

THE IMPACT OF RENEWABLE ENERGY ON THE ENVIRONMENT AND THE PLANET



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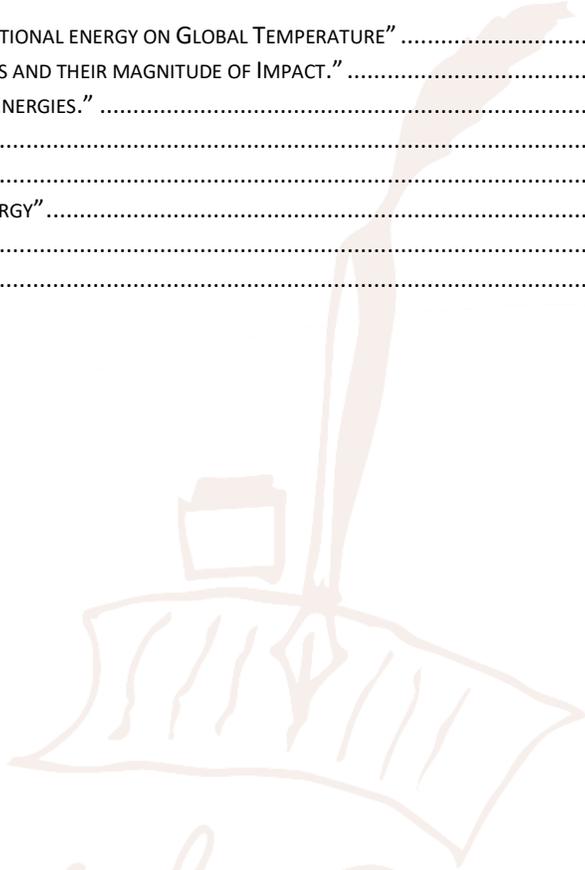
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Abstract

Even though we consider conventional energy sources like coal, gas, and oil are the primary resources for augmentation of a country from every aspect. Therefore, we grapple more and more, play a scrimmage against each other go get our hands on these energy resources without giving a second thought about the adverse upending impacts they may have upon the environment. Be it coal, gas, and oil, burning fuels of any sort have some corroding effects upon the environment as they emit poisonous gases like carbon dioxide, carbon monoxide, sulfur dioxide, etc. in most cases.

To address this problem and to contribute more to sustainability the concepts of renewable energy comes to play. Energies of such sort not only have huge potential but also these kinds of energy are going to be a pivotal source of power in near future because of its two important attributes cleanliness and re-usability. They are harmless not only to our environment but also to our health as well in a way. Moreover being clean in nature such as energy resources can be helpful for the mitigation of greenhouse and global warming effects as well.

Though it is true that these renewable energies are harmless in nature but that doesn't mean that they don't come with any environmental consequences. Most of these have their own ingenious impacts and require a large area of land. And some have a substantial level of impact upon our ecosystem. This paper identifies some of the key environmental impacts associated with renewable energies. Though it is usually

more environmentally friendly than the alternative energy sources the environmental impacts these renewable energies have are site-specific. Therefore, this paper will dwell upon and discuss those impacts and limitations and what should be the approach to overcome them.

Introduction

With this ever-accretive growth of population is leading to more demand and consumption of energy resulting in more usage of fossil fuels like coal, gas, and oil. And burning those fuels is contributing substantially to streamlining global warming and other problems associated with it. Even after such humungous consumption of energy still “Approximately 1.6 billion people have no access to electricity and about 1.1 billion are without water supply” (Kumar, 2020). Therefore, if we think of bridging the gap using conventional fuel resources then the subversion it might hurl upon the environment will simply be intractable. And renewable energy resources not only have the potential to quench the demand but also will protect the environment, and provide energy security. But all kinds of renewable energy technologies are not suitable for all the locations and there are some associated trifling effects on the environment as well that they bring with them for example variation of output due to seasonal changes which are pretty common for almost all alternative energy sources especially in case ‘Wind energy’. This paper identifies those alternative energy sources that have upon the environment and planet and discusses them.

Methodology

In this technical report, information on the impacts that renewable energy has upon the environment and planet is gathered from a wide range of sources and reviewed. The components and all the aspects of renewable energy were explained. And the benefits, as well as the detrimental effects of the same, were analyzed and discussed as well.

