institute of Higher Education, Nangarhar, Afghanistan

²Department of Research & Development, Spinghar Institute of Higher Education, Nangarhar, Afghanistan

*Corresponding author email: safiullah.muhabat@spingharuniversity.edu.af

ABSTRACT

The energy sector is a complex institutional framework that includes many ministries, government agencies, aid agencies, and international organizations. Electricity levels have increased fivefold between then and now. Thousands of renewable projects have been implemented in rural areas. Many large energy projects have been built, renovated, the institutional, policy and regulatory landscape has improved to some extent, and transmission lines and distribution networks have been expanded. Despite the lack of reliable data, Afghanistan has significant reserves of fossil fuels and a promising future for renewable energy. For the next several decades, the country's wind power capacity alone will probably exceed the projected demand for electricity. Serious problems including the need for energy, the depletion of fossil fuels and their impact on the environment have drawn attention to renewable energy sources in the last ten years. Because of this, there is a growing consensus to prioritize sustainable energy systems based on energy, especially renewable energy sources that produce no pollution or emissions. The research study concludes with the involvement of renewable energy technologies with minimum operating and external cost as the best option in the future. From a policy point of view, steps must be taken in the field of renewable energy and technological innovation that require biomass resources that are associated with unsustainable long-term investments.

Keywords: Climate Change, Renewable Energy, Hydropower, Solar power

INTRODUCTION

Renewable Energy will be key in a low carbon future. In order to meet the 2°C climate goal, the share of renewable energy in the final energy consumption must increase from 19% in 2017 to 65% by 2050. By then, the share of renewable energy in electricity generation should be roughly 85%, up from an estimated 25% in 2017 (Gielen et al., 2019). The physical impacts of climate change are among the challenges that renewables will have to face, as they have implications for the reliability and performance of the energy system. Initial studies on this topic addressed the vulnerability of the energy sector from a demand perspective, but there are a growing number of studies analyzing impacts on supply as well. An overview of renewable energy policies, institutions and players is given in this brief article with special attention to the country's potential for renewable energy sources and the provision of electric power. It is also one of the least developed countries in the world (Cronin et al., 2018). In general, the demand for energy is growing quickly due to advancements in social and economic development. Therefore, in order to ensure public health and energy security, environmental policies and sustainability should be taken into account when defining the energy supply. About 4.1 million deaths from respiratory illnesses, heart attacks, strokes, lung cancer, and chronic lung diseases were recorded in 2016 as a result of exposure to particulate matter (PM) that is less than or equal to PM 2.5 μm . There has been a shift from traditional internal combustion engines (ICE) to electric cars as a result of the low-emission mobility policy (Fahimi & Upham, 2018).

The goal of this paper is to conduct a review of studies that provide an estimate of climate change impacts on renewable energy and an over view of renewable energy sectors.

AN OVER VIEW OF RENEWABLE ENERGY

The year 2019 is considered a new record-breaking year for renewable resources. The installed power capacity increased by more than 200 gigawatts (GW) during 2019, which is ever the largest increase. Modern renewable energy sources (apart from conventional biomass usage) constituted an estimated 11% of total final

energy consumption (TFEC) for the year 2018 (Qader et al. 2021). It was a feeble increase from 9.6% as compared to 2013. In electrical uses, there is 26.4% highest share of renewable energy uses excluding heating, cooling, and transport. The end uses of these renewable resources comprised a mere 17% of TFEC during 2017. The energy usage in the transport sector represents 32% of TFEC having a small amount of share of renewables of 3.3% (Bilal *et al.*, 2022; Bakhoda *et al.*, 2012). The calculation of each renewable energy potential is explained in detail in separate published articles. Here, a short explanation is given introducing each. Utility-scale PV and CSP start with the theoretical potential based on a global solar irradiation map (kWh m⁻² per day). This is subsequently restricted by excluding unsuitable areas to calculate the geographical potential. The remaining area is further restricted by suitability factors. The idea behind suitability factors is that only part of the land is physically available for solar generation to ensure that it may keep the land-use function that it has, such as agricultural crop production. To calculate the technical potential, conversion efficiencies are assumed that are explained in Climate impacts on renewable energy section (Gernaat et al., 2020).

Hydropower

Global studies differ in their projections of impacts on hydropower generation due to rising temperatures and changing precipitation patterns (Turner *et al.*, 2017). That climate change will have little effect on total global resource potential, even in high emissions scenarios, whereas project a decrease of global hydropower capacity of up to 6.1% under RCP8.5 in the 2080s (Van *et al.*, 2016).

Wind

Conducted a literature review on the effects of wind and determined that by the end of the century, average wind speeds in North America and Europe would not differ by more than 15% from their current levels. Since then, $\pm 20\%$ and $\pm 30\%$ have been added to this limit (Carvalho *et al.*, 2017).

