

## **POLICY RECOMMENDATIONS FOR THE IMPACT OF CPEC ON CLIMATE CHANGE; A CASE STUDY OF GILGIT BALTISTAN**

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### **ABSTRACT**

Gilgit Baltistan, which is an economically diffident region in Pakistan, will benefit one way or the other through the 'game-changer' project CPEC. The remote mountainous region, whose 'game' changed (to some extent) just because of a highway known as Karakoram Highway (KKH) in the early 1970s, has a lot of opportunities to avail in the wake of the China Pakistan Economic Corridor (CPEC). However, because of its geographical terrain and location, its ecosystem and the environmental condition seems vulnerable in the case of advanced energy projects, road infrastructure and over-loaded population. Energy projects such as coal power plants produces huge amount of CO<sub>2</sub>, improved road infrastructure is equivalent to an increased number of vehicles, and overpopulation leads to the consumption of more natural resources, all of them have direct linkages with environmental degradations. Being 'the largest reservoir of glaciers outside the poles,' Gilgit Baltistan is already prone to the menace of global warming. As researchers have already estimated, 'The Mountain glaciers of Asia would lose at least a third of their masses due to global warming by the end of this century.' The increasing glacial melting is not only precarious for the ecosystem or biodiversity of the region but the economic and social life of the whole country, with dire consequences for freshwater and natural disasters. Contrarily to put additional strict actions on environmental factors in the execution of advance projects, Environmental Impact Assessment (EIA) has been sidelined in the construction of the CPEC project. Various policy options recommended by this paper will explore the methods to mitigate the calculated environmental hazards and climate change. CPEC will provide more social and economic opportunities for both Pakistan and China if planned to meet the ecological needs.

**KEYWORDS:** CPEC, Global warming, Climate Change, Gilgit Baltistan (GB)

### **INTRODUCTION**

Despite bringing a lot of opportunities, the China Pakistan Economic Corridor (CPEC) has various implications on the climate of the diffident region Gilgit Baltistan (GB), which possesses a unique ecosystem, geographic location, and mountainous terrain. GB is located between the Pamir Plateau and the Tibet Plateau, in the northern part of Pakistan, stretching from longitude 72-75 in the

## Policy Recommendations for The Impact of Cpec on Climate Change; A Case Study of Gilgit Baltistan.

North and 35-37 latitude in the East. Geographically, it has borders with three countries China in the North, Afghanistan in South West, and Tajikistan is separated by the narrow Wakhan corridor in the West. The total area of GB is 72496 sq. km, 27 % of which includes glaciers (GilgitBaltistanGovernment n.d.).

GB has blend of natural resources in the form of mountains, glaciers, rivers, lakes, forests, etc., that set up GB into rugged geography and scenic beauty. For its mountains and high peaks, GB is famous all over the world, as the three mighty mountain ranges Himalaya, Karakorum, and Hindu Kush meet at Juglot, which is situated in GB. Out of fourteen 'Eight Thousander peaks', five are situated in GB, including K2 or Chogori, which is the second-highest in the world ranking. Along with Nanga Parbat and Gasherbrum, the second and third highest peaks of Pakistan, respectively, there are more than 101 other peaks, which are above 7000 m (Miller, Immerzeel et al. 2012). As Miller, Immerzeel, and Rees (2012) rightly pointed out in their article that "mountains are often referred to as the 'water towers' of the world and many such high-altitude areas store much of this water as snow or ice," GB is thought to be the most massive water tank on the land and is also the largest reservoir of glaciers outside the poles. The largest glacial range stretches from Hisper to Siachen 116.87 km. It is estimated that there are more than 7000 glaciers (Aljazeera 2020), which are the main source of water for the local rivers (Ali, 2016).

The majority population of GB is stretched on both sides of various rivers that are Indus River (Sengay Chu), Shigar River, Shyok River, Kharmang River, Hunza River, and Gilgit River. But unfortunately, there is no direct benefit to the local peoples from these rivers. The combination of these rivers makes the main hydro-regime of the down-land areas of Pakistan, which is used for both agriculture and drinking purpose. For several years, these rivers are also responsible for heavy floods, which are direct threats to the livelihood, agriculture, and livestock of the down country.

GB consists of mostly rural areas with a population density of about 28.8 persons per sq. km. The two main cities are Gilgit and Skardu, while with the passage of time, other districts like Hunza, Ghanche, and Diamer are also urbanizing gradually. Rapid and unplanned

constructions are at peak in the region these days (Hassan, Ali, & Ahmed, 2017).

