

## **CLIMATE CHANGE: ITS IMPACTS ON PAKISTAN**

**Dr. Sultan Mahmood**

*Professor, Government college of commerce and management sciences Abbottabad.*

Email: [Wafa692@yahoo.com](mailto:Wafa692@yahoo.com)

**Qamar Hassan**

*Lecturer, Department of Pakistan Studies, Abbottabad University of Science and Technology, KPK, Pakistan*

Email: [Qamarhassan476@gmail.com](mailto:Qamarhassan476@gmail.com)

### **Abstract**

*The climate is in the changing process, and it is a threat to the survival of humanity on the planet Earth. Climate change is one of the leading Current issue that the world is facing. Climate change is the most serious and dangerous issue not only for Pakistan but for the entire world. A developing country like Pakistan, which is dependent on agriculture for its economy is at more risk of climate change as compared to the developed countries. Climate change is disturbing agriculture which is affecting the economy of the country to a larger extent. Pakistan is in a region which is more sensitive to climate change. The increase in temperature, melting of glaciers, irregular behaviour of rains, locust outbreak, severe heatwaves and flooding are outcomes of this climate change in Pakistan. As a result of climate change, flooding, rise in temperature, rise in sea level, droughts, cyclone are hitting Pakistan back-to-back. Due to all these Pakistan is losing annually USD 3.8 billion and is ranked as the most affected country in the world by climate change. This study is an attempt to find out the impact of climate change on Pakistan. This research is qualitative in Nature, based on primary and secondary sources which included Books, articles, reports of different national and world organizations, research journals, Thesis and Documentaries. This study has tried to search for the reason for climate changes and threw light on the fact that Human being is the biggest reason behind the repaid change in climate, not only in the world but also in Pakistan.*

**Keywords:** *Climate change, World, Pakistan, Effects, Temperature, Environment, Earth.*

## **INTRODUCTION**

Climate change is a great threat to the globe and its Life. It has far reached inevitable results for the whole world. According to the website of United Nation, <sup>1</sup>Climate change is referring to long-term shifts in temperature and weather patterns. These changes in weather patterns and temperature may be natural but after 1800 AD, humans activities are the main cause of climate change. The burning of many toxic gasses is resulting in increasing the temperature globally.<sup>2</sup> Climate change is simply a phenomenon in which the climate of the world is changing and results in the alternation of eco and biosphere through a slow natural process. Causes of climate change are natural as well as manmade. 100 years ago, savants discovered that Earth is warming, its atmosphere and oceans are heating up due to the emissions of different gases by human beings.<sup>3</sup> The emissions of different gases like carbon dioxide, Methane, nitric oxide is the main cause of climate change and all these harmful gases are produced due to human activities.<sup>4</sup> The Earth receives energy in the form of heat from the sun. When light enter the Earth atmosphere it bounced back after hitting Earth surface. But now due to the Green House effect, the amount of heat entering the atmosphere is not going back to space due to the greenhouse gases in the atmosphere. These gases don't allow her to go back into space, hence the temperature of the atmosphere is increasing day by day and causing global warming. This increase in temperature is creating many issues for the planet Earth, including melting of glaciers, irregular pattern of rains, cyclones, droughts and many health issues. Climate change or global warming is one of the biggest upcoming issues for the globe in general and Pakistan in particular.

Due to climate change, the average temperature of the globe is increasing that is causing many difficulties for the world. Pakistan is in the list of the top ten most affected countries in the world because of climate change.<sup>5</sup> In recent two Decades Pakistan faced many natural disasters due to climate change like floods, droughts, cyclones, severe heat waves, rapid melting of glaciers and many more. Pakistan's contribution to atmospheric pollution due to industrialization is less than 1% but the impact of climate change includes it in the list of most affected countries in the world. Pakistan is an agricultural state, more than 65% of the total population is dependent on agriculture but due to the change of climates like change in the pattern of rains, floods, and droughts. This sector is affecting massively resulting in many financial crises for the country. Pakistan is paying hundreds of lives and billions of dollars every year to climate change<sup>6</sup>.