What & Why

Renewable energy or clean energy is such sort of an energy that comes from natural resources or processes that are constantly replenished (Shinn, 2020). Even though usage of such kinds of energy may appear to be something new, if dig deep it will be found we have been using such sort of energies for a long period of time. For example, Wind had powered our boats for quite long, and there was a time when we were solely dependent upon the Sun for warmth and fire. With passing time, we managed to augment the system of harnessing and using the natural energy resources with the use of modern technologies.

With this increasing demand of energy prompted us get inclined more towards dirty or conventional resources of energy. And since its inception, it has witnessed that the consumption of conventional energies had always been increasing. Which in the long run not only creates scarcity of those resources as they are not unlimited but can be found in a limited quantity but also subverting the nature in many ways. Phenomena like climate change, ozone layer depletion, acid rain are considered the considered to

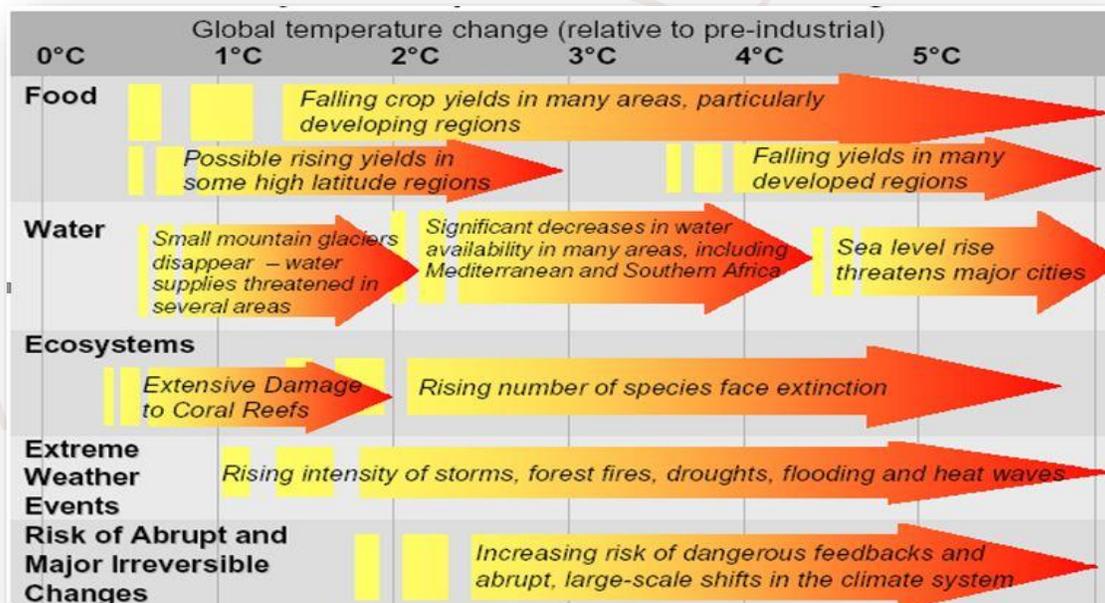


Figure 1- "The Impact of conventional energy on Global Temperature"

Source: <https://www.intechopen.com/books/wind-solar-hybrid-renewable-energy-system/social-economic-and->

be the most acrimonious effects of consumption of such fuels. These effects are not only limited to our food and water but also hampers our ecosystem prompts extreme weather conditions and sometimes abrupt and irreversible damages to the same.

Therefore, if we replace such conservative energy with renewable one then not only we will be able to avert such calamitic changes but also manage to cocoon the reserve of natural resources. As an end result, it would help maintain the equilibrium of nature. Though Every type of energy utilization for electricity generation has consequences one way or the other as far as these ‘Clean Energy’ is concerned they are more or less trivial than that of the ‘Dirty’ ones. And in most cases, they are not related to environmental degradation at all.

Technology	Impact	Magnitude
Photovoltaic	Toxins	Minor-Major
	Visual	Minor
Wind	Bird strike	Minor
	Noise	Minor
	Visual	Minor
Hydro	Displacement	Minor-Major
	Agricultural	Minor-Major
	River damage	Minor-Major
Geothermal	Seismic activity	Minor
	Odor	Minor
	Pollution	Minor-Major
	Noise	Minor

Figure 2- "Various Technologies and their magnitude of Impact."