As compared to the other provinces of Pakistan, GB has slightly poor infrastructure. The only road that links GB with other parts of the country is Karakoram Highway (KKH), build in 1969. It is considered as the economic backbone of GB and has proved as the game-changer infrastructure in the history of the region, which brought changes in the living standard of the locals. Before the 1970s, the inhabitants were almost living in the stone-age; there was no concept of modern education, no facilities of health, and other social amenities (Afridi 1988). This road has connected GB to the rest of the country and the world. Other than the constitutional and political rights, currently, the people of GB are enjoying almost all types of facilities, such as other provinces of Pakistan. In various fields, particularly in education, the region is leading the country despite low standard infrastructure. Similarly, in all other aspects of life, GB is better than what was before the 1970s. The locals attribute all the credit to the KKH as it changed their fate. This is the reason the people of GB are optimistic regarding the CPEC project because this project will multiply tens of times to its capacity.

The CPEC, which will be completed in three phases, is a comprehensive development program under the Belt and Road Initiative (BRI) to link the deep-sea Gwadar Port to China's northwestern region of Xinjiang via highways, railways, oil and gas pipelines, and optical fibers. The route which will build from Kashgar to Gwadar will enter Pakistan through the Khunjrab Pass. It is expected to have a future possible regional connectivity with Afghanistan, Central Asian Republics, Russia, Iran, and India (hesitantly) in the long-term phase of the project. It will also take on the revival and extension of the KKH that links Xinjiang with GB on the one hand and links GB with Khyber Pakhtunkhwa (KP) on the other hand. Besides these infrastructures, the project also envisages establishing joint ventures in the agriculture sector, industrial sector, many power projects, and economic zones along the corridor. In the long term phase, Havelian-Kashgar new railway line is also likely to be completed passing this region (Planning Commission of Pakistan, 2017).

## Policy Recommendations for The Impact of Cpec on Climate Change; A Case Study of Gilgit Baltistan.

Everyone in Pakistan is talking about the benefits and opportunities from the CPEC even calls it a game-changer for Pakistan, but very few have tried to analyze the CPEC's environmental and climate impacts on Pakistan. Several articles were published on the climate and environmental impacts of CPEC in newspapers and journals but only a rhetorical discussion, and nobody has given practical or definite solutions even at the World Economic Forum 2017, China encouraged countries to follow the Paris Agreement but there is no commitment to follow this in the long-term plan document of CPEC (Alam 2020).

The long term climates risk index 2020 ranks Pakistan at number five among top ten climate change vulnerable countries (CRI) in the twenty years period 1999-2018 (Eckstein, Künzel et al. 2019) and after the construction of CPEC, its rank would get worse. Additionally, the country is experiencing serious challenges of climate change like disease, heat waves, floods, droughts, and increase in poverty and malnutrition (Nabi, Ali et al. 2019).

The climate issue is severe that worldwide biodiversity loss is increasing at an unstoppable speed and the Mountainous areas of Hindu Kush, Himalaya and Karakoram are more delicate to high temperature (Ahmad 2019) (Khan, Gul et al. 2015) due to which the glaciers have been shrinking for the past 30 years, Pakistani meteorological reports in 2017.

Due to the nature of GB's terrains and geographical location, its ecosystem, and environmental condition seem vulnerable in order to advanced road infrastructure, industries, economic zones, railway lines, power projects, and higher volume of flow of trade and business under CPEC projects.

The main objective of the paper is to find out the possible policy recommendations and efficient safety measures to tackle the threat to the environment and ecosystem and the consequences from the construction of CPEC.

### **Map of Gilgit-Baltistan (GB)**

Map of Pakistan



Map of Gilgit Baltistan Pakistan



Figure 1: Political map of Pakistan and Gilgit Baltistan

(source: [http://www.surveyofpakistan.gov.pk/SiteImage/Misc/files/political\\_map\\_pakistan](http://www.surveyofpakistan.gov.pk/SiteImage/Misc/files/political_map_pakistan))

## 1.2 CPEC and GB

The estimated resource roads in the CPEC project roadway network is 2442 km, the CPEC project will be used for people and freight transportation, industrial and agricultural growth, energy and mineral growth, and commercial and public reformation. The benefits of the CPEC are more social and economic rather than environmental. Especially in the case of GB, the advanced infrastructure has a lot of implications on the environment. These

## Policy Recommendations for The Impact of Cpec on Climate Change; A Case Study of Gilgit Baltistan.

effects may occur during the CPEC roadway construction and also has long term implications on the ecosystem of the region.

According to the website of the Planning Commission of Pakistan, an area of about 250 acres is allotted near Moqpondas that is at a distance of 35 km from Gilgit city and 160 km from Skardu city, for a Special Economic Zone (SEZ). This project will provide benefit for the regions which comes only in its way, like Hunza, Nagar, Gilgit, and Diamer districts. But the other parts, particularly Ghizer and Baltistan region, are already in a sense of deprivation because of the lack of direct benefits for these regions as the only economic zone is too far from them. Districts like Skardu, Shigar, and Ghanche are the home of glaciers, which are vulnerable because of the industrial advancement in other parts of the region (Hassan, Ali, & Ahmed, 2017). And the reconstruction and up-gradation of 887 km long KKH is underway under the CPEC project which would also impact on the climate change in the GB region.

