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Climate Change Impact on Energy

Over the past few decades, scientists have become increasingly aware of the adverse effects that human activities are having on the environment and climate on Earth. These environmental and climatic changes have several consequences, impacting both the health of living organisms and more practical aspects of society.


Among other things, recent studies reveals that climate change is a true story and it is negatively impacting energy systems, increasing transport costs, or making it harder for suppliers to meet demands due to unpredictable and adverse weather conditions. Technologies that use natural resources to produce electrical energy, such as solar panels and wind turbines, are highly dependent on climate, so radical climatic changes can prevent them from generating enough energy.

Changes in temperature, precipitation, sea level, and the frequency and severity of extreme events will affect how much energy is produced, delivered, and consumed across Africa. Energy plays an important role in many aspects of our lives. For example, we use electricity for lighting and heating or cooling. We use energy for transportation, heating, cooling and cooking. There is a relationship between energy production and consumption and many other aspects of modern life, such as water consumption, use of goods and services, transportation, economic growth, land use, and population growth. Our production and use of energy (most of which comes from fossil fuels) also contributes to climate change, accounting for more than 84% of greenhouse gas emission.

There is direct proportion in Increase in temperature energy demand, as well as change in capacity and ability to produce electricity and reliable delivery. In warmer climates, people uses more electricity for air conditioning and less natural gas, oil, and wood for heating. If the climate warms by 1.8°C, the demand for energy used for cooling is increases by about 5-20%, while the demand for energy used for heating decrease by about 3-15%. Since demand for electricity for cooling increases because of temperature increase and extreme heat events, the balance in energy delivery is likely to shift from natural gas and oil used for heating to electricity used for air conditioning. Changes in energy demand affect greenhouse gas emissions, but the net effect depends on which energy sources, including alternative energy used for electricity and heating.

Warmer climates reduce the efficiency of power production for fossil fuel and nuclear power plants because these plants use water for cooling. The colder the water, the more efficient the generator. Thus, higher air and water temperatures reduce the efficiency with which these plants convert fuel into electricity.

Energy and water systems are connected. Energy is needed to pump, transport, and treatment of drinking and wastewater. Cooled water is needed to run many of power plants. Hydroelectricity is itself is one of the major source of power in parts of Africa. Changes in precipitation, increased risk of drought, reduced snowpack, and changes in the timing of snowmelt in spring influence patterns of energy and water use.



Climate Change Impact on Energy (cont.)

Power plants can require large amounts of water for cooling. On average, a kilowatt-hour of electricity (enough power to run 400 typical compact-fluorescent light bulbs for an hour) requires 115 litres of water. Parts of Africa faces increased competition for water to meet the demands of population and economic growth while also protecting natural ecosystems. Many local governments in these regions have slowed or stopped plans for new power plants that require large withdrawals of water due to concerns about adequate availability of cooling water.

More frequent and severe heat waves will likely increase the demand for electricity in some parts of Africa. At the same time, these areas are likely to experience reduced water supplies due to increased temperature and evaporation, as well as possible decreased rainfall. Since water is necessary for electricity production, these combined effects could stress water resources.

Hydroelectric power plants are sensitive to the volume and timing of stream flows. In some regions, especially during times of increased rainfall, dam operators may have to allow some water to bypass the electric turbines to prevent downstream flooding. Maintaining stream flow for hydroelectric dams could present conflicts with other activities, such as salmon habitat restoration.

Growing crops for biomass and biofuel energy may stress water resources in certain regions, depending on the type of crop, where it is grown, agricultural production in the region, and current water and nutrient management practices. Given the many factors involved, more research is needed to understand how climate change may affect these resources.

Rising temperatures, increased evaporation, and drought increase the need for energy-intensive methods of providing drinking and irrigation water. For example, desalinization plants convert salt water into freshwater, but consume a lot of energy. Climate change may also require irrigation water to be pumped over longer distances, particularly in dry regions.

A large portion of energy infrastructure is in coastal areas especial the hydropower stations, therefore sensitive to sea level rise and storm surge. For example, fuel ports and the generation and transmission lines are at risk. Changes in the frequency and severity of storms and other extreme events may also damage energy infrastructure, resulting in energy shortages that harm the economy and disrupt peoples' daily lives.

Flooding and intense storms can damage power lines and electricity distribution equipment. These events may also delay repair and maintenance work. Electricity outages can have serious impacts on other energy systems as well. For example, oil and gas pipeline disruptions following extreme weather events are often caused by power outages rather than physical damage to the infrastructure.

Railways and marine transportation that move large amounts of oil and coal are also vulnerable to climate change. More intense rainfall and storms can threaten railways by washing out railway beds. Changes in precipitation could affect marine transportation by reducing the navigability of rivers.

The impacts of climate change on wind and solar power is still a developing area of research due to the challenges involved in modelling wind and cloud cover changes at the necessary spatial scales.