Global Journal of Arts, Humanities and Social Sciences
Vol.10, No.6, pp.1-26, 2022
Print ISSN: 2052-6350(Print)
Online ISSN: 2052-6369(Online)

Climate Change and Its Impact Worldwide Particularly On Pakistan and Measures to Control Its Effects

[1] Mahnoor Irfan; [2] Samiullah; [3] Irum Azba; [4] Batool Haider; [5] Aleena Tahir ; [6] Karen Samuel; [7] Yusma; [8] Anfal younas; [9] Bilal Atiq

Undergraduate Students of Pharm-D from Hamdard Institute of Pharmaceutical Sciences Islamabad

Citation: Mahnoor Irfan; Samiullah; Irum Azba; Batool Haider; Aleena Tahir ; Karen Samuel; Yusma; Anfal younas; Bilal Atiq (2022) Climate Change and Its Impact Worldwide Particularly On Pakistan and Measures to Control Its Effects, *Global Journal of Arts, Humanities and Social Sciences*, Vol.10, No.6, pp.1-26

ABSTRACT: *Quantitative and qualitative data analysis shows that revolutionary climate changes have been observed in recent decades in world history. The earth's temperature is rising to the ever-alarming limits the world is facing the noticeable and direct impacts of climate change in the form of extreme weather events, irregular precipitation, reduction in water resources, formless average temperature trends, other damages to natural ecosystems and human health due to green-house gases and anthropogenic emissions. Pakistan is one of the most affected countries globally. Previous studies confirmed the direct relationship of climate changes with drought, migration, flooding, diseases, poverty, un-equality, agriculture, Land and soil devastation, diseases, gender, and the impeding effect on the economy of Pakistan. Comparative excerpts are highlighted and solutions proffered; highlighting climate change policy objectives (CCPOs) based on symmetric principles, i.e., energy, transport, urban and town planning, industry, and agriculture as criteria, with 17 sub-criteria in total and strategies included.*

KEYWORDS: climate change, global warming, impacts on the world economy, influence on Pakistan, climate change policy adaptation strategies

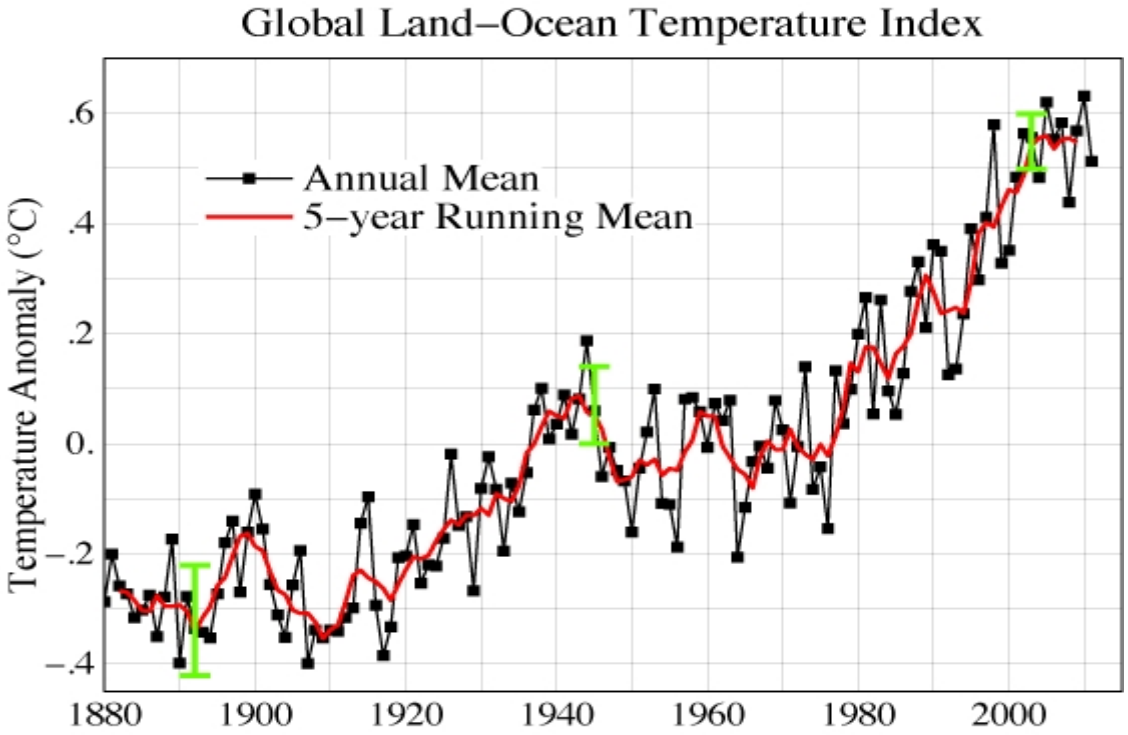
INTRODUCTION

The Oxford Learner's Dictionary defines climate as "the regular pattern of meteorological conditions in a given place." These weather conditions could be described as mild, moderate, warm, or wet depending on season and/or region. Evidence, however, reveals a shift from the typical pattern of weather conditions to a fairly detrimental and adverse trend as the climate is now known to impact the environment and inevitably the Ecosystem, both living and non-living.

Global Warming Process

The greenhouse effect is natural, and many of these greenhouse gases are necessary for life because, without them, heat would escape back into space, and the Earth's average temperature

would be 33 degrees lower than it is now. However, when the greenhouse effect intensifies, more heat is trapped than is required, making the Earth less tolerable for humans, plants, and animals. As a result, it may be deduced that greenhouse gases' potential to absorb sunlight is the fundamental cause of global warming. As a result of increased fossil fuel burning and deforestation in recent centuries, humans have led to a rise in atmospheric GH Gases. The



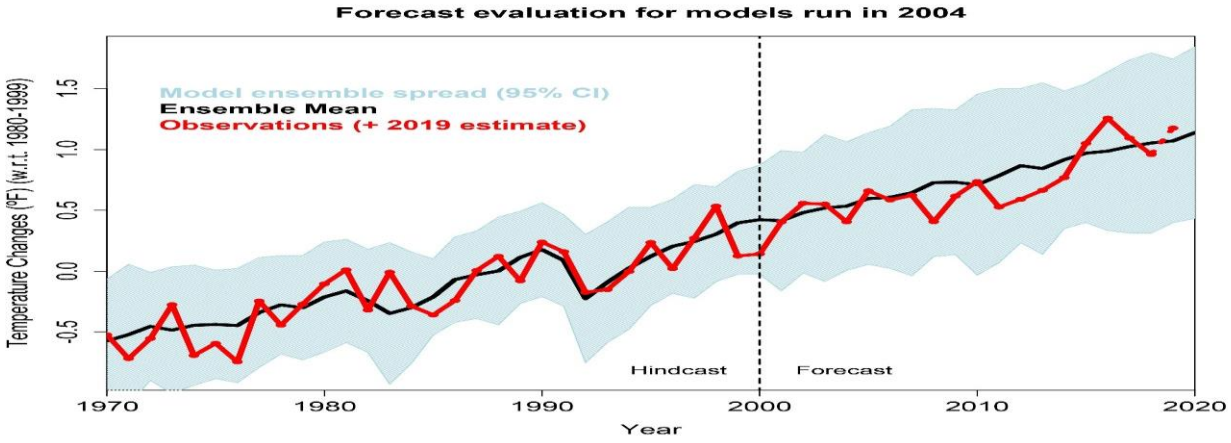
fundamental cause of global warming during the last century has been the increase in GHGs.

The greenhouse effect is a natural phenomenon. While global warming is often observed on multi-decadal time scales (30+ years), identifying trends over less than 30 years can be difficult due to natural variability.