Industrial development is also expected in order to complete the project. According to the Planning Commission of Pakistan, the following industries are enlisted, 'marble/granite industries, iron ore processing, fruit processing, steel industry, mineral processing unit and leather industries (Planning Commission of Pakistan, 2017). Installation of industries that tire out more temperature, as the steel industry and iron ore processing units in the valley of glaciers, is pointless.

### Routes of CPEC in Gilgit Baltistan

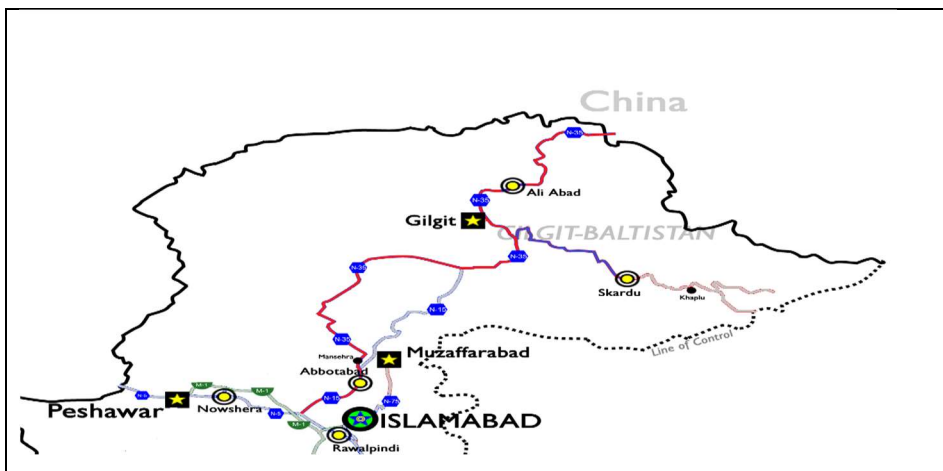


Figure 2: Highlighted in red is the route of National Highway 35, which is to be completely rebuilt and upgraded under the CPEC agreement. Highlighted in blue is the 175-kilometer road between Gilgit and Skardu which is to be upgraded to a 4-lane highway.

(Source:[https://en.wikipedia.org/wiki/China%E2%80%93Pakistan\\_Economic\\_Corridor](https://en.wikipedia.org/wiki/China%E2%80%93Pakistan_Economic_Corridor))

## RESULTS AND DISCUSSIONS

### Trend of Climate Change in GB

Mountainous environments are generally considered sensitive indicators of climate change. According to research the rates of warming in the Hindu Kush, Himalayan, and Karakoram areas are significantly higher than the global average of  $0.74^{\circ}\text{C}$  over the last 100 years. Rising temperatures are expected to have a greater impact on the Himalayan and Hindu Kush region than elsewhere in the world (Kulkarni et al., 2013). The warming average of the Himalayan and Tibetan plateau is three times the global average (Ahmad 2019). Chaudhry et al. (2009) indicated that Pakistan experienced a  $0.76^{\circ}\text{C}$  rise in temperature during the last 40 years. However, during the same time period the increase in temperature in the mountain atmosphere home of thousands of glaciers was recorded as  $1.5^{\circ}\text{C}$ . As a whole, the average temperature all over Pakistan will increase in the range  $1.3^{\circ}\text{C}$  -  $1.5^{\circ}\text{C}$  by 2020s,  $2.5^{\circ}\text{C}$ - $2.8^{\circ}\text{C}$  by 2050s, and  $3.9^{\circ}\text{C}$  -  $4.4^{\circ}\text{C}$  by 2080s, according to the study of Global Circulation Models (GCMs.).

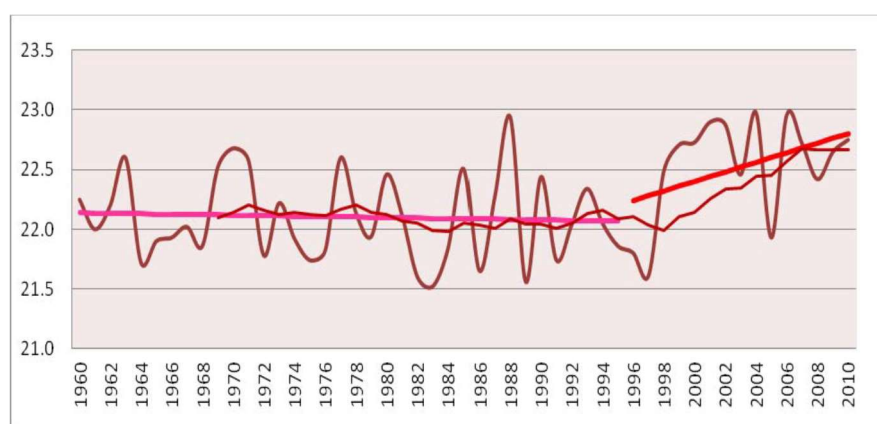


Figure 1: In the graph the meteorological observatories showing the temperature record (1500-2900 masl) in the Mountains of GB Pakistan from 1961 to 2010.

