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Impact on Water Resource Due To Climate Changes

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Abstract: *Climate change will have large impact on water resources and its predictions are fraught with uncertainties all over the world. It affects the globe and hydrological cycle. It also affects the surface and subsurface water availability. These changes have being increasing the vulnerabilities of ecosystem and of human society. This paper presents an overview upon global impacts on hydrology and water resources as consequence of climate change. It explains how climate change has affected water resource variability in the past and how climate leads to rapid changes at present and future which affects the sustainable development in different parts in the world. It also explains about the effect of global warming due to the emission of green house gases. And the relation between climate change and water resource.*

Keywords : *hydrological cycle, vulnerabilities, water resource, sustainable development, green house gases, global warming.*

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I. Introduction

The climate and water has a close communion with each other. Change in climate shows a great impact on the hydrological cycle as well the life cycle. It is a phenomenon that we can no longer neglect as its effect increases obviously. It has now become one of the hardest hurdle for all the nations in the world. In January 2017, several scientific agencies around the world, including NASA and the NOAA in the United States and the Met Office in the United Kingdom has named 2016 is the warmest year recorded. It is marked as the third consecutive year reaching a new record temperature, the first time since the current warming trend began in the 1970s that three years in a row were record highs. 2016's record meant that 16 of the 17 warmest years have occurred since 2000, 2017 being the third hottest year on record meant that 17 of the last 18 warmest years have occurred since 2000.As a result, there is an increase in sea level as the glaciers melt.It also increases the evaporation rate resulting in droughts.

GLOBAL CLIMATE CHANGE AND GREEN HOUSE EFFECT

Life on Earth depends on energy coming from the sun. About half the light reaching Earth's atmosphere passes through the air and clouds to the surface, where it is absorbed and then radiated upward in the form of infrared heat. About 90 percent of this heat is then absorbed by the greenhouse gases and radiated back toward the surface, which is warmed to a life-supporting average of 59 degrees Fahrenheit (15 degrees Celsius).The main cause for the global warming trend is due to the human expansion of the green house gases.

The gases that contribute to green house effect include

- **Water vapour**

Water vapour is the most important greenhouse gas. About 95% of the green house gases are water vapour. If there is a fall evening or spring evening and the sky is clear the heat will escape and the temperature will drop and you get frost. If there is a cloud cover, the heat is entrapped by water vapour as a green house gas and the temperature stays quite warm. Then, it increases as the Earth's atmosphere warms, but so does the possibility of clouds and precipitation, making these some of the most important feedback mechanisms to the greenhouse effect.

- **Carbon dioxide**

Carbon dioxide is one of the major green house gases. Warmed by sunlight, Earth's land and ocean surfaces continuously radiate thermal infrared energy (heat). It is released to the atmosphere by means of human activities such as burning fossil fuels, deforestation as well as natural causes such as volcanic eruption and

respiration. The latest information given by NASA is that, the present rate of carbon dioxide till june 2018 is about 448 ppm

❖ **Methane**

Methane gas is more potent green house gas than CO2. Research says that methane contributes 28% warming which CO2 contributes. The increase in number and size of landfill sites causes release of methane gas. The farm animals also release methane during digestion. The main source for the release of methane is from the oil and gas industries.

❖ **Nitrous oxide**

Nitrous oxide is one of the powerful greenhouse gas which produced by soil cultivation practices, especially by the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning. It is much stronger than carbon dioxide, which is 34 times stronger if compared over a 100-year period.

❖ **Chlorofluorocarbons (CFCs)**

It is the synthetic compound made of chlorine, fluorine and carbon. It is partially of industrial origin used in a number of applications and also by the human activities such as usage of refrigerator, air conditioner etc.. It also increases the earth's temperature and makes the earth warmer.

Water resources

Water is the most important substances on earth. All plants and animals must require water for the survival. If there is no water there would be no life on earth. About 71% of the earth's surface is covered with water and the oceans holds about 96.5% of all earth's water. Only 97% of the water is of salt water and only 3% if of fresh water, slightly over one third is of glaciers and polar caps. The remaining unfrozen water is found as the ground water. Such ground water has started steadily decreasing due to the climate change.

Some of the sources of fresh water are listed below:

❖ **Surface water**

The surface water includes rivers, lakes and fresh water wetland. It's level is naturally reduced by means of evaporation, transpiration, discharge through oceans and ground water recharge. It is again refilled by precipitation.