Impacts of climate change on biodiversity, health, water, economy and agriculture is visible everywhere in the world. Developing countries, like Pakistan are at more risk than developed countries. The economy of Pakistan is shrinking, and it depends upon agriculture, more than 65% of the population is attached to agriculture, therefore the impact of

climate change on agriculture is a direct threat to the common population of the country. Further, heatwaves, melting of glaciers, the rise of sea level are interlinked issues for Pakistan. Pakistan requires annually 7 to 14 billion dollars to overcome the side effects of climate change<sup>7</sup>. Pakistan is dependent mostly on the rivers for water supply and these rivers are directly dependent on glaciers for water flow. Due to the rise in temperature glaciers of Pakistan, in the northern parts of the country are melting at a rapid pace. This unusual melting of snow is causing floods and land erosion. If the glacier's melting rate didn't stop or slow down it will cause the end of glaciers and will cause severe water shortage in the country<sup>8</sup>.

## **LITERATURE REVIEW**

Climate change is one of the greatest upcoming threat for the humanity on the planet Earth. Therefore, research on the particular topic is the demand of time. Although this is the global issue but it's impact on Pakistan are more deadlier, this is the reason that researcher selected this topic for research, it may help in understanding the nature of this global issues. The current research topic Climate change and its impact on Pakistan is an attempt to know what is climate change? how it is affecting Pakistan and how we could counter this natural disaster? There is lots of work that has been done on the topic of climate change worldwide. But there is a lack of knowledge or study gap on the particular topic " climate change and its impact on Pakistan. This research paper is an attempt to fulfil this research gap.

A report of Asian Development Bank published in 2017, "Climate change profile of Pakistan", tells about the impacts of climate change in Pakistan. This report gives details about climate change impacts on different field of Pakistan. According to this report Pakistan has faced many natural disasters like cyclones, Droughts, floods, and severe heat waves, resulting in deaths of many citizens, destruction of infrastructure and cost loss of billions of dollars. According to the report Pakistan is on the list of most affected countries in thy world by climate change. This report covers the history of climatic change events, prospects of climate change in Pakistan, government policies towards this hazard but this report doesn't throw enough light on the importance of response of the common population towards this big threat to counter the outcomes of climate change. Naeem Karam & Abdul Hamid in their Journal titled, "Climate change: A threat to the Economic Growth of Pakistan" describes the impact of climate change on the economy of Pakistan comprehensively. According to the study climate change is affecting the economy of Pakistan and it has significant effects on the agriculture of Pakistan. The average increase in the temperature is resulting in low production of many crops and if climate change continues it will hurt the economy of Pakistan greatly in the coming years. The researchers had discussed only the economic aspect of Pakistan only and neglected the impact of climate change on human society as well as the causes of

climate change.

Rehana Siddiqui and Ghulam Samad in their Article titled "The impact of climate change on major Agricultural Crops: Evidence from Punjab" explains about the impact of climate change on different crops in Pakistan. Their work is a good attempt to find the impacts of climate change on the crops. According to the report increase in temperature and precipitation is not good for crops. The production of crops, in case of high temperature and irregular pattern of rains is less as compared to the normal weather conditions. The climate change is affecting the production of crops. The study of Rehana Siddiqui and Ghulam Samad is limited to the Punjab only. Their main focus was Punjab only and they worked on only two indicators, temperature and precipitation. They neglected the others important aspect of climate change. But this study is aimed to fulfil this gap of knowledge. Zareen Shahid in his PhD thesis "Climate change Awareness and Adoption by Local planning in Punjab, Pakistan", talked about climate change and argued that due to the rapid increase in the temperature, glaciers are melting down rapidly and causing severe floods. According to him if the increase in temperature continues, the Glaciers will melt rapidly and after some time it will result in a severe shortage of fresh water in the country. He focused only on the Punjab province in his study.