Sources: <https://www.intechopen.com/books/wind-solar-hybrid-renewable-energy-system/social-economic-and-environmental-impacts-of-renewable-energy-resources>

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Therefore, if we delve deep, there are plenty of reasons why we should replace conventional energy resources with the renewable ones.

Kinds of Renewable energy resources and their impacts

Out of all the renewable energy resources energies that we harness from Solar, Wind, water, Tide, Geothermal and Biomass are the most important ones. Even though most of these clean resources of energy are subsumed under the 'Zero Carbon Emission group' the emission of carbon as on burning each of such fuels tends to zero in most of the cases. But there is no denying the fact that there are certain kinds of impacts that these kinds of 'clean energies' have upon our environment and planet as well.



Figure 3- "Kinds of Renewable Energies."

Sources: <https://www.zeroenergy-systems.com/what-are-the-types-of-renewable-energy/>

Solar Energy

What Is Solar Energy?

It is simply the heat that comes from the light of the sun. As this energy doesn't produce air pollutants or greenhouse gases, and as long as they are responsibly sited therefore people are nowadays showing more propensity towards harnessing this energy resource more and more. Amongst all the 'Solar Photovoltaic Technology' is the most pivotal one in this arena of solar conservation as it directly converts sunlight into electricity.



Figure 4- "Solar Energy"

Source- <https://www.eqmagpro.com/list-of-top-15-solar-energy-startups-helping-india-transition-to-sustainable-energy-sources/>

According to the National Renewable Energy Laboratory, “more energy from the sun falls on the earth in one hour than is used by everyone in the world in one year” (*Solar Energy Basics*, 2020). Therefore, if we can successfully harness even 90% of it then there will be no shortage of energies at all that this planet will have to face.

Its Impact upon environment?

Materials used in some solar systems can create health and safety hazards for the workers working on them because hazardous materials like arsenic and cadmium are used rapidly in the manufacturing of photovoltaic cells. Besides this chemicals like hydrochloric acid, sulfuric acid, nitric acid, hydrogen fluoride, 1,1,1-trichloroethane, and acetone is also used in order to clean and purify the semiconductor surface. And this usage of chemicals is pretty analogous to those used in any general semiconductor industry. Moreover, the workers are more exposed to the risk of inhaling silicon dust as well (*Environmental Impacts of Solar Power*, 2020).

Secondly while manufacturing and using Thin-film PV cells the workers and if not disposed of well then environment get exposed to more toxic materials including gallium arsenide, copper-indium-gallium-diselenide, and cadmium-telluride. And they could pose some serious environmental threats as well. Even though things are handled accordingly, keeping, the potential precarious effects that it might have upon the environment and our health, in mind (*Environmental Impacts of Solar Power*, 2020b).

And thirdly there are some trivial environmental impacts as well. For example, there can also be an indirect generation of water pollutants via the use of herbicides to deter excessive vegetation

growth around the collectors. Moreover, a dedicated land is to be commissioned forever if a large solar plant is to be set. And on decommissioning, it generates numerous non-recyclables for example fiberglass, glass, coolant, insulations, etc. Which not only hampers the fertility of the soil but also pose threat to our eyesight as well (*SOLID WASTE FROM THE OPERATION AND DECOMMISSIONING OF POWER PLANTS*, 2017).

Wind Energy

What is wind energy?

It is a form of 'Solar Energy'. Through this process, electricity is generated. The wind turbines convert the kinetic energy present in the wind into mechanical energy by rotating its propeller-like blades and thereafter a generator converts that mechanical power into electricity. Though mechanical powers can be used directly as well for some specific tasks like pumping water. Even though such sort of energy no air or water pollution and involves no toxic or hazardous substances as well but there are still quite a few aspects that pose some trivial threat to the environment and on the planet as well (*Wind Energy | Open Energy Information*, 2020).



Figure 5- "Wind Energy"

Source: <https://openei.org/wiki/File:Windfarm.Sunset.jpg>

Its Impact upon environment?

Noise Pollution: Even though modern technologies have successfully the unbearable sound emitting from a wind turbine up to a substantial extent but still the noise of the whole system could not be canceled totally yet. It produces an aerodynamic noise of air passing over the blades and a mechanical noise of the moving parts of the turbine, especially the gearbox. Therefore, people living within the 100-kilometer radius of the safe have to tolerate this constant noise of turbines all day long for the rest of their lives.