❖ **Ground water**

Ground water is the water source present beneath the earth's surface and also in the cracks, fissures, fractures of rock. Ground water is recharged and flow within aquifers below the water table into the surface due to gravity. It is used for agricultural, municipal and industrial purposes.

❖ **Frozen water or ice bergs**

Frozen water which is so called as ice bergs are the large pieces of freshwater ice which is broken as glacier and is floating freely in open water. It is found that about 90% of iceberg is below the surface of the water.

Cycle of climate change and water resource

Climate and water has close relationship with each other. They depend on each other. Since, if there is any change in the climate, it influences the water resource. Also the change in level of water depends upon the climate. During summer season, the climate is too hot and in countries like Asia the temperature is about 40 degree Celsius. In this season, the rate of evaporation of surface water as well as ground water increases to the peak. Hence there is reduction in the water resource. But in the monsoon season, the climate changes rapidly from very hot to very humid and heavy monsoon rains. It may also result to flood. As the climate changes promptly, the rate of evaporation decreases. And the rate of precipitation increases due to heavy rain, resulting in over flow of water. Hence there is abundant amount of water which is helpful in raising the ground water table and resources.

In the month of autumn, the temperature is very mild and thus the climate is not stable. Hence there is also change in water table. Winter is generally divided into two, Pre-winter and winter. During pre-winter, the climate is very pleasant such that the temperature is about 20-25 degree Celsius. In this season the water level is somewhat maintained. But during winter season, the climate is quite cold and the temperature may go below 10 degree. In this season the water resources are frozen and thus is forms ice bergs. Then it is followed by spring season. In this season the temperature may go around 25-30 degree Celsius. As a result, the ice bergs formed in the winter season starts melting and thus there is an increase in the water level which is sufficient for the survival. But in the forthcoming season such as summer, the climate becomes too hot resulting in easy evaporation of water which causes scarcity. Thus the cycle of climate change and the water resource.

Impacts of climate on water resource

Due to varying climate, there is a vast impact on the water resources. Some of the effects are as follows. Due to increase in temperature, the rate of evaporation is increased. There begins the water scarcity. It adversely affects the ecosystem and species directly. Agriculture has a significant effect due to climate change. It causes loss of crops and income with the occurrence of extreme weather events.The climate change mainly cause the polar ice to melt, which in turn increases the sea water level which results in submerge of coastal areas. It also increases the rate of precipitation, which leads to heavy downpour. In spite of the fact that more rainfall increases the water resources, it also leads to rapid movement of water from the atmosphere back to the oceans, reducing our ability to store and reuse it further. High temperature, change in intensity and time of precipitation can affect the water quality. Also high temperature can reduce dissolved oxygen content levels, which affects the aquatic life. Warming will also cause hydrological changes that will affect freshwater resources.It is the most significant impact of climate change.

Remedial measures

The climate change has serious impact on the water resources. Hence preventive steps must be undertaken in order to reduce these effects. Some of the remedies are as follows. Avoid the usage of carbon emitting products and start using Eco-friendly products. Stop the activities like deforestation (cutting of trees) for human purposes. Practise such as plantation of trees must be done.Stop burning coal and fossil fuel for the production of energy. Reduce the energy usage. Save the water resources and use it in an efficient way. Have 3R (Reduce, Reuse and Recycle) practise. Use less heat and air conditioning. Support organic farming practices. Conserve the water resources. Rain water harvesting must be implanted in all the houses. Programs must be conducted explaining about rain water management. Awareness must be created among all, regarding the effect of global warming.

Overall view

The water resources are irregularly distributed in area and time, which are under pressure due to major population change and increase in demand. All the components involved in the hydrological cycle has a great influence due to human activities on it. Hence it need to be understood and quantified efficiently and there must exists a sustainable development for the protection of our water resources.

Climate change has a significant impact on weather patterns and hydrological cycle, affecting surface water resource as well as moisture and groundwater availability.The demand of surface water and increasing levels of water pollution threatens the social and economic development in many areas as well as the ecosystem. Thus climate change will create challenges in water availability from the resources . By planning and undertaking preventing measures the freshwater crisis could be prevented in upcoming years.

II. Conclusion

Thus the climate change and water resources has a great link with each other.Mainly the freshwater resources and it ecosystem are highly sensitive to various weather and climate. The changes in global climate are occurring as a result of accumulation of green house gases in the atmosphere. It will affect the freshwater availability and thereby alter the frequencies of floods and droughts. It may also affect the water quality. The main cause for the temporal variability in water resources at world wide is due to the distribution of precipitation in space(area) and time(period) which is caused by the climate change.

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