Natural Variability:

Climate variations caused by internal interactions between the atmosphere, ocean, land surface, and sea ice are referred to as natural variability. Those variations can happen with or without climate change, and they're sometimes referred to as "noise" or natural variations around a "normal" value. Figure 2.2 depicts two of these episodes in the light of longer-term global warming, as well as yearly natural variability

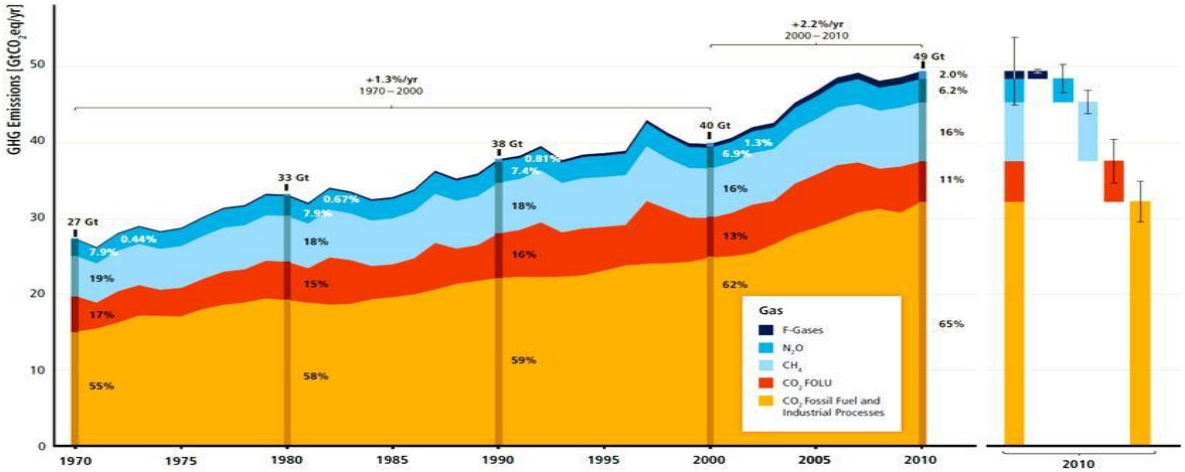
Figure 2.2: NASA GISS Global average temperatures. The forty-five-year trend is shown in blue.



Causes of Global Warming:

Several variables affect the Earth's climate. These variables include sun output (warming effect), volcanic eruptions (cooling effect), GHG (Greenhouse gas) levels in the atmosphere (warming effect), and aerosols (cooling effect). Carbon dioxide (CO2) has been the most significant contributor to the increase in global warming since the Industrial Revolution (i.e., 1750), followed by methane (CH4).

Emissions from the Past Figure 2.5 depicts historical anthropogenic GHG emissions by GHG type (in CO2 equivalent/year). CO2 emissions accounted for 76% of total GHG emissions. Net CO2 emissions from forestry and other land uses are referred to as "CO2 FOLU.



Historical Annual Anthropogenic GHG emissions, 1970–2010 (Gt CO2e/yr

Greenhouse gases:

The greenhouse gases and their sources are as follows:

Water vapor: Water vapor is the most common greenhouse gas, but others are equally valuable. Some are caused by natural processes, while others are the result of human activity. Water vapor has a strong influence on temperature rises affected by increased GHG levels. GHG-induced increases in global temperature increase the atmosphere's capacity to hold water vapor, acting as a positive feedback loop because water vapor also has a greenhouse effect.

Aerosols: Based on its ability to halt solar radiation from reaching the earth's surface, aerosols produced by industrial emissions have aided to neutralize about 26% of global warming. However, there is considerable uncertainty about the extent to which aerosols influence climate, owing primarily to aerosol interactions with clouds.

Carbon dioxide CO2: The major greenhouse gas emitted by human activities is carbon dioxide (CO2), which is primarily produced by the combustion of fossil fuels. It is the predominant cause of global warming.

Methane: When greenery is burned, digested, or rotted in the absence of oxygen, methane is produced. Methane is produced in large quantities by trash heaps, rice fields, pasturing cows, and other livestock.

Nitrous oxide: Nitrous oxide is naturally ubiquitous in the air, but human activities are increasing its levels. Chemical fertilizers emit nitrous oxide. When agrochemicals and excrement are used in agriculture, nitrous oxide is released.

Halocarbons: CFCs (which also harm the ozone layer) and other man-made chemicals containing chlorine and fluorine are examples of halocarbons**.**CO2 is the most important greenhouse gas.

Human activities: CO2, mainly from deforestation and biomass combustion, fluorinated gases from industrial processes, and methane and nitrous oxides from agriculture and waste all resulted in a rise in greenhouse gases in the atmosphere. The natural cycle of the greenhouse effect and related processes has been disrupted by anthropogenic activities. Burning and removing trees, stumps, and other vegetation from wooded areas, for example, emit millions of tons of CO2 into the atmosphere each year in Australia. Scientific data shows a clear correlation between Atmospheric co2 levels and global temperature. Carbon dioxide levels in the atmosphere have been 280 parts per million before the Industrial Revolution; today, seem to be 380 ppm, according to research.

CLIMATE CHANGE ISSUES AND CONSEQUENCES:

A-Smog Pollution:

Rising temperatures, can exacerbate smog pollution according to the NRDC (Natural Resource Development Council), and increase the number of "bad air days," as shown in Fig. 2, when breathing becomes difficult. Many people are at risk of having their eyes, noses, and lungs irritated, and this is especially harmful to people with respiratory diseases like asthma. Ozone smog is generated when automobiles, industrial plants, and many other airborne pollutants react with sunlight and heat. Rising temperatures hasten this process, resulting in more smog.

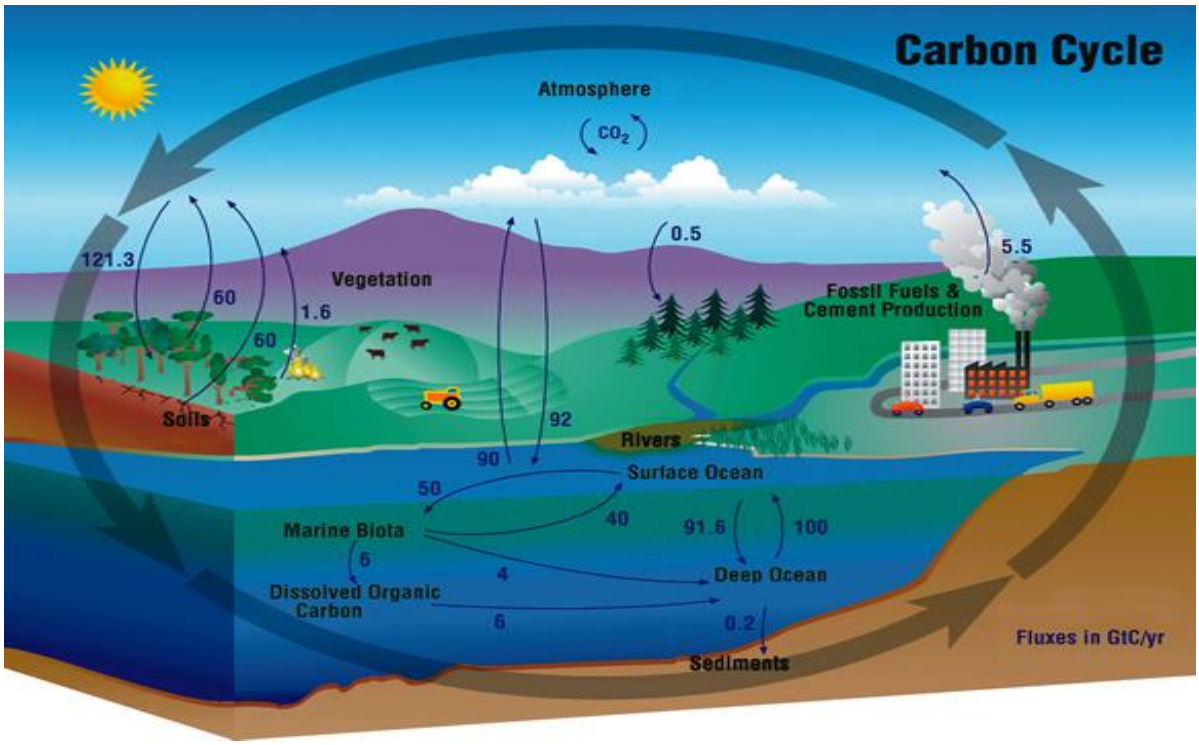


Fig. 1.4. Carbon cycle. source: NASA

B-Human Health:

Human infections have subsequently increased as a result of rising temperatures, heavy rain, and high humidity. Many diseases that were thought to be erased are reappearing. Recurrent influenza epidemics are well known in developed countries today as it occurs in mid-winter. It has also been identified that a couple of months with average temperatures above 180 ° C. and also the degree of urbanization correlate with an elevated risk of dengue fever. Tropical and subtropical insects that act as disease vectors travel from regions where infectious diseases prevail into new areas and end up causing disease interchange as a consequence of Increases in heat, precipitation, and humidity. Warmer, humid environments broaden insect and zoonotic disease vector habitats, resulting in faster vector reproduction and microorganisms' growth and proliferation.