According to the report of the Pakistan Metrological Department, "climate change in Pakistan: Focused on Sindh province", published in 2012. Climate change is affecting everything around us, i.e., biodiversity, health, agriculture, and economy but these changes are very clear in Pakistan as compared to the rest of the world. Pakistan is a weak economy, suffering more from climate change. Due to climate change, Sindh is a more affected province. Due to the rise in sea level and lack of water in the Indus River, salty water is coming into the Indus Delta and transforming the fresh water into salty water which is harmful to agricultural land and can't be used for drinking purposes. This report only covers the Sindh province regarding climate change in Pakistan and doesn't give information about the rest of the country. The researcher is trying to fulfil this gap. Climate change is the most dangerous natural problem that the World is facing today. The evidence of this change is in front of all in the form of rising in temperature, rise in sea level, an unusual pattern of rainfall, migration of wildlife, melting of glaciers, droughts, floods, cyclones, storms etc. All this is happening just due to the emission of carbon dioxide CO<sub>2</sub> and many other harmful gases in the atmosphere. Greenhouse gases cause Green House effect in the atmosphere and increase the average temperature of the globe. This increase in temperature due to the contribution of mankind is causing many difficulties, not for only humanity but a whole living creature living on planet Earth. (Climate change 2009).

According to (Reilly,1995) an increase in temperature will affect the developing countries more than the developed countries because most

developing countries are dependent on agriculture and if the temperature increases it will directly affect the growth of crops, resulting in food shortage and low income. Fakhara Shahid and Dr Mubeen Adnan (2021) in the journal "Climate change: impact on Pakistan and proposed solutions", concluded that despite neglect able contribution of Greenhouse gases in the atmosphere as compared to the other developed countries, Pakistan is facing many climates change challenges. The economy, agriculture and more importantly the health of citizens are at risk due to this climate change. But the research paper has not detailed the pattern of climate change.

According to the Pakistan economic survey 2019-20 Pakistan is including in the top ten most affected countries in the world by climate change in the previous 20 years. Pakistan needs 7 to 14 billion US dollars annually to counter this threat. This survey tells about climate change that it is affecting the economy of Pakistan on larger extent. This survey gives full details of the country's need to counter or lessen the effects of climate change but it doesn't throw light on the causes and Future aspects of climate change in Pakistan.

### **BASICS OF CLIMATE CHANGE**

Climate change is the long-term shifts in temperature and weather patterns. Climate change means the change in the climate. Climate is the average weather condition of a particular area but due to some anti-environmental activities of humans like the burning of fossil fuels, industrialization etc., different gasses are increasing in the atmosphere which results in disturbing the overall climate of the world climate changing is causing global warming, which is resulting in many unusual changes in the world such as severe rainfalls, droughts, heatwaves, cyclones, the rise of sea level<sup>9</sup>.

### **GREENHOUSE GASES EFFECTS CLIMATE**

The sun is the source of energy for our planet. Life on Earth is dependent on the energy of the sun. When sunlight is entered into the Earth's atmosphere, some of the light is bounced back into space while some are observed by the atmosphere. Now due to the excess of the Greenhouse gasses like CO<sub>2</sub>, Methane, Nitrous oxides, and dust particles, don't allow remaining light to go out of Earth atmosphere, they again sent it back to earth surface due to which overall temperature of the earth is increasing and Global warming is in progress. These Green House gases are emitted by Domestic as well as industrialization activities of man and disturb the balance of energy or heat on planet Earth.<sup>10</sup>