Solar

According to most climate change estimates, cloud cover will decline in low- to mid-latitude regions; however, gains in solar resource availability will frequently be offset by declining efficiency brought on by higher temperatures. Therefore, by the end of the century, variations in solar generation are typically predicted by regional studies to be less than $\pm 10\%$ (Gaetani *et al.*, 2014).

Wave

Sea level rise and modifications to wind patterns may have an impact on wave resources. Restricted research, however, indicates that wave generation will not alter (Kamranzad *et al.*, 2015).

Thermal power stations

Because of decreased thermal efficiency, rising temperatures are predicted to reduce power plant output by about 0.4–0.7% per degree (Ibrahim *et al.*, 2014). Power plants are predicted to decrease their load or shut down as a result of reduced water supply for cooling. Global annual thermal power plant capacity is predicted to decrease by 7–12% by the middle of the century, despite the fact that certain locations are forecast to see increased capacity due to climate change (Van *et al.*, 2016).

CLIMATE CHANGE

Climate change is a hypothesis and also since the beginning of the transition period, the climate on the surface of the earth has changed dramatically, the last ten years of the 21st century have been shown to be the warmest years. The average temperature of the world has increased by 1 centigrade, and the level of carbon dioxide in the atmosphere has increased from 416 PPM. Based on this, climate change has been considered the first line of study by environmental scientists (Berhail, 2019).

The level of greenhouse gases has increased significantly since the industrial age, which has caused the warming of the earth's surface in the atmosphere and the increase in the temperature of the world's surface. The increasing concentration of carbon dioxide and greenhouse gases in the atmosphere is particularly significant because of the steady rise in global average temperature over the past 150 years (Cerveny *et al.*, 2017).

CLIMATE CHANGE IMPACTS

Three working groups concentrating on climate science, adaptation and mitigation created the third assessment report of the Intergovernmental Panel on Climate Change (IPCC) of the United Nations. The study

established that human activity is causing the Earth's climate to change, especially from the usage of fossil fuels, and that more change is unavoidable. The study found that a variety of renewable energy solutions might be used to assist cut greenhouse gas (GHG) emissions over the course of the next 20 years. The near-term potential of renewable energy and allied new industries, their business earning capability, and their high employment potential will result in significant global business prospects (Sims, 2004).

Climate change science

After many years of observations and thorough scientific analysis, we can fairly confidently say that (Sims, 2004):

- CO₂ levels have increased 31% in the past 200 years;
- Deforestation has been responsible for around 20 Gt C of this since 1800;
- CH₄ has more than doubled since 1800;
- The global mean surface temperature has increased by 0.4–0.8 C in the last century above the baseline of 14 C;
- The 1990s was probably the warmest decade of the last 1000 years;
- Since the 1950s, night time minimum temperatures have increased at twice the rate of day time maximum temperatures;
- the number of frost days for nearly all land areas decreased during the last century;
- Precipitation increased by 5–10% in the northern hemisphere last century, though it decreased in the drier regions;
- Flooding from high precipitation events occurred more frequently at mid and high latitudes;
- Global mean sea levels increased at an average annual rate of 1–2 mm over the last century;
- Arctic sea ice thinned by 40% and decreased in extent by 10–15% in summer since the 1950s;
- Glaciers retreated and snow cover decreased in area by 10% since the 1960s;
- El-Nino events became more frequent, persistent and intense;
- Growing seasons lengthened by around 1–4 days each decade during the last 40 years;
- Plants, insects, birds and fish shifted towards the poles and to higher elevations;
- Weather related, inflation adjusted economic losses rose 14 times over the past 40 years.

CONCLUSION

It will be challenging to increase the proportion of renewable energy in the world's primary energy mix while fossil fuels are still widely available and inexpensive. Politicians have generally embraced the claim made by climate scientists that increased climate instability will result from the continued use of coal, gas, and oil. It will be difficult to get industry support for changing their operations to emit fewer greenhouse gases, particularly when there are investment expenditures involved. Still, developing and novel sources of energy are having difficulty holding onto their 2% market share in worldwide consumer energy.

Among other things, the quick adoption of renewable energy sources to replace fossil fuels will be necessary to create a future society that is acceptable and requires the least amount of money for adaptation due to climate change. To achieve enough progress to provide long-term advantages, this will require large expenditures in learning as well as more supportive government policies and institutions. As the globe transitions to renewable energy and decarbonizes, there will be a wealth of business opportunities.

The need for energy will only increase. Such intricate international climate change negotiations have never been undertaken before. The consequences of burning fossil fuels on the environment have not yet been priced. Society will eventually have to make retroactive payments. Some businesses will see a decline in profits as a result, but others will see opportunities. What the cost of climate change will be if we carry on with business as usual is a question that many threatened businesses fail to ask. It is up to society to decide what kind of world it wants to leave for the next generation.

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