Climate change will have three effects on human health:

• Weather extremes have immediate consequences, such as increased mortality and disability risks.

• Environmental and ecosystem changes have an indirect impact on human health, such as a predominance of waterborne diseases warmer temperatures, or higher death and disability rates during extreme heat events. There will be an exacerbation of current illness loads, particularly in areas with shaky healthcare systems and limited adaptability. The poorest regions are assumed to be the most susceptible to climate-related health hazards.

• Other societal systems will be affected indirectly as a consequence of climate change extremes. , such as malnutrition and psychotic problems as a result of increased food shortages and emigration.

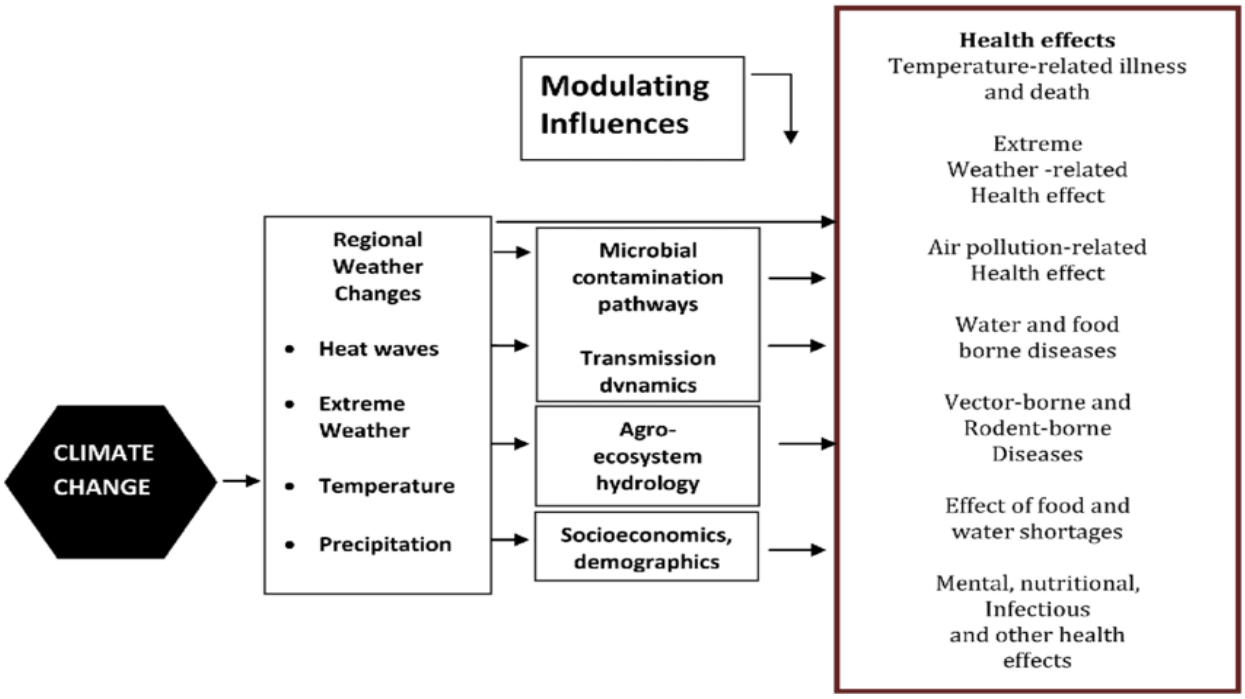


Figure 1. Pathways by which climate change affects human health include local modulating influences and the feedback influence of adaptation measures. Source: adapted from Patz et al., 2000.

Monitoring of Climate-Related Injuries and Diseases:

Along with tracking extreme weather events that end up causing hazards, injury, and disease monitoring is obligated to aid health experts in responding proficiently to climate-sensitive health implications and boost local clinical capacity. Health indicators must be relevant to vulnerable populations and/or tropical and subtropical regions. Environmental conditions, mortality and morbidity, vulnerability (e.g., proximity to hazards), adaptation and mitigation efforts, and the environmental policy are among the indicators proposed in the United States25

and Canada26. These aren't all-inclusive, and they may need to be refined further for use in tropical medicine. Public health agencies, and health professionals. To better equip for the health burdens affected by climate change, research teams must track changes in climate-sensitive health outcomes in tropical and subtropical areas. Furthermore, descriptions of the state of infrastructure and clinical capacity to cope with these impacts are required, particularly in developing countries.

C- Extreme Dry Weather and Drought:

Water is essential for life, and climate change is putting this valuable resource at risk. Water quality may be imperiled as temperatures rise and precipitation decreases. A drought is defined as a prolonged period of extremely dry weather that disrupts the water cycle, concentrating residues such as toxic substances, chemical products, pesticide residues, sediments, and salts. Aquatic life is also at risk. As the world is becoming drier, water resources are reduced and its quality is affected badly, affecting people's health and food supplies. This has dire implications not only for safe drinking water but also for crop production, leading to reduced crop yields and food security.

Due to reduced rainfall and changes in precipitation patterns, hydrological droughts (less rainfall) and agricultural droughts (drier soil) are expected to last longer or become more frequent in some areas and seasons. Droughts that are more severe will put additional strain on water supply systems in dry areas, but they may be controllable in moist areas if proper measures are taken.

https://www.cdc.gov/nceh/drought/default.

https://www.who.int/healthtopics/drought#tab=1

D-Downpours and Flooding Risk:

Experts predict that the rate of occurrence of rainstorms will increase, putting many communities at risk of flood widespread destruction. Warmer air retains more moisture, culminating in more precipitation. Increased populations of disease-carrying insect vectors, moldy houses, community chaos, and dislocation are all potential consequences of flooding. Streams, rivers, and lakes flood as a result of rains fall, increasing the risk of water-borne pathogens accessing drinking water supplies. Rainstorms can also wreak havoc on critical infrastructures such as sewer and solid waste systems, causing sewage overloads that can

pollute local waters. Downpours are expected to become more usual across half of the globe. Snowfall is predicted to decline in the mid-latitudes during the winter, resulting in fewer snowmelt floods in the spring.

(A) (B)

A- https://www.accuweather.com/en/severe-weather/disaster-emergency-declared-ice-jam-flooding-in-alaska/1184837

B-https://www.nytimes.com/2021/07/16/world/europe/germany-floods-climate-change.html

E-Severe weather conditions:

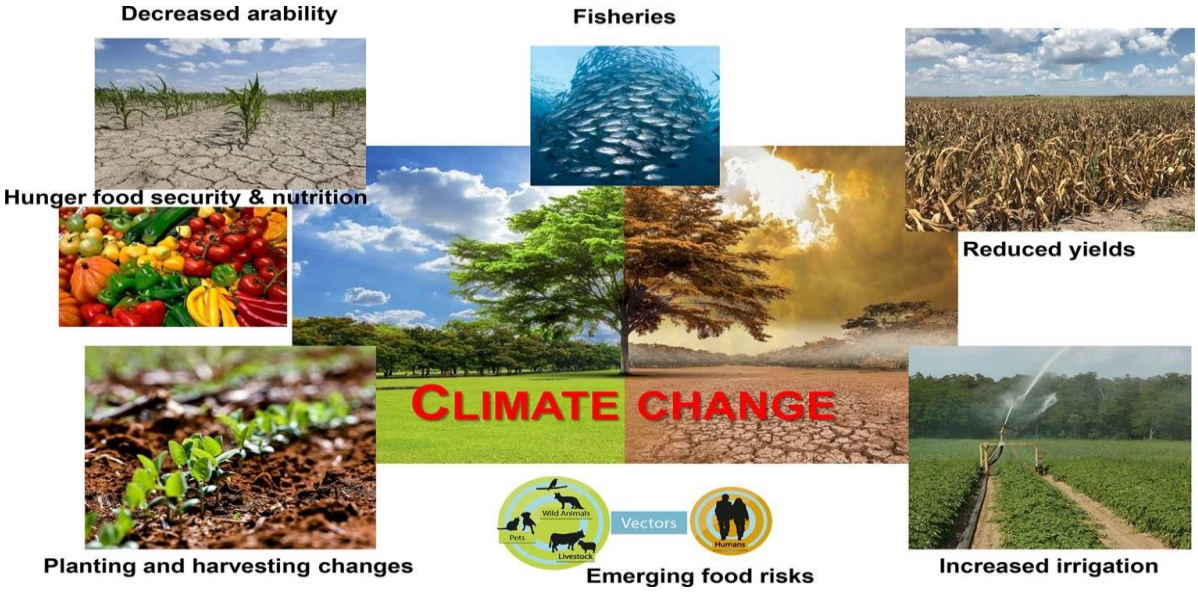
Heat is trapped near the earth's surface by CO2 emissions from automobiles, industries, and power plants. More heat equals more energy and dumping so much energy into the atmosphere increases the likelihood of more extreme weather. Droughts, wildfires, heatwaves, and hurricanes are becoming more common as global warming causes more extreme heatwaves, with urban areas bearing the brunt of the impact because asphalt, concrete, and other structures absorb and reradiate heat, causing temperatures in urban areas to be up to 10 degrees Fahrenheit higher than in nearby rural areas