(Source: PMD)

## Policy Recommendations for The Impact of Cpec on Climate Change; A Case Study of Gilgit Baltistan.

The mountains in GB Pakistan are warming double as compared to the lower areas (Rasul, Chaudhry et al. 2011). Such observations show worrying signals of the formation of glacial lakes, their expansion, and outburst flooding. Figure 1 shows that the temperature has risen in no time during last decade.

As global warming and climate change is occurring in GB, the climate stations in Gilgit, Skardu, Gupis and Bunji indicate rise in the maximum temperature and mean temperature in the last two decades from 1980 to 2006, both temperatures rose by  $0.440^{\circ}\text{C}$  and  $0.19^{\circ}\text{C}$  per decades respectively (Steinbauer and Zeidler 2008).

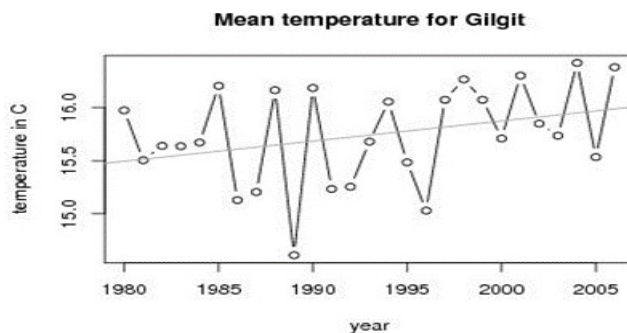


Figure 2: Mean temperature from 1980 to 2006 in Gilgit rise by  $0.19^{\circ}\text{C}$  in every ten years has been measured ( $p < 0.10$ ). (Steinbauer and Zeidler 2008)

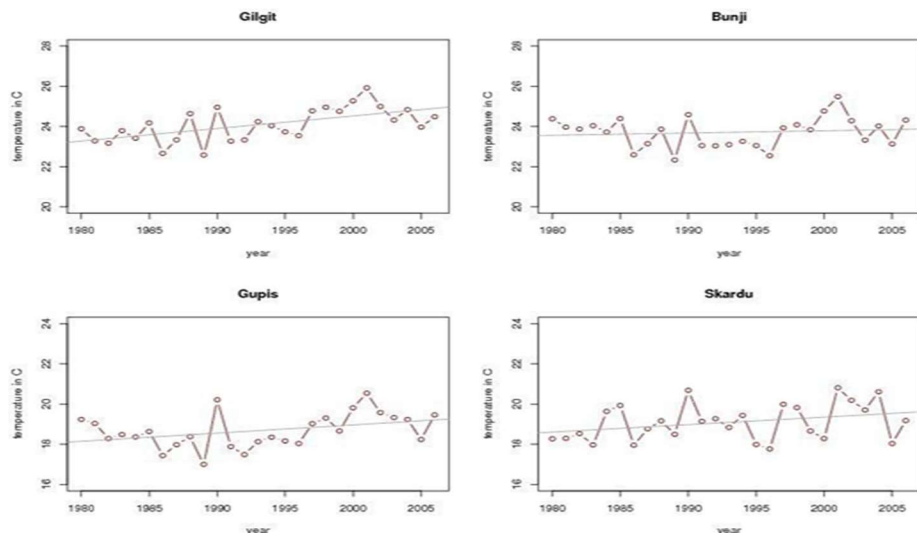


Figure 3: Maximum temperature from 1980 to 2006 was measured in increasing trend. Significant ( $p < 0.10$ ) was a warming by  $0.63^{\circ}\text{C}$  and  $0.41^{\circ}\text{C decade}^{-1}$  for Gilgit and Gupis, respectively, and  $0.37^{\circ}\text{C decade}^{-1}$  for Skardu. (Steinbauer and Zeidler 2008)



Climate change has put almost all the natural ecosystems in danger in GB. GB is gifted with bunch of natural resources, such as natural forest, glaciers, fertile soil, wildlife, and fresh water. The climate change has put adverse effects on these natural resources particular to biodiversity in GB (Ishaq, Khan et al. 2015).

These issues are expected to get worse because of CPEC projects such as construction of dams, hydro power projects and industries in the GB region.