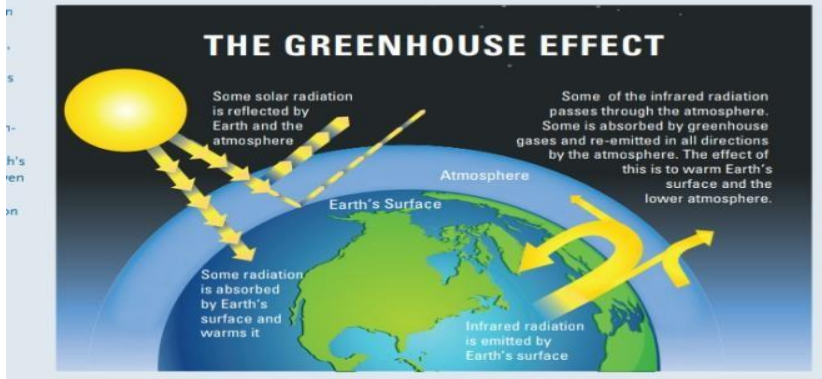


figure sources: US National Academy of science

## **CLIMATE CHANGE AND PAKISTAN**

Pakistan is in the tropical region of the globe. It is the region where climate change is causing more disasters. The region of Pakistan is more sensitive to climate change as compared to others<sup>11</sup>. According to the report of the United Nations Environment Program<sup>12</sup>, the impacts of climate change on agriculture, forestry, water resources and agriculture is a greater threat for Pakistan. The increase in temperature and change in the pattern of rains will affect the agriculture of the country more badly. Pakistan is more likely to face extreme weather conditions in the coming years. Furthermore, Pakistan has not had enough resources to help its citizens to protect them from this natural disaster.<sup>13</sup> The Global climate index has placed Pakistan 5th most affected country by climate change from 1994 to 2017. According to the reports, climate change caused 512 deaths per year and caused a loss of 3826.03 million Dollars. There was a total of 145 incidents of climate change during this period. These climate events were droughts, floods (super flood of 2010), heavy snowfalls, cyclones, severe heat waves.<sup>14</sup>

Pakistan is at more risk of climate change because it is an agriculture-based economy and depends on natural resources for its needs. As agriculture is a lifeline for the economy of Pakistan that's why climate change is a huge problem for Pakistan. Change in average rainfall, rise in temperature, droughts and flooding are serious problems for its agriculture and food security. Pakistan's 22.8 % area and 49.3% population is at direct risk of climate change<sup>15</sup>. Pakistan's contributions to climate change in respect of emissions of harmful gases are less than one per cent still its population is amongst the most affected victims of climate change.<sup>16</sup>

## **IMPACT ON AGRICULTURE/ LIVESTOCK AND FOREST**

Agriculture is the backbone of Pakistan's economy. agriculture is dependent on climate if the climate is favourable then the production of crops would be high and if the climate is not according to the requirements of crops the results would be against good production. Pakistan has 23.4 million hectares of agricultural land, and it is 29% of Total land.<sup>17</sup> Changing climate is a direct threat to agriculture as it

causes a shortage of agricultural commodities and disturbs the balance of needs and demand of agricultural or food commodities. It is estimated that there will be a surge of 10 c to 20c in Pakistan which will cause production losses in agriculture<sup>18</sup>. Pakistan's agriculture is endangered due to climate change. In Pakistan, 47% of the population depends on agriculture for their livelihood. There is 21% part of agriculture in the GDP of Pakistan, but the increasing temperature of Pakistan is affecting this most important sector of the economy.<sup>19</sup> Climatic changes have many negative impacts on agriculture by reducing the crops yield, Pakistan is on the list of those countries which can face severe food shortages due to the impact of climate change on its agriculture. The temperature rise is affecting the productivity of wheat which is the backbone of Pakistan's food. Droughts due to climate change are another risk factor for agriculture in Pakistan. Baluchistan, Sindh and KPK are facing droughts for the last two decades, therefore the agriculture sector is affected due to the lack of enough rains. Flooding is another danger for agriculture, heavy and unusual rains during monsoon seasons are a serious threat for farmers because flood damages crop on a larger scale every year. The floods rate is directly related to climate change, Due to the climate changes every year crops on millions of acres of land are destroyed in Pakistan

Livestock is another agriculture supporting sector. In Pakistan, more than 8 million families are attached to this business and contribute 11% to the GDP. As livestock depends directly on agriculture lack of sufficient water and low productivity of agriculture is also a threat for live stocks in Pakistan. Changing climate is a direct threat to agriculture as it causes a shortage of agricultural commodities and disturbs the balance of needs and demand of agricultural or food commodities. It is estimated that there will be a surge of 10c to 20c in Pakistan which will cause production losses in agriculture<sup>20</sup>. Forests are one of the great gifts of nature. These are the source of oxygen and provides timber, fuels, shelters for wildlife. Pakistan has only 5% forest which is too low than the international standard. Due to climate change, their quantity is further reducing the high temperature, fewer rains are the major causes of forest reduction.<sup>21</sup>

## **IMPACT ON WATER RESOURCES**

Water is one of the basic needs for the life of living things on the Earth. Life without water is impossible. Pakistan's water sources are monsoon's rains, glaciers, and some underground water. The biggest source of water in Pakistan is glaciers. These glaciers are in the northern part of Pakistan in the Himalayan and Hindukush and Karakorum ranges. These glaciers are responsible for the supply of water to Pakistan throughout the year. The Himalayan region is warming due to climate change. According to the economic survey of Pakistan 2020, glaciers in the kara Kurram ranges are melting more frequently especially glaciers in Chitral and Gilgit region, glaciers have retreated fastly due to global climate change.