F-Depletion of water resources:

The availability of renewable water is expected to decrease in some areas while increasing in others. Because of greater streamflow fluctuations (due to higher volatility of precipitation and increased evaporation during all seasons) and seasonal cuts, temporary water resource shortages are still likely in locations where increases are projected (because of lower accumulation of snow and ice). A warmer atmosphere may cause lower water quality, reducing the clean water supply. Toxins produced by algae, for example, could degrade the quality of water sources such as lakes. The struggle for water will escalate among agriculture, ecosystems, towns, industry, and energy production, affecting regional water, energy, and food security.

G-Impact on agriculture:

AgricultureClimate change will have direct and indirect consequences on agricultural growth processes, affecting food output. Changes in carbon dioxide availability, precipitation, and te mperatures are all direct repercussions. Indirect effects tend to involve changes in water resource availability and seasonal variations, soil mineralization, soil abrasion, changes in pest and disease information, the arrival of exotic species, and a decrease in arable land due to the flooding of coastal lands and drought. Even on lower emissions pathways, these effects are likely to harm major staple crop yields on a global scale. Tebaldi and Lobell (2018)59 estimate a 5% and 6% reduction in global wheat and maize yields, respectively, even if the Paris Climate Agreement is met and warming is limited to 1.5°C. Changes in the best and most viable spatial ranges Certain crop shifts are also unavoidable, however, their magnitude and speed will be determined by the emissions pathway. Another, perhaps less well-known effect of climate change on agricultural production is its impact on labor force health and productivity. According to Dunne et al. (2013)60, warming has already reduced workers' efficiency by 10% during peak months, with a further 20% drop expected by 2050 under the maximum climate change scenarios (RCP8.5). When the following processes are coupled, they are extremely likely to have a considerable influence on national dietary patterns, both directly and indirectly through repercussions on internal agricultural activities.



https://ars.els-cdn.com/content/image/1-s2.0-S0963996920302817-ga1_lrg.jpg

H-Impacts on Ecosystem:

In the past millions of years, climate changes have naturally occurred at slower paces, permitting the ecosystems to adapt. The species extinction rate has exceeded by up to 100 times the "normal" pace. Massive extinctions are caused by many factors including urbanization, increased world population, etc. Of course, climate change has made its contribution which

will amplify with time. , the majority of ecosystems will remain vulnerable to climate change. The increase in average temperatures will cause a lot of terrestrial and aquatic species to migrate towards more adequate climates, but many of them will not be able to do so quickly enough, thus jeopardizing biodiversity

I- Production and Security of Food:

Obvious climate change impacts on terrestrial food production can already be observed in some sectors around the globe. In the past few years, climate extremes such as droughts have occurred in major producing areas, resulting in many episodes of price hikes for food and cereals. Although these effects are beneficial in certain areas, adverse consequences are more frequent than favorable ones, especially, because key production areas (e.g. California) are located in historically favorable areas which will become unfavorable. Many climate change impacts will increasingly affect food security—particularly in low-latitude regions—and will be exacerbated by escalating food demand. Forecasted ocean level rise will threaten crucial food-producing areas along the coasts, such as India and Bangladesh, which are major rice producers.

J-Non-Gender-Neutral Effects:

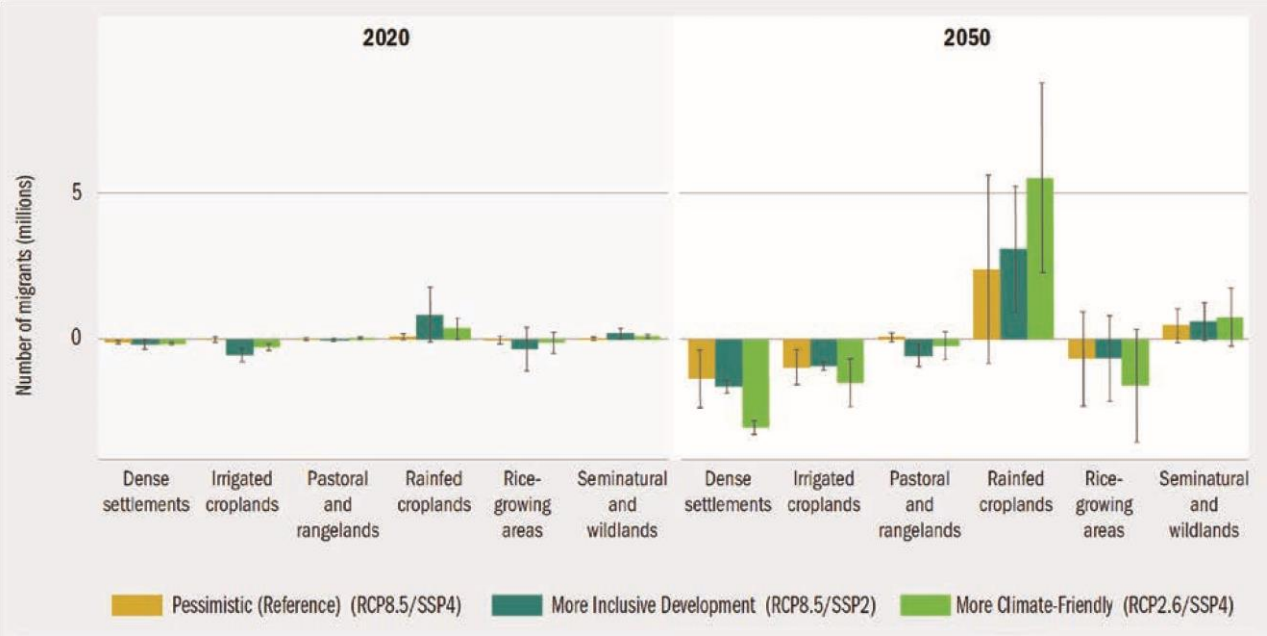
Climate-related disasters have influenced communities in numerous sectors, including the agriculture sector, food production, water quality, and healthcare sector, according to researchers. The amount of effect and managing methods of communities is significantly influenced by their socioeconomic situation, socio-cultural values, availability of resources, deprivation, and sex. Women and children are among the most vulnerable categories, according to research. Gender variations in time usage, access to assets and credit, treatment by formal institutions, which can limit women's prospects, limited access to policy debates and decision making, and a lack of sex-specific data for policy change are key parameters that account for inequalities in women's and men's susceptibility to climate change risks. 87

K-Emigration

According to research conducted by the World Bank Group88, gradual climate change would result in an estimated 17–36 million internal immigrants in South Asia by 2050. This estimate's range incorporates several future growth trajectories with varying amounts of emission mitigation and injustices in development results. In all situations, the underprivileged populations will be the most affected. Without considerable mitigating measures, the pace of climate-induced migration is anticipated to increase significantly beyond 2050. It is anticipated that 'trouble spots' of immigration and emigration will arise. The vast number of migrants in South Asia is sure to come from communities that rely on lands that depend upon rain for productivity for their survival, as indicated in Figure 15. Migration, according to Rigaud et al (2018), maybe a successful adaptation strategy provided it is well-planned, backed by upskilling and job development, and carried out with consideration for the implications on people already residing in receiving regions. Climate-related migration is still a poorly known phenomenon, and more investigation is necessary to fully understand the driving forces,

potential troubles, and how communities may be assisted in various local settings. Research can help to promote management that incorporates migration across sectors.

FIGURE 15 Rigaud et al 2018 projected net climate migration in and out of livelihood zones in South Asia under three scenarios (2020, 2050), positive figures imply emigration from the specific livelihood zone.