### **Deforestation and Fuel Consumptions**

Only four percent which is equal to about 6592 sq. km of the total area of GB, consists of forests, which host a variety of wild animals, birds, and trees. Ali (2016) documented that these valleys and forests are host to 54 species of mammals, 230 species of birds, 20 species of freshwater fish, 23 species of reptiles, and six species of amphibians. Both the forest and flora and fauna living there are endangered because of its falling as it is the only source of fuel consumption in the region. Moreover, the timber mafias are also cutting down the trees, selling them to the locals to use as firewood, and transporting the wood to other parts of the country. By giving legality to fell old and mature trees to the Diamer district in 1979, 'the government either acted as a bystander or a willing participant in GB's deforestation.' In the other nine districts, the government owns forestland, but the local populace can also legally cut the trees that have been damaged by getting the license issued in order to the federal government's 'timber disposal policy.' The mafias use legal licenses to do illegal acts as 'no penalties were imposed nor was any royalty received' yet (Hassan, Ali, & Ahmed, 2017).

Because of the tough climate conditions in winters, when the temperature falls to minus twenty Celsius, the only source of energy is firewood. In such harsh conditions, the local inhabitants even induces to cut down their young plants and fruit trees too. Every year more than 170000 trees are being cut down to fulfil the need for fuel (ANI 2020).

As deforestation and forest degradation contribute to global warming, climate change and environmental change. Sign of these

## Policy Recommendations for The Impact of Cpec on Climate Change; A Case Study of Gilgit Baltistan.

changes is already appearing in the form of landslides, floods, avalanches, and land erosions, etc. (Ahmed & Ali, 2017)

Huge developments and industrialization without taking consideration of this sector might be dangerous both in terms of the whole ecosystem and for the species living there.

### **Glacier Hydrology of GB**

Glaciers are the most susceptible indicators of global warming, which shows their immediate response by melting and shrinking. The readings of the automatic weather stations, which were launched on the Baltaro Glacier by the Ministry of Climate, to measure the intensity of sunlight, rain, and air pressure clearly indicate that the average temperature is increasing rapidly. This can also examine by the small lakes appearing on the glaciers and the rising amount of water flowing from the Glaciers. According to the representatives of the Ministry of Climate, the snow line is gradually moving upward. The satellite images show that in the areas of Biafo Glacier, the ice line retreated about 4.3 km since 1977 (BBC Documentary on Youtube)

The mountain glacier-melting rate, according to the United Nations Environment Programme (UNEP) and the World Glacier Monitoring System, has doubled since 2000 (Anwar, 2012). According to UN Development Program-Pakistan (UNDP), as of 2018 there are about 3000 glacial lakes formed due to glacier melt waters, and 33 of them were declared potentially dangerous for Glacial Lake Outburst Flood putting more than 7 million people in danger downward in the valleys. Due to the downward steep slope, the floods and avalanches carry tons of mud, debris including heavy rocks gain momentum and causes heavy losses to people, lands, valleys and villages, and other infrastructures (Rasul, Chaudhry et al. 2011).

According to the Director-General of Metrological Department Ghulam Rasul, on the way towards the Khunjarab pass alone, there are various glaciers around the KKH, including Batura glacier and other glaciers that emerge from the Passu Mountain. Because of these glaciers' melting, a large lake has formed next to the KKH in recent years. He argued most of the black carbons are coming to the Northern areas of Pakistan from the coal power plants and steel industries of India through blowing wind. These contaminants and

wastes settle onto the glaciers, blackening them and decreasing their ability to reflect the sunlight away which speed up the melting process of the glaciers. The author of National Climate Change Policy recommended that a comprehensive study on the impacts of CPEC is needed to develop a strategy as on the one hand, the CPEC will bring much-needed infrastructure, but on the other hand, the carbon emissions will definitely increase, which will melt the mountain glaciers (Reuters, 2017).

### **River Discharge in Gilgit Baltistan**

The main water resource of the Gilgit Baltistan region is the Indus River, which is attributed to the Shigar River, Shoyke River, Olding River, Astore River, Hunza River, and Gilgit River, which flow from mighty mountains. Snow and glacier melt is considered the primary source of the Indus River's hydrological regime, which flows from Mount Kailash in Western Tibet (Mukhopadhyay and Dutta 2010). According to research, about 34% of total stream flow in this area is contributed by snowmelt and 26% from glacier melt. The river is hugely sensitive to temperature changes. Another research says that snow and glacial melt contributes approximately 85 percent to the annual flow of the River Indus. There are more than 5000 glaciers feeding the Indus from 10 sub-basins through different tributaries (Rasul, Chaudhry et al. 2011).

Rising temperatures and changing precipitation patterns across this region have implications on the water resource availability and food security for the downstream population in the form of natural disasters. Increased glacier melt will provide short-term increases in the water of the Indus River, but is likely to lead to decreases in the future, as potential ice stores will shrink (Dyer, 2010).