Electromagnetic interference: Wind turbines tend to scatter electromagnetic signals as well which creates a hindrance to the communication system nearby at a very large scale for the people living nearby.

Bird safety: The impact of a wind turbine, especially upon migratory birds and bats, is the most notable one. A recent study by *National Wind Coordinating Committee (NWCC)* found evidence of deaths of birds and bats from collisions with wind turbines because of some changes in air pressure caused by the spinning of turbines. Even though they have assured that these impacts are relatively low and do not pose a threat to species populations (*Environmental Impacts of Wind Power, 2020*).

Ecological Impact: The generation of electricity at a very large scale can reduce the wind speed at a substantial level which can subvert and efface the ecosystem on so many different levels. For example, because of the reduced evaporation of its surface lakes that are downwind from the windmills get warmer. A disparity in soil moisture can also be observed. Even though these

impacts appear trivial but these small changes compound substantially and impact severely the environment of sensitive places.

Biomass energy

What is Biomass energy?

It is organic energy, meaning it is made of stuff that comes from material that comes from living organisms, such as plants and animals. “People have used biomass energy—energy from living things—since

“cavemen” for cooking or (National 2012). Even

considered to be a energy since it

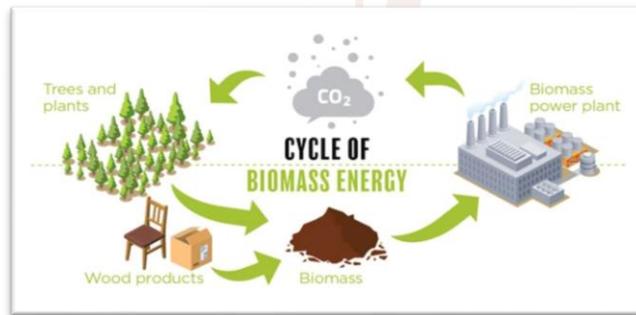


Figure 6- “Cycle of Biomass Energy”

Source: <https://sites.psu.edu/crp5406civicissues/2018/03/23/biomass-energy/>

the earliest first made wood fires keeping warm” Geographic Society, though Biomass is form of renewable contains energy first

derived from the sun but it can be a non-renewable energy source as well. And because of this dichotomic nature, it has a propensity to impact adversely upon our nature more than often.

Its Impact upon environment?

The burning of plant matter raises some serious environmental problems like the emission of greenhouse gases. Moreover, massive plantation causes the mister of the soil to dry out. As a result of this, the soil of the land becomes infertile as it loses its biological nutrients. Besides these degradations of soil and water Biomass, energy production projects can act as an aggravating

cause of soil erosion. Which contributes significantly towards drying out of groundwater. In the long run, it might end up marring the quality of receiving rivers, lakes, or estuaries by causing eutrophication.

Conservation of natural ecosystem through the energy-crop plantations not only upends the habitat but also the food resources of wild animals. Without and doubt such alteration of lands reduces many preferred habitats and mating areas of some mammals, birds, and other biotas.

Geothermal Energy

What is Geothermal energy?

The heat that is derived within the sub-surface of the earth is known as geothermal energy. The geothermal energy is then carried to the surface of the earth by water or steam. It is mainly used for heating and cooling purposes or be harnessed to generate clean electricity. Though for the generation of electricity the resources that are needed must be of medium to high temperature which usually can be found in places that are close to tectonically active regions. Of all the most popular types of geothermal energy that are being used widely is hydrothermal energy consisting of trapped hot water or steam. Though new technologies are being developed to make use of hot dry rock, geopressured resources, and magmas as well (*Geothermal Energy, 2020*).