L-Effects on World Economy:

Changes in the global climate will have far-reaching consequences for both l nature and the economy. Even a minor increase in mean annual temperature can have a significant influence on the ecology and biological richness of a region. Biodiversity is essential for environmental stability as well as human health. Droughts, floods, and other climate change effects will have a significant economic impact. These expenses are expected to climb to between 5% and 20% of global revenue, according to some academics (Stern, 2006). The IPCC has yet to come up with a reliable cost estimate for the effects of climate change. However, it has calculated the cost of limiting future change. If such action is taken, global income will only grow by a fraction of a percentage point less than if nothing is done: overall economic growth will be 3 percentage points lower by 2030. (57 percent instead of 60 percent, for example). If the United Nations' "Millennium Development Goals," as defined by the UN, are to be met, catastrophic climate change must be avoided.

Millennium Development Goals

• Put an end to extreme poverty and hunger.

• Make universal elementary education a reality.

• Encourage women's empowerment and gender equality.

• Lower the infant mortality rate.

• Improve the health of mothers.

• Fight diseases including HIV/AIDS, malaria, and others.

• Maintain environmental stability.

• Create worldwide development cooperation.

It is clear that climate policy and the Millennium Goals are inextricably linked. the Millennium Goals will simply not be achieved unless climate change is addressed. Poverty and hunger will get worse rather than eliminated in regions where climate change causes more extreme drought. Malaria will spread more widely as a result of climate change, rather than being effectively combated. Climate change's multiple effects on biodiversity will result in a less stable environment. Both the physical effects of climate change and adaptation strategies will have an impact on virtually every sector of the economy. Here are a few examples.

1- The insurance business will be impacted by the increased frequency and scale of extreme weather events, producing more damage and higher loss volatility in property/casualty, life, and health insurance. It could make it more difficult for insurance companies to provide coverage at a reasonable rate and raise risk-based capital.

2-Human health effects will increase the demand for healthcare and stress existing healthcare systems.

3-The financial services industry may be impacted on many levels depending on the vulnerability of their asset/loan portfolios to climate change.

4-Agriculture, forestry, fishing, tourism, hydroelectricity, transportation, and mining are all weather-sensitive industries.

5-Economic growth and development may suffer.

III- Adapting to the Changes in Climate:

The process of modifying biological and non-biological mechanisms or procedures to assist an organism in dealing with new sets of environmental pressures that arise as a result of its exposure for the benefit of survival, growth, and development. However, the extent and scale to which organisms can adapt have a limit. Almost all organisms can adapt their biological systems to cope with environmental challenges to some degree in order to survive and reproduce. Apart from organisms' innate adaptability, especially crop plants, certain man-made coping mechanisms could be used to reduce climatic hazards.

The following are some examples of natural and man-made adaptation mechanisms:

Genetic adaptation: Crop types are being bred for heat tolerance using both traditional and modern breeding techniques. Heat-tolerant crop genotypes are screened, and favorable genes are extracted mostly from germplasm acclimated to such warmer circumstances.

Natural adaptation: Different adaptive mechanisms such as adjusting their optimum thermal range, fleeing, avoidance, cooling through heat, stomatal closure, cutin, wax development, production of heat shock protein, osmoregulation, and others demonstrate different abilities to adapt to warming.

Biotechnological procedures: selective gene transfer from a donor with minimal genetic alterations.

Crop insurance: Crop insurance is a method of reducing the climate risk to crop yield.

Non-genetic adaptation: Agricultural-physiological manipulations such as sowing dates, frequent irrigation, a larger dose of chemical fertilizers, crop diversity, green manuring, and other non-genetic adaptations to lessen vulnerability to climate change. Crop genotypes enabling faster grain growth and delayed leaf senescence under a higher temperature regime have been identified.

IV-Influence on Pakistan

A few nations are in danger because of environmental change and this hazard is considerably more noteworthy for less created nations. Because of this grave issue as it impacts South Asia, this locale has become more calamity-inclined (Kekar&Bhadwal, 2007; Sivakumar &Sefanski, 2011). Like different locales, South Asia is additionally noticing the adverse consequences of environmental change (Sterrett, 2011). The easy objectives of negative changes in the climate which are happening quickly with time are the unfortunate public of these areas (Morton 2007). Furthermore, our nation is very helpless against the impacts of climatic varieties because of its reliance on agribusiness (Wassmann et al., 2009). Pakistan is additionally remembered for the rundown of the best 10 most vulnerable nations to environmental change (Khan &Samiillah, 2015). As a general rule, change is occurring quickly and creating adverse consequences for Pakistan. Geographically, Pakistan is arranged in a space where the impacts of environmental change are being noticed genuinely (Malik et. al., 2012). "Fiascos like floods, dry spells, and other normal catastrophes" are the primary instances of environmental change in Pakistan (Banoori, 2012). There is an immense monetary, social and natural effect because of this climatic debacle. Measurements of the 2010 floods show the devastating effects on the 20 million existences of individuals who lost their homes, got injured, and got missing (Kurosaki et.al. 2011). Essentially, one more flood in 2012 carried catastrophe to Pakistan (Germanwatch, 2014).

Pay, sanctuary, food, and security are in danger in Pakistan because of environmental change (Aftab& Hickey, 2010). Keeping in view the cruel realities, the Pakistani state needs to find genuine ways to handle the adverse impact of environmental change. Most likely, this issue has stood out among the authority specialists who likewise think of it as a delicate and significant issue (Rasul et al. 2011). Pakistan has made different strides, for example, detailing environment strategy and activity plans. In Pakistan, the principal environmental change strategy was upheld in 2012. The requirement of the National Climate Change Policy (NCCP) was without a doubt a critical turn of events. NCCP recommends in excess of 120 strategy

estimates covering various regions. In spite of contributing an exceptionally microscopic measure of ozone harming substance emanations Pakistan is among the most impacted nations by environmental change in the accompanying ways:

• It is normal that the liquefying of ice sheets in the Himalayas will increment in the approaching time which equally expands the pace of flooding in Pakistan.

• Accessibility of freshwater for life exercises is anticipated to diminish because of which life will be in danger and the populace will confront serious conditions. Environmental Change: Impacts on Pakistan and Proposed Solutions 226

• Networks at the line of the Arabian Sea in the south of Pakistan are at the most extreme gamble because of the expanded gamble of flooding because of environmental change.

• Pakistan's economy is exceptionally founded on agribusiness. Because of difficulties presented by environmental change the yield of the harvests is in danger which straightforwardly impacts the occupation of the populace and makes numerous other social issues like destitution, urbanization, and so on.

• It is extended that because of environmental issues illnesses like Cholera in the seaside areas of Pakistan are getting forced.

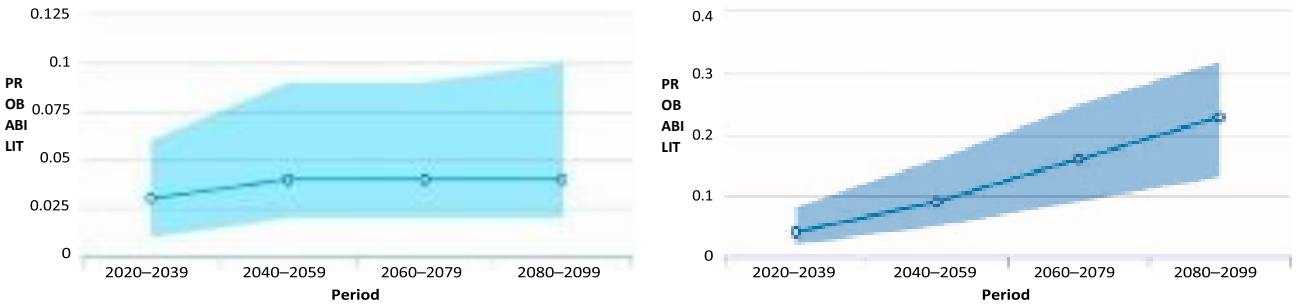
• Environmental change likewise upgrades social disparities in Pakistan because of consumption of assets and monetary wounds. Monetary imbalances, removal of individuals, and conflictive circumstances will additionally increment. (LEAD,n.d.)