At the time of partition, per capita availability of water to the Pakistani population was 5300 m<sup>3</sup>, and it is recorded only 1000m<sup>3</sup> in 2010, and it is predicted that by 2036 it will be only 250 m<sup>3</sup> per person per year, 'one-quarter of the United Nations' Critical Level.' Dyer (2010) further narrates that the glacier melting may cause water shortages both for agricultural purposes and for drinking purposes, as it is the main source of potable and irrigation in Pakistan. Likewise, the Tibet plateau, the Hindu Kush, and the

## Policy Recommendations for The Impact of Cpec on Climate Change; A Case Study of Gilgit Baltistan.

Himalayas are the main sources of freshwater in China and India as well.

### **Industrialization and Climate Change**

As mentioned earlier, the CPEC will bring industrializations in GB, both in the form of special economic zones (SEZs) and in private sectors. Here we will generally mention the connection of industrial growth with environmental hazards only.

The most significant trigger to the carbon level of the global climate was the 'industrial revolution' of the nineteenth century that increased about 100 parts per million to the climate system. This trigger increased to three-quarters of the manmade carbon dioxide because of the extraction and the use of fossil fuels (Anwar, Talking Sense: Climate Change, 2014). In the wake of industrialization, the main contributions to climate change are energy use, transportation, land-use changes, and emissions from industrial activities.

Certainly, there is a strong connection between industrialization and climate change as the global greenhouse gas emissions by industrial sector is 24.2% (Ritchie 2020). The main cause of the emissions is due to the burning of fossil fuels in industries for energy.

The developed or industrialized countries are more responsible for global emissions as 20% world developed population contributes 47% of global greenhouse gas emissions while 80% population of the developing world contributes 53% of global greenhouse gas emissions ( United Nations Population Fund (UNFPA) and International Institute for Environment and Development (IIED), 2009). China is emitting 30% and India 7% of the global total of carbon dioxide (EPA 2020). Being situated in the center of these countries, GB is already badly affected by greenhouse gases.

Unlike other parts of the country, GB lacks chimneys of industries, factories, and mills; this is the reason the region is known for its organic productions and clean weather. However, with the advancement of the road infrastructure and installments of the economic zones under CPEC project, the region will face industrial transformation.

### **Urbanization, Demographic Change, and Climate Change**

The tendency of migration towards cities is a global issue. As of 2008, more than 50% world's urban population occupied only 2.8% area of the earth surface. The urban population of Asia has already surpassed 50% (United Nations Organization, 2019). In the case of Pakistan, it is estimated that 45.6% of its population will live in cities by 2030 (Planning Commission of Pakistan, 2011). Urbanization and demographic changes are being anticipated after the completion of this mega project in GB. In the case of urbanization and advancement in investment opportunities under CPEC project, GB might experience a fundamental demographic restructuring that will exploit the rights of the locals on the one hand and affect its climate on the other hand.

GB is a very attractive region, that is why tourists in more number than its total population visits to this region every year. Other sectors vis a vis tourism sector will be enhanced, and investors and workforce from other provinces like Punjab and KP will be moved to GB to take over businesses and administrative jobs. As in Murree and Galyat region where mostly high profile elites had invested in the local tourism industry in the form of resorts, hotels, farmhouses, transportations, etc. (Ali & Ahmed, Personal Interview, 2017).

There are also chances of future inflow of Chinese towards GB as they are already facing the increasing population issues. China has the world's largest population, with 1.379 billion inhabitants, accounting for twenty percent of the world total. Yet, the Chinese government has already started a birth control policy, called 'Du Sheng Zi Nu,' to limit couples to having one child, but still, China's population is expected to increase eighty percent of the total population by 2050' (China and a sustainable future: towards a low carbon economy and society", China Human Development Report, 2009/10)

GB peoples are not that economically empowered to participate in these upcoming investment activities and compete with external investors. There are various dimensions behind their economic backwardness like political deprivation and geographical detachment etc. Hence, the influx of foreign investors and tourists

will disturb its demography, which has direct and indirect implications on the ecosystem of the region.

### **Mounting Vehicles and its Environmental Implications**

The transport industry releases several million tons of gases each year into the atmosphere as it contributes 16.2% of the global greenhouse gas emissions (Ritchie 2020) while, in the case of Pakistan, the CO<sub>2</sub> emissions was 16% in 2014 (Rasool, Zaidi et al. 2019). This sector has shown the highest emission growth rate of all sectors and accounts for about a quarter of carbon dioxide emissions (Pakistan Climate Change Policy, 2012) and the emissions from transportation in Pakistan has grown quickly from 2007 and this sector is refrained to reduce the emissions as well (Raza and Lin 2020).

Particularly the road transportation is the major contributor to environmental deterioration as it creates direct and harmful effects in the form of noise and emissions of carbon oxide, carbon monoxide, nitrous oxide, sulfur dioxide, methane, and other particulates. All these are the primary elements of greenhouse gases (GHGs) that affect the Ozone layer, atmosphere, and air quality, causing acid rain, smog, and other climate changes. Rodrigue (2010) writes that depletion in the Ozone layer will bring harmful radiations from the sun, which is dangerous for the glaciers too. Next, acid rain is the mixture of sulfur dioxide, nitrogen oxides, and cloud water, which has detrimental effects on the built environment, reduces agricultural crop yields, and causes forest decline. Likewise, smog is a mixture of solid and liquid fog and smoke particles formed through the accumulation of carbon monoxide, ozone, hydrocarbons, volatile organic compounds, nitrogen oxides, sulfur oxide, water, particulates, and other chemical pollutants. The smoke usually came from burning coal.