The study suggested that if the temperature rises to 4 degrees centigrade then at the end of this century the mass of these glaciers would be 50% less as compared to the current mass.<sup>22</sup> This indicator is most serious for Pakistan because Pakistan depends upon these glaciers. The availability of fresh water in Pakistan is decreasing day by day as a result of high temperatures and low rain forecasts<sup>23</sup>

Further, it is expected that the melting of glaciers at a rapid pace will cause more flooding and land erosion in Pakistan in the coming years. Availability of fresh water for drinking would also be decreased in the coming decades. Pakistan may face acute water scarcity by 2025 and will be a more affected country in South Asia in the next two decades. In Pakistan, more than 30 million citizens have no access to clean water<sup>24</sup>. To overcome the shortage of water Pakistan must have to build dams and minimize the water loss.

### **RISE IN SEA LEVEL**

The level of the sea is rising worldwide due to global warming. The increase in temperature is heating the seawater, resulting in the expansion of seawater which is raising the sea level. The melting of glaciers is also resulting in the rise of sea levels<sup>25</sup>. Sea level has raised 10 inches during the last century.<sup>26</sup> Sea level can rise 3.6 feet by 2100. Pakistan has a total of 1046 kilometers of coastline in the province of Sindh and Baluchistan. The sea level of Pakistan has also risen due to climate change. The sea level of Karachi rose 1.1 mm per year while the Indus delta rose 4mm annually. Due to the rise in sea level the saltwater of the Arabian sea has intruded more than 60 kilometers in the Indus delta and converted freshwater of the Indus River into salty water. More than 3 million acres of land in district Thatta, Badin and Sahiwal have been destroyed due to seawater<sup>27</sup>. The coastal cities of Pakistan like Karachi, Thatta, Badin and Gwadar are at more risk of rising sea levels and coastal erosion.<sup>28</sup>

### **IMPACT ON ECONOMY**

According to the reports, climate change caused 512 deaths per year and caused a loss of 3826.03 million Dollars. There were a total of 145 incidents of climate change during this period. These climate events were droughts, floods ( super flood of 2010), heavy snowfalls, cyclones, severe heat waves<sup>29</sup>. Pakistan is at the note of risk to climate change because it is an agriculture-based economy and depends on open natural resources for its needs. As agriculture is the lifeline for the economy of Pakistan that's why climate change is a huge problem for Pakistan. Change in average rainfall, rise in temperature, droughts and flooding are serious problems for its agriculture and food security. Pakistan's 22.8 % area and 49.3% population is at direct risk of climate change.<sup>30</sup>

### **HEATWAVES AND HEALTH ISSUES**

Heatwaves during summer is another impact of climate change which is increasing the average temperature of Pakistan. Pakistan is facing an increase in temperature average temperature significantly more than the

global average. At the end of this century, an increase of 3.7 degrees centigrade is expected in Pakistan. Pakistan is experiencing the highest temperatures in the world. More than 80% of the total population is at direct risk of extreme temperatures in the coming days<sup>31</sup>. In 2015, more than 65000 people were hospitalized due to heatwaves in Pakistan.<sup>32</sup> From 1997 to 2015 Pakistan has faced more than 127 severe heat Waves due to climate change. According to the report of BBC NEWS more than 1300 people died in a week during the heat wave in Karachi.<sup>33</sup> Pakistan has lost 523 lives per year due to extreme climate and weather conditions<sup>34</sup>. Dengue fever, Malaria, cardiac diseases, skin cancer are most common due to severe increases in temperature and exposure to sunlight<sup>35</sup>.

### **LOCUSTS CRISES**

Locusts are small flying insects that normally breed and grow in the African continent but are now due to climate changes. These small insects have started their migration toward Asia specifically towards Pakistan and India. Some scientists believed that this migration of locusts is due to climate change. During the winters of 2019 million of locusts migrated from Africa entered the province of Baluchistan and then attacked Sindh and Punjab province. They destroyed crops on millions of acres in these provinces. In response to that attack, Pakistan declared a national locust emergency.<sup>36</sup> According to the FAO (an organization of the United Nations on food and agriculture), Pakistan has lost crops worth USD four billion due to this locust outbreak.