As previously investigated, Pakistan has seen great human and financial misfortune due to the deadly floods in Pakistan. People had to move to safer homes to save their lives. Their homes were destroyed as a result of this terrible incident. From now on, we have entered another phase. Almost all nations have experienced the worst possible global warming. Pakistan has also seen freezing temperatures as the head of state directs the experts involved to provide a safe haven for the poor. First of all the existence of Pakistan, is the cover houses of the famine. Right now, we're in for another year. It is hoped that the international community, especially Pakistan, will take concrete steps on an important basis to address this issue. The way the global climate is improving; there is a strong possibility that it could have serious consequences in Pakistan such as extreme conditions such as floods, shortages, tropical storms, coastal aging, and declining agricultural development. As indicated by the 2017 Global Climate Risk Index, Pakistan is ranked seventh in the world with a US $ 3.8 billion (PPP) record of damage somewhere in the period 1996 and 2015, due to climate change (UNDP, 2018).

The devastating effects of Heat Waves:

Pakistan has the world's highest temperatures, with an average monthly temperature of 27 ° C and an average June temperature of 36 ° C. Nowadays average yearly temperature from anywhere in Pakistan is about 3%.33; the population has been exposed to danger, as evidenced by estimates that more than 65,000 people have been hospitalized due to the heat of 2015. Annual temperatures in several parts of Pakistan reach 38 degrees Celsius or more, where weather conditions combine to produce longer periods of heatwaves that could have devastating effects on human health. According to Nasim et al. (2018) 35, Pakistan endured 126 degrees Fahrenheit on average per year from 1997 to 2015, with a sharp rise. Extreme heat killed over 1,200 people in 2015, with Sindh province bearing a disproportionate share. Both Karachi and Lahore are identified by Matthews et al. (2017) 36 as cities at high risk of severe temperatures, where temperatures are now termed hot waves and are linked with a high risk of death becoming prevalent, even under low-emission pathways. Most projections of mid-year temperature rise in any location vary from 3% to 4% -23%, depending on the carbon emissions technique (Figure 10). 37 Nasim et al. (2018) 38 changes in rating.

FIGURE 10 . Projected change in the probability of observing a heat wave in Pakistan under RCP 2.5 (left) & RCP 8 5 (right) estimated by the full IPCC model ensemble in 10th, 50th, and 90th percentiles In this model a 'Heat Wave' is defined as a period of 3 or more days where the daily temperature is above the long-term moving 95th percentile of daily mean temperature [39]



Global Temperature:

Since industrial development, global temperatures have risen by 0.7 degrees- if we do not take immediate action, by 2100 temperatures could rise by 5 degrees. This increase in temperature will have a profound and devastating effect on the world around us, leading to extreme weather events and the widespread extinction of many animals and plants. Future temperature changes are depicted in three different ways. As in Table2 changes (or confusing) changes in daily and low daily temperatures within a given time period, as well as changes in moderate temperatures. Figures 7 and 8 are showing the average annual temperature for each month. Although similar, these three indicators may provide slightly different information. Medium

monthly and annual temperatures are widely used in the general measurement of climate change, but the maximum daily and minimum values can explain more about how daily life can change locally, affecting important variables such as environmental performance, health impacts, labor productivity, and crop yields, often influenced. differently due to overheating.

Pakistan's expected temperatures are substantially higher than the world average. Under the greatest gas emissions, the IPCC projects global warming of 3.7 degrees Celsius between 2081 and 2100. (RCP8.5).

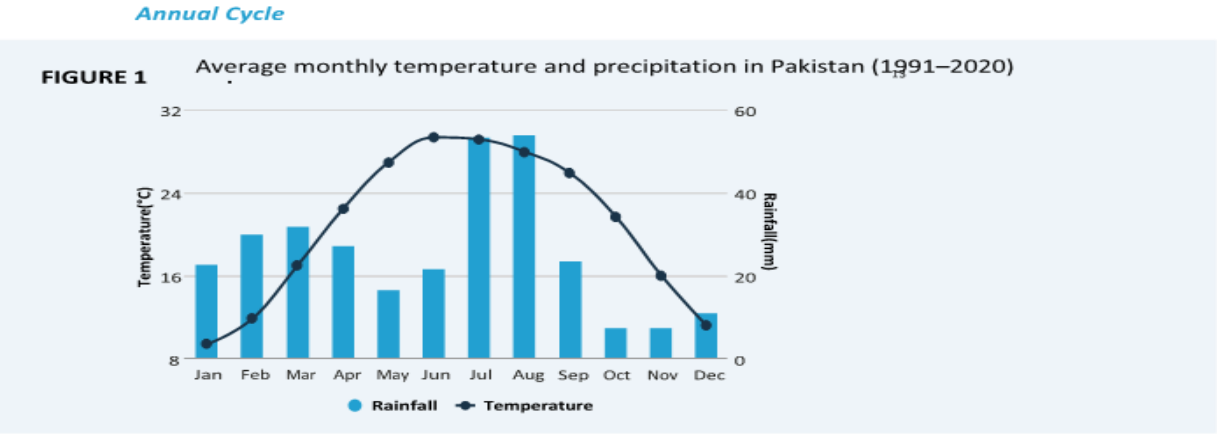


Figure 2.1 shows the Average monthly Precipitation & temperature from (1921_1990

Increase in Precipitation rate:

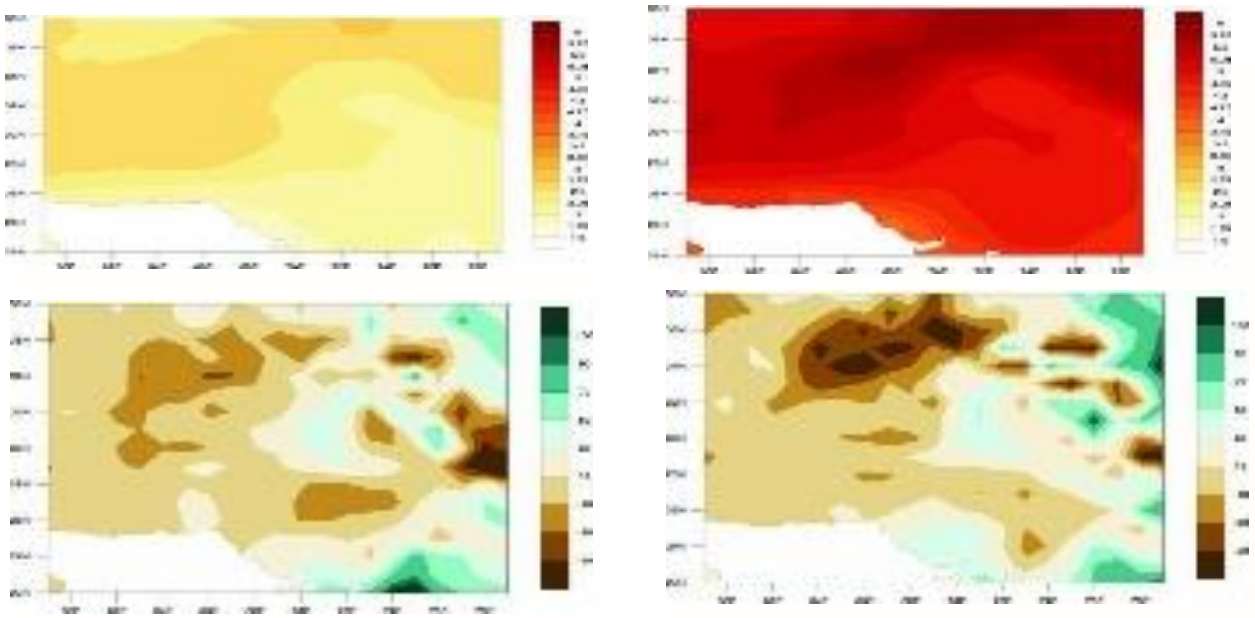
Precariousness regarding the upcoming Pakistan precipitation rate has been observed, despite the yearly advancements for the complete model. Although the examination of 16 models gives the results of increasing yearly precipitation under the greatest emission cycle. (RCP 8.5). Research like amin at e which specializes in RCP 6.0 elucidates a rise in yearly precipitation. This increase and changes in precipitation rate also put forward the threat of devastating floods and droughts. This was then again confirmed by the elevation of rainfall presented by Westra et al (2014),25. These changes may also affect different Pakistan's sub-regions while that of the Indus basin holds special vigilance. The upper and lower Indus basin will observe an increase and decrease in precipitation rate respectively as presented by Rajbhandari et al (2015)26 through downscaled modeling. Contradictorily, the conformity of these results still remains in question. Amin et al (2018)27 research highlights the south of Punjab along with precipitation changes with respect to seasons (RCPs 4.5,6.0 and 8.5), with a lower and higher rate from January to April and May to December respectively.