As transportation has great impact on the atmospheric temperature and air temperature changes are the reason for avalanches and icefalls, and indirectly influence rock falls and landslides because of the formation and opening of fractures and hydrological cycle changes (ClimateChangePost 2018).

GB is already facing environmental and climate hazards. One of the best examples is the formation of 7 miles long Ata Abad Lake by

blocking Hunza River after a huge land sliding on January 4, 2010, destroying 26 homes and killing 20 people. The land sliding submerged the whole village and 5 km of KKH and blocked the highway for several days due to the blockade and rock falling following the landslide (Scott 2010).

The threat of climate change and global warming in the region will increase as 7000 vehicles are expected to travel through KKH every day that will release up to 36.5 million tons of CO<sub>2</sub> (Kouser and Subhan 2020). The rise of temperature due to the mounting vehicles on the KKH would increase the formation of lakes, avalanches and land sliding along the CPEC route, and even it can disturb the movement of transportation between China and Pakistan by blocking and destroying the CPEC in the area of KKH again and again.

### **POLICY RECOMMENDATIONS**

So far, GB is fortunate enough to be the 'diffident region' in terms of road infrastructure, which has saved this region from the worst consequences. It has only one highway, KKH, which brings the rest of the world to GB. Widening this road following the CPEC will bring more vehicles to the region.

As of today, both Pakistan and China are ready to cooperate with the world in order to address the climatic changes under the United Nations Framework Convention on Climate Change, so it is suggested to the governments to sign MOUs under the CPEC to secure the environment of the region as during an announcement to the UN general assembly on September 22, 2020, Xi Jinping has vowed to reach carbon neutrality by 2060. Beijing has already stated its goal of exporting tree planting systems to other countries, through the Belt and Road initiative as reported by the China Green Foundation, "Green Economic Belts" will be established by 2030, linking China with Western and Central Asian states, with the addition of Turkey, Pakistan, Kazakhstan, and Iran (Ma Jingna 2018). It is the immediate need to give special attention to the exiting climate affecting drivers and other related risks. To triumph over the climate change risks, we need to adapt the logic of early prevention is better than later intervention. To counter the danger of environmental degradation due to advanced infrastructure, mounting vehicles, growing urbanization, and increasing the influx of

## Policy Recommendations for The Impact of Cpec on Climate Change; A Case Study of Gilgit Baltistan.

visitors and investors in GB, various practical policy options are recommended.

- a. Firstly, the policy measures included in the Government of Pakistan's 'National Climate Change Policy' and GB's Environmental Assessment Cell (EAC) should be properly implemented, and additionally, a policy guideline on glacial melting of the mountainous region (GB) should be involved and given special attention.
- b. Promote research on socioeconomic impacts of climate change, particularly in the area of agriculture, water quality, glacial melting, deforestations, adaptation, and mitigations. Extensions and research are the only methods to create a bigger picture and understanding of climate change and its consequences among deprived and underprivileged communities. Very few research works have been done on climate change and other such issues in GB; being the gateway of CPEC, there should be different research institutes and think tanks.
- c. It is required to promote renewable and clean energy. Developing hydroelectric, wind, biomass, and solar power stations are more eco-friendly as well as economically. The hydropower generation potential in GB is more than 40,000 MW and has also been fairly experienced with respect to hydropower generation, but the present demand is approx. 551 MW. Miraculous panacea for this purpose is the construction of large dams like the Diamer-Bhasha (4500 MW), Bunji (7100 MW), Tungus (2200 MW), and Yulbo (2800 MW) on the Indus (Gilgit Baltistan Government).
- d. Planting more trees is the cheapest, most reliable, and natural way to tackle environmental hazards like avalanches and land sliding. In these efforts, volunteers from civil society and non-governmental organizations should also participate along with the government. Targeted campaigns to plant trees should be completed on both provincial and federal levels like the KP Government has planted more than billion trees in the previous years under the 10 Billion Tree Tsunami project (Ebrahim, 2019) but the project is only providing saplings and seeds for forestation; however, GB needs special funds for land allocations and to construct water



channels otherwise, it seems impossible to grow trees and plants as GB has dry and rocky terrains and landscapes. Low cultivated land and massive areas of barren land on both sides of the rivers and on elevated areas can be converted into farmlands or forests by utilizing the huge river water resources, by installing tube wells, and by spreading pipelines.