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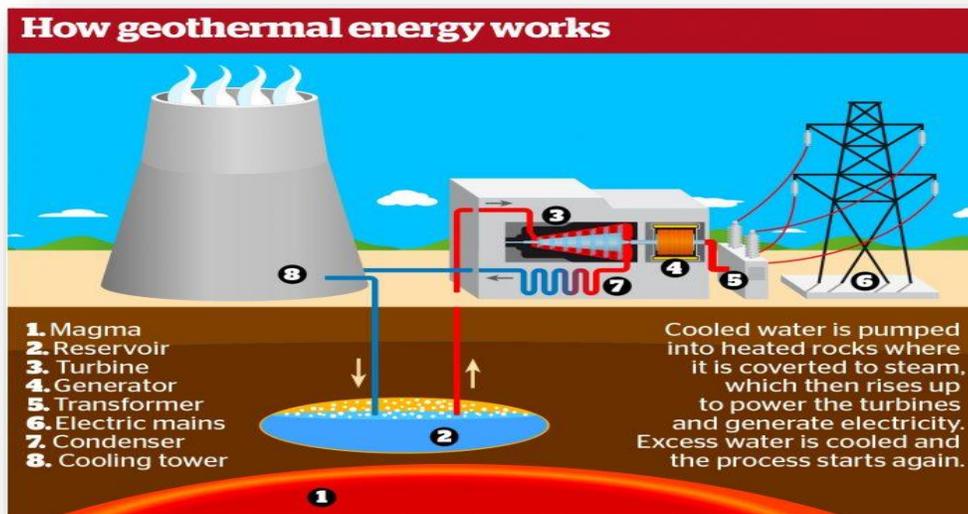


Figure 7- "Geothermal energy"

Source- <https://qrendz.com/pin/6959/>

Its Impact upon environment?

Concerns about Greenhouse Emissions: Even though the amount is significantly lower but still the extraction of geothermal energy from the ground to the surface leads to the release of greenhouse gases like carbon dioxide, hydrogen sulfide, methane, and ammonia. Which in the long run end up subverting the nature and environment.

Depletion of Water quality: Geothermal power plants can impact both the quality and quantity of water. All most of all the geothermal plants will require a large amount of water for cooling or other purposes. Therefore, in those places where water is in short supply, a conflict may arise with other users for water resources.

Chemical emissions: While passing through the rock metals, minerals, volatile species of boron, arsenic, and mercury, and gases leach out into the geothermal steam or hot water. Therefore, such a large amount of the release of a chemical when geothermal fields are tapped for commercial production can engender problems and objections for the people living and working around the same. Can engender problems and objections for the people living and working around the same.

Natural calamities: In some geothermal energy, there involve volcanic activities. And if such volcanic activities occur on a regular basis it prompts numerous types of tectonic activities as well. Earthquakes and volcanic eruptions are the most important among those.

Hydropower/ Hydro Energy

What is Hydropower or Hydro Energy?

“Hydroelectric power or hydroelectricity is a form of energy that harnesses the power of water in motion—such as water flowing over a waterfall—to generate electricity” (National Geographic Society, 2019). Even though this technology may appear to be surfacing at this concurrent time but we have been taking advantage of such forces of water for ages.



Figure 8- “Hydro Power”

Source:

<https://www.innovationnewsnetwork.com/hydropower-vs-wind-energy-securing-the-worlds-electricity-supply/6440/>

Its Impact upon environment?

Even though this energy might seem to be a clean one but despite that, it can have some severe environmental impacts as well. For example, huge hydroelectric projects cause major adverse environmental impacts, as far as the water quality is concerned. Humungous projects on hydro

energy may hurl severe adverse impacts upon its surrounding ecosystem by reducing biological diversity. And lastly but most importantly though way lesser than burning fossil fuel but still Hydro-power emits some greenhouse gases on a life-cycle basis, Methane to be precise, which is generated by eroding the bioenergy in reservoirs.

Conclusion

Therefore, the question remains should we be discarding the usage of the aforementioned renewable energies? Well, the answer is no. Because that decision would be a highly irrational one. And we ever consider comparing the ratio of pros and cons of using renewable energy with the conventional resources of energy we will learn how little the impacts are of the 'Clean energy' upon our environment and planet as compared to the 'Dirty energy.' Therefore, what our imperative should be is the augmentation of the technology so that these clean energies should be exploited to their last onus. We should improve our infrastructure so that the life cycle of renewable energy gets improved. We should keep on making stratifying improvements to the system so that the trivial adverse impact that these energies still have can be reduced to zero in due course. And lastly, we should aware people more and more for inclining them towards consuming such sort of energy. If not now, then when? If we don't take the important steps for ratifying the usage of such energy resources to every corner of the world, then we will be leaving a more toxic world behind us for our future generation to live in.

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