Spatial Variation:

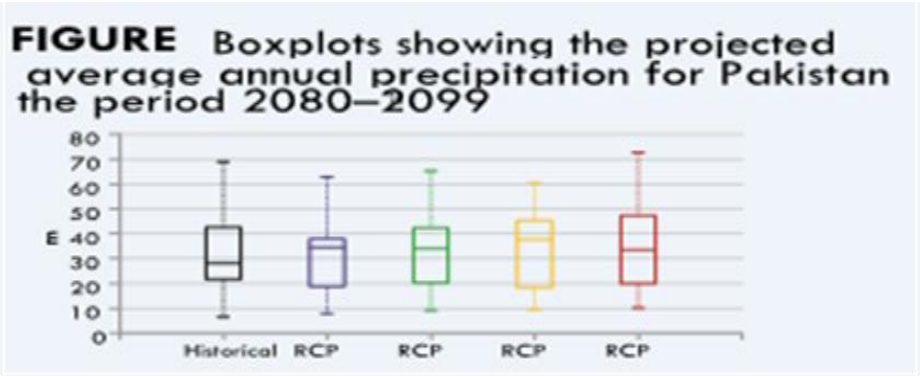
Southern Punjab will face an increase of 10% from September to November by the year 2050. In Pakistan, conflicting precipitation projection behavior persists (Latif et al 2018) 29, contributing to a weak and unstable future in sight of the South Asian rainfall. (2013) (Sperber et al.) 30. Furthermore, there is skepticism about El Nino's southern oscillation.

Spatial Variation

FIGURE 6 CMIP5 ensemble projected change (32 GCMs) in annual temperature (top) and precipitation (bottom) by 2040–2059 (left) and by 2080–2090 (right) relative to 1986–2005 baseline under RCP8



Maps present the coordinates of Pakistan: latitude 60°4815″E – 74°36′14″E and 32°50′42″N – 24°25′26″N.



Estimated Average Annual precipitation for Pakistan in 2080_2090

Impoverishment and Inequality:

Numerous expected climatic changes will unfairly target the weakest members of society. Heavy manual labor positions are widespread among the lowest-paid workers, and they're also the ones most prone to heat stress-related productivity reductions. 83 Poorer enterprises are less able to pay for air conditioning, which will become more important as the number of cooling days rises, and poverty-stricken farmers and communities are less able to finance public water storage, irrigation projects, and adaptation technologies. The expected temperature rises in Pakistan pose unique concerns in a country where agriculture remains the primary job. According to Ahmed and Gautam (2013)84, just 17.5 percent of destitute Pakistanis live in cities. Those who own small farms (20%), peasant farmers (10%), and agricultural workers (12%) are all likely to be among the most affected by the foregoing factors and are included in the rural grouping. The association of consumption habits with temperature is one lens through which we examine the impact of changes. Mani et al. (2018) discuss this link, focusing on how consumption (as a measure of living standards) declines if a certain temperature limit is exceeded. According to Mani et al. (2018), Pakistan's average temperature is already above the ideal range for maximum consumption (Figure 14), and that additional rise will lower the standard of living due to their influence on worker output (especially related to health concerns). Pakistan has encountered unique problems in combating malnutrition, with the absolute number of undernourished persons growing every year between 2006–2008 and 2014–2016. Approximately 20% of the population of Pakistan is malnourished, and climate change appears to be posing a threat to Pakistan's efforts to combat malnutrition, deprivation, and misery. According to Mani et al. (2018)85, all of Pakistan's provinces will face worst living standards as temperatures rise, with Sindh area suffering the most.

Desertification:

With increasing population growth, steps taken for human development are resulting in desertification. 80% of Pakistan's arid or semi-arid land now counters dangers of degradation or dryland expansion. Overuse of natural resources like water resources and over-cultivation along with greater use of chemical fertilizers all constitute the factors harming the land. Working on the National Action Program to End Desertification, as highlighted by MOCC/IUCN (2017) and has certain challenges. 56 If the temperature rises at its current rate, Huang et al (2016)57 warn that some sections of the world may be classified as driest land. A part of this phenomenon has already been seen in areas with increasing droughts. With dryland expansion and desertification increasing it is very much likely to witness other bad outcomes like dust storms and danger to biodiversity. Projects like "Clean Green Pakistan " among others are working to restore the condition to normal.

Impact on the Economy of Pakistan

The regression of world climatic conditions can greatly affect the agro-based nation's economy like that of Pakistan. Global reports have recognized Pakistan among the 12 countries which

possess danger because of extreme weather conditions. The varying temperature and precipitation can subsequently harm the irrigation, forests, and agriculture which at the end results in a damaged economy. Biodiversity may also see the consequences of this as livestock and crops may face different pests and diseases because of the ever-increasing moisture and thermal rate. The agricultural and natural payoff may depend on variation in agro-ecological areas. The dry west mountains may see the result of melting glaciers due to an increase in sudden temperature causing changes in water levels that play an important part the in growing of crops and energy generation (Pakistan social sciences review (PSSR) April June 2021 Volume 5, Issue 2 227. Currently, Unjust human activities and natural disasters lead to ecological devastation in west hills (Ullah ,2017). Agriculture holds significant importance in reference to a better economy, living, and food protection of a country. A large part of gross domestic product GDP comes from agricultural production in developing countries. Thus, economic development is dependent on agricultural development. The economic survey of Pakistan (2011-2012) states that about 21%of GDP is provided by agricultural sites and agricultural production is the main natural source of our country. The analysis also states that 45% of labor work in agricultural production and 18% of export makes our total economy. Since agriculture plays a major role in our country's economy controlling the problems that leads to its decline must be taken into account, keeping this in view temperature increase must be paid attention to along with precipitation (Siddique et al 2012). Agricultural production not only affects our economy but damages our industrial production as well, thus the three of them are in coherence and negligence can be fatal to our country. (Zafar 2015)

The climatic change also affects the food and energy production negatively, the quality of the final product after manufacturing is compromised. This sudden climatic change is becoming a cause of numerous natural disasters thus nearly finishing the production of natural food and energy Resources, naming the floods which have struck major destruction to Pakistan's infrastructure and agriculture many times. For instance, the flood of 2010 made us a loss of US $9.6billion and later the 5 floods that followed it cost us more than US$ 25 billion. These floods directly impacted general public infrastructure, education, health, water system. Industrially, the cotton industry constitutes the major portion of our economy which was affected greatly by these natural mishaps. To add to the existing problems our increase in population, urbanization and bad climatic changes has also stirred up our security issues. According to a prediction made by the United Nations, the population of the world will increase from 7.2 billion to 8.1 billion. This increasing population along with worsening climatic conditions is affecting our economy even further. Heat waves are also causing an increased usage of electricity which at the end results in higher prices. Taking a total bird's eye view, this shows that the usage is greater than the production. From the above argument it is safe to say that global change is linked to climatic change in one way or the other. At both smaller and national level socio economic problems demand a solution for a sustainable economy (Zahra ams Batool 2016). The climatic conditions will greatly influence the developing countries (Nordhaus ,1991; stern ,2006) because it would have an adverse effect on its agriculture, irrigation, ecosystems and overall health (Akram and Hamid ,2015). A large number of people in developing countries are affected by this inappropriate change in climate and in addition these countries don’t have the mechanism to

fight against these outcomes. Although these countries are not a large contributor of greenhouse gases like other developed countries are but still they have to bear its results (sathaye,2006) concluding that there lack of ability to solve these problems puts them in a position where they are more prone to difficulties (Parry at el 2007)

V-Climate Change Policy Objective Criteria (CCPOC) and Climate Change Policy Objective Sub-Criteria (CCPOSC) Policy in Pakistan

Criteria	Sub-Criteria	Description
Energy (CCPOC1)	Energy Production (CCPOSC11)	One of the major sources of anthropogenic CO2 emissions is energy production. Alleviation and modifications are necessary on a crucial basis for environmental stability.
	Transmission and Distribution (CCPOSC12)	Up-gradation and advancement of transmission lines and distribution systems could help in lessen line failures and enhance the productive use of energy that is produced.
	Fiscal Reforms in the Energy Sector (CCPOSC13)	Fiscal reforms in power divisions are surely required to grasp the circular deficit. Energy investment strategy requires to be directed on interest in green energy. A transition of energy mixture of non-renewable to renewable energy sources to guarantee environmental stability.