### **FLOODS**

Pakistan experienced many floods during the last few decades. Due to the melting of glaciers and unusual rains during monsoon seasons Pakistan is more likely to experience heavy floods. Being an agriculture-based economy floods are the most dangerous natural disaster for agriculture. According to the report of the Federal flood commission, Pakistan has experienced more than 20 major floods since independence. five in the first decade of Pakistan, five in the 70s, four in the 80s, four in the 90s and two in the previous decade. These floods resulted in damage to more than 500000 square kilometers of land, 12000 lives and economic loss worth 39 billion every year. The agriculture sector which is the source of living for Pakistan is the most affected sector along with public and private economic sectors<sup>37</sup>. The flood of 2010 was the most devastating in the history of Pakistan. According to the data collected by NDMA Roads, railway lines, bridges, schools, crops on millions of acres, tube Wells, public and private infrastructure was damaged.<sup>38</sup> More than 2000 people were killed, economic loss of more than a 578billion dollars and 728,193 houses were destroyed<sup>39</sup>. These floods are a serious concern for a country like Pakistan which is an agriculture-based economy.

### **IMPACT OF CLIMATE CHANGE ON BIODIVERSITY**

Temperature and rainfall play a vital role in biodiversity. It decided that which species of plants or animals can live grow and reproduce in the

area. Climate Change has affected both these indicators in Pakistan. Due to climate change, many species of plants and animals are endangered in Pakistan, while some are vanished completely.<sup>40</sup> Due to changes in temperatures and weather patterns Markhor, Indus River dolphin, Sindh Ibex, Asian black Bear, Fishing cat, the snow leopard is near to end from Pakistan<sup>41</sup>.

## **GOVERNMENTAL POLICIES AGAINST CLIMATE CHANGE**

Pakistan's government is now giving priority to climate change. Many steps have been taken in this regard to counter the climate change impact on Pakistan. Pakistan has initiated the following steps:

The present government is working to enhance the water storage capacity of Pakistan by buildings new Dems in Pakistan.

Maintenance of old water storage resources.

Minimize the water loss.

Pakistan has launched the policy of National food security in 2018, to make the agriculture of Pakistan safe, productive and to prevent it from climate change.

Billion tree Tsunami program.

Billion tree plantation programs have been launched to increase the forest of Pakistan because forests can help in reducing climate change.

The ecosystem restoration initiative was launched in 2019 to prevent biodiversity.

Efforts to reduce air pollution are also under process.<sup>42</sup>

Climate change is threat for the survival of humanity and other creatures on our beloved planet

Earth. It's impacts are slow but steady. It's impacts are inevitable and far reaching. It could only be minimize when there is less carbon dioxide consumption in the air. To counter this issue, it is necessary to lessen the amount of carbon from atmosphere by reducing the amount of this harmful gas. Plantation is the best and easy way to counter this global challenge.

## **CONCLUSION**

From the above discussion, it can be concluded that climate change is the most serious and dangerous issue not only for Pakistan but for the entire world. A developing country like Pakistan, which is dependent on agriculture for its economy is at more risk of climate change as compared to the developed countries. Climate change is disturbing agriculture which is affecting the economy of the country to a larger extent. Pakistan is in a region that is more sensitive to climate change. The increase in temperature, melting of glaciers, irregular behavior of rains, locust outbreak, severe heatwaves and flooding are the outcome of this climate change in Pakistan. As a result of climate change, flooding rise in temperature, rise in sea level, droughts, cyclones is hitting Pakistan back-to-back. Due to all these Pakistan is losing annually USD 3.8 billion and is ranked as the most affected country in the world by climate change.

Along with the economy, climate change is affecting human life as well. Climate change is costing more than 523 precious lives of Pakistan every year. Contributions of Pakistan in GHG is less than 1% but its sufferings are more than any developed country. Pakistan is taking this global threat very seriously and is working on, countering this global challenge but Pakistan alone can't eliminate this global challenge of climate change, the meaningful efforts of the whole world are required to make this planet safe and secure for coming generations.



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