- e. In addition, by encouraging the development of technological innovations for improved water efficiency for crops, including artificial groundwater recharge, etc. All the barren lands of GB can be converted into green jungles. In addition, it is required to do researches in sustainable harvesting of indigenous dry land tree species and low delta crops. Growing shrubs on mountain slopes will be helpful in extreme soil erosion, wind, hailstorm, and snowstorm related damage.
- f. To build up a good social atmosphere to address climate change, public awareness and attentiveness are necessary. Students and volunteers can be encouraged to launch a network inside the country and its institutions. Publish a monthly bulletin, distribute pamphlets, or spread social media messages to raise awareness in society regarding climate change. Media can also play a role in this regard. Climate change should also be introduced as a subject in the basic and higher levels of education in the country. Moreover every year, a specific day should be observed as the national tree-planting day in the country to enhance awareness about the great importance of trees to the ecosystem.
- g. For both small and heavy vehicles, it is recommended to develop renewable energy technologies, introduce novel means of energy conservation, and promote carbon-sink techniques and other adaptive technologies such as CDM projects and mass transit systems. Secondly relying on public buses and establishing local train or metro projects is the best alternative to increasing personal cars. It is adding, encouraging non-motorized modes of travel, such as bicycles, and developing inland waterways transportation where possible. Thirdly the employment of electric vehicles in the region is a possible remedy to decrease CO<sub>2</sub> emissions.

Policy Recommendations for The Impact of Cpec on Climate Change; A Case Study of Gilgit Baltistan.

- h. Greenhouse gas emissions particularly CO<sub>2</sub> can be reduced by following some measures like upgrading the vehicle's aerodynamic property; converting to alternative fuels e.g., biodiesel; developing road infrastructure; revising maximum weights and dimension of heavy-duty vehicles under European Molecular System (EMS), and platooning of trucks (linking of two or three self-driving trucks in convoy). Though, EMS has great capacity to reduce CO<sub>2</sub> emissions. The Netherlands, Denmark, Finland and Sweden has successfully adopted these measures and combating the emissions, however, Spain, Germany and Belgium, are testing these measures for adaptation (EAMA 2017).
- i. Instead of industries that produce more heat like iron ore processing industries and steel industries etc., fruit processing, garment, and jewelry industries should be established in GB. GB is famous for its delicious fruits such as apricot, cherries, apple, pear, almond, walnut, and pine nut. It is very rich in mineral resources, both in metallic ores and precious stones. In metals gold, platinum, palladium, copper, lead, zinc, cobalt, nickel, etc., and in precious stones, we can get ruby, e emerald, sapphire, spinel, aquamarine, tourmaline, topaz, garnet, and many more. This industry should be given special status in the CPEC projects
- j. Strict and applicable laws should be made and impediment in order to preserve forests and wildlife. Restrict the activities of the timber mafia and other development activities detrimental to mountain ecology. Regarding household and commercial fuel consumption, electricity is the most relevant and reliable eco-friendly alternate way. Installation of solar water heaters in commercial and public places will be helpful in order to fight harsh weather conditions in winter.
- k. Proper land use planning' should be ensured, and it is required to impose vertical instead of horizontal expansion of urban housing projects on the principles for lower carbon footprints. Green infrastructure strategies should be the priority in this regard.
- l. GB has mostly low cultivated lands and barren lands due to the concentration of sand in the soil and dry climate, and there are some desert areas as well. To make these barren

lands, green Pakistan can take guidelines and assistance from China for plantation and cultivation under the CPEC project as China has adopted firm steps to protect the environment and climate change. For example, the project to stop the expansion of the Gobi desert, "The Great Green Wall of China."

- m. The restoration of the State Subject Rule in GB could play a vital role in stopping the emigration of nonlocals in the region. If the population remains in control, it would be easy to control vehicles mounting, deforestation, and natural resources in the region. Although the people of this GB are protesting due to the drastic changes in the demography of the area and fears of the takeover of the lands and natural resources by nonlocals. The political People's Party of Pakistan is encouraging them as well (Dad 2019).
- n. Last but not least, empowering the local government of GB to manage and safeguard their interest and resources for the greater good of the people of GB should be higher on the agenda.

## **CONCLUSION**

The paper attempts to encompass and delineate the impact of CPEC on Climate change in the GB region. The researcher applied a mixed research design to collect and analyze various sources of qualitative data (i.e., articles, reports, policy documents, and newspaper articles) along with structured interviews with an expert on CPEC and climate change. It further added the local dimension through interviews with local people from the GB region. The findings of the study revealed that CPEC could have an impact on climate change and the GB region is therefore, prone to risk in the future. However, it takes time to implement the National Climate Change Policy and GB's Environmental Assessment Cell (EAC) in true spirit to continuously monitor the impact of the CPEC on climate change in GB by empowering the local government. Additionally, the Governments of Pakistan and China should work together to manage the environmental impacts of CPEC projects.

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