Transport (CCPOC2	Road Infrastructure (CCPOSC21	Road infrastructure is essential for the action of nation welfare. Besides, it furthermore incorporates the country, facilities financial activity, and labor mobility helps to generate employment opportunities, and deprivation relief. Transport infrastructure is the core of political and scientific discussion on stability due to its adverse effects both on the environment and quality of life. Enhancing the road infrastructure by assessing environmental and climate is vitally important.
	General Transport (CCPOSC22)	The number of transport vehicles has expanded dramatically in recent decades. This industry is one of the most energy-intensive and contributes to GHG emissions. It is one of the most important areas in which mitigation and adaptation are required**.**
	Railways (CCPOSC23)	The railway is one of the most important transport modes which plays important role in the country's economy, still, Pakistan is not able to provide endurable facilities. A complete transport plan is required to improve this mode of transport which can lead to a green transport system.

Urban & Town Planning (CCPOC3)	Population and Urbanization (CCPOSC31)	Pakistan with its rapid increase in population and urbanization requires proper planning, for relief measures should be adopted that will change the climate.
	Integrate Mass-Transit System (CCPOSC32)	Management of urban transport is one of the major issues due to its developed mass transit system which is impossible to reduce. In order to reduce the number of vehicles on the road and provide sustainable transportation options, large cities must develop integrated urban mass-transit systems. For the sake of the urban environment's stability, the urban transportation system must transition to renewable energy sources.
	Solid Waste Management (CCPOSC33)	Solid Waste Management (SWM) is a major issue in urban areas of Pakistan. its development policy should be considered in the climate change policy.
	Water Management (CCPOSC34)	Climate change is not being considered in urban water management. Groundwater pollution in urban areas has been exacerbated by rapid urbanization. Water management, such as the provision of clean drinking water and the disposal and recycling of drainage and wastewater, urgently requires consideration of climate change perspectives
Industry (CCPOC4)	Air pollution (CCPOSC41)	One of the major sources of anthropogenic GHG emissions is the industrial sector. Industrial and manufacturing plants need to move to renewable energy sources to mitigate these emissions.
	Water pollution (CCPOSC42)	One of the major sources of water pollution is industrial plants. To ensure water quality, water treatment plants must be built. Water pollution from industry must be taken into account as part of any climate change policy

	Land Pollution/Brownfield (CCPOSC43)	Brownfields and land pollution are a drastic issue in Pakistan but unfortunately has not captivated ample awareness from government and policymakers**.**
Agriculture (CCPOC5)	Crops (CCPOSC51)	In Pakistan, there is substantial use of fossil fuels, Fertilizers, and other chemicals in crop growth processes. If climate change and agricultural policy are integrated, environmentally friendly crop growing techniques and practices could be extremely productive.
	Irrigation System and practices (CCPOSC52)	In almost every region of the world, agriculture is one of the largest water-using industries. This is also true in Pakistan. Agriculture's irrigation systems and water use practices have been described as improper. Given Pakistan's agrarian economy, climate change policy should pay special attention to the irrigation management system and water use practices in the agriculture sector.
	Livestock (CCPOSC53)	Livestock is also a factor that contributes to climate change it has the potential to reduce GHG emissions. So, this sector also needs attention.
	Forestry (CCPOSC54)	Deforestation has its own environmental ramifications. Multiple activities like reduction of emissions from deforestation and forest degradation as a relief in the forestry sector.

VI-- Pakistan's policy goals (alternatives) for combating climate change:

The objective of Pakistan's climate change policy is to assure that mainstream climate change affects the country's economically and socially weak sectors of the country and leads the country toward a climate-resilient economy. The key goals are summarized in figure 1.

Figure showing Objectives of the climate change policy of Pakistan

VII- Climate Change Adaptation Strategies:

1- Climate change is a big issue in today's world. It is important to educate people about the risks in order to avoid them. People do not place enough emphasis on this. People should be informed about the hazards of not doing anything by utilizing the media tactics General public, farmers, Fisherfolks, youth, disabled people, school-going children, policymakers, opinion leaders, researchers, civil servants, and the business community are the targeted audiences. Communication methods through which information can spread are reading material, promotional materials, documents, talk shows, music, calls, messages, online advertisements, etc.

2-Effective relief policies should be implemented. A community should be created to provide quality information for this purpose.

3- One of the reasons for climate change is toxic emissions so the use of such vehicles should be stopped. Public transport should be preferable instead of private transportation. Hybrid vehicles should be used as they have less rate of emission.

4- Good governance is the heart of this issue all the solutions can be applied if government designs an implementable and competent Pakistan social science review (PSSR). Prioritizing should be used to adopt relief policies. They are followed by letters.

5- Dams' construction to store the additional water problem should be considered along with the enhancement of existing water storage facilities.

6-Fossil fuels should be avoided as they are a major source of climate change instead of the alternative energy sources like wind, bio, hydro and solar energy should be used. Renewable sources are the solution to this major issue.

7- Following Covid-19 lifestyle of people must be changed because sudden use of vehicles and economic activities can lead to new calamities in the shape of climate change. For this government should employ the use of renewable sources of energy to stabilize the economy affected by Covid-19. At the national and international level cooperative and reasonable approach is essential.

CONCLUSIONS

- Developing countries like Pakistan are highly affected by swinging climate change despite playing a very little part in the total aggregate of greenhouse gasses and other anthropogenic emissions as compared to the other developed & emerging countries; due to their geographical position.
- Pakistan is on the edge of the skeptical devastations of climate change because its economy is highly contingent on Agriculture and water levels as seen in future perspectives. The effects of climate change in Pakistan can be compensated by giving consent to the policies and recommendations unreservedly, raised above. In 2018 former Prime Minister of Pakistan Imran Khan launched five years campaign; in this scheme, substantial afforestation was planned and pursued by the KPK government in the war against rising temperature, floods, and other disastrous circs, and the government now aiming 10 billion trees. Such master plans should be executed at every level and all major national and international stakeholders should come forward & should be taken on board in this need of the hour; should increase funding for adaptation and coping programs and projects in affected areas to nullify the impacts on human health and curtail the spread of diseases and above-mentioned shortcomings in the regions which are highly affected by climatic changes.

References:

1-D. S. Matawal and Dafang John Maton Climate Change and Global Warming: Signs, Impact, and Solutions

2-Jennifer M. Kreslake,1, * Mona Sarfaty,1 and Edward W. Maibach1 Documenting the Human Health Impacts of Climate Change in Tropical and Subtropical Region. Center for Climate Change Communication, George Mason University, Fairfax, Virginia

3-A Brief Review on Global Warming and Climate Change: Consequences and Mitigation Strategies Aadil Gulzar1, Mohammad Aneesul Mehmood2 and Sartaj Ahmad Ganie3* and Irfana Showqi3.

1Department of Environmental Science, University of Kashmir, Hazratbal-Srinagar-190006. 2Department of Environmental Science, Sri Pratap College, Cluster University Srinagar, Jammu and Kashmir, India 3Division of Environmental Science, Sher-e-

Kashmir University of Agricultural Science and Technology, Shalimar Campus, Sinagar-190025

4-Climate Change: Impacts on Pakistan and Proposed Solutions Fakhara Shahid 1 Dr. Mubeen Adnan* 2 1. Ph. D. Scholar, Department of Political Science, University of the Punjab, Lahore, Punjab, Pakistan 2. Associate Professor, Department of Political Science, University of the Punjab, Lahore, Punjab, Pakistan

5-Assessing and Prioritizing the Climate Change Policy Objectives for Sustainable Development in Pakistan Waqas Ahmed 1,2, Qingmei Tan 1 , Ghulam Muhammad Shaikh 3 , Hamid Waqas 2 , Nadeem Ahmed Kanasro 4 , Sharafat Ali 1,5,6,7 and Yasir Ahmed Solangi 8,

6-Global Climate Change Olufemi Adedeji, Okocha Reuben, Olufemi Olatoye University of Ibadan, Ibadan, Nigeria Email: oluadedeji2001@yahoo.com

7-Climate Risk Country Profile: Pakistan (2021): The World Bank Group and Asian Development Bank.

8-Climate change and resource sustainability: An overview for actuaries.