



ADDRESSING REGIONAL ENVIRONMENTAL IMPACTS OF CHINA-PAKISTAN ECONOMIC CORRIDOR (CPEC)

Dr. Allauddin Kakar
Assistant Professor /DS Research
Command and Staff College
Quetta – Pakistan
allauddin_kakar@yahoo.com

Dr. Muhammad Shabbir
Assistant Professor
Department of Education
Government Collage University
Faisalabad - Pakistan
mskhalid606@yahoo.com

Dr. Ghulam Mustafa
Assistant Professor
Department of International Relations
Government Collage University
Faisalabad - Pakistan
ghulammustafa@gcuf.edu.pk

Abstract

This study explores environmental risks associated with CPEC projects. CPEC provides opportunities of economic development for Pakistan. The mega project is helping Pakistan in infrastructure development, industrial development, and bolstering its energy sector. Pakistan has been facing energy crisis for decades, the CPEC energy projects are helping Pakistan to enhance the capacity of its energy sector. On the other hand, these projects could increase the possible risks of climate change due to its possible environmental risks and effects. The energy sector of Pakistan has low capacity and does not meet the energy requirements of the country. Under CPEC, several energy projects has been announced to enhance the capacity of Pakistan's energy sector. The energy projects are dominated by coal-based power plants which are considered harmful for environment. Infrastructural development is vital for economic development of a country, CPEC is helping Pakistan in developing its



infrastructure, but construction of road networks is leading to deforestation in northern parts of Pakistan, affecting environment. Another possible environmental risk of CPEC is Vehicle trafficking that will release millions of tons of CO₂. If timely initiatives are not made to lessen environmental effects, Pakistan will be among major contributors of CO₂ emission.

Key Words: CPEC, China, Pakistan, Environmental risks, Energy, Development.

Introduction

Over the last few decades, the destruction of environment has witnessed an unprecedented pace, causing natural disasters such as flash floods, earthquakes, blizzards, tsunamis, and cyclones (Almond, Grooten & Peterson, 2016). The negative effects of climate change, global warming, and decline of non-renewable sources are causing concerns. Since the industrial revolution, humans have emitted about 450 tons of CO₂ which has major contribution in present climate crisis of the world (Akanwa & Ikechebel, 2018). Moreover, use of fossils fuels, and industrial works by developing countries are factors in increased levels of greenhouse gases that has caused global warming and climate change (Sanderman, Hengl & Gregory, 2017).

Environmental issues such as global warming, ozone layer depletion, acid rain, natural resource, depletion, and loss of biodiversity are accelerating at a rapid pace. The multi-billion-dollar China Pakistan Economic Corridor is Chinese investment in Pakistan aims at infrastructural development, industrial development, and enhancing capacity of Pakistan's energy sector. Sizeable part of CPEC projects are related to energy, with rest comprise infrastructure development, and industrial sector development. CPEC is expected to bring economic prosperity, bolstering textiles, agriculture, tourism, and manufacturing industries of Pakistan. The mega project is expected to boost Pakistan's economic growth by 7.5 by year 2030 (Government of Pakistan, 2017) , It will provide enormous opportunities of employments for people of Pakistan.

Energy is fundamental for economic development. Pakistan has been facing critical crisis of energy shortage for decades, affecting each sector of economy and everyday life of its citizens. The energy crisis has its roots in policies formulated during 1990s. In year 1994, 40% of the country's population had access to electricity, power shortfall of about 2000 Mega Watts (Government of Pakistan, 1994). In 2016, shortfall of power sector was about 4000 MW, and around 140 million Pakistani suffered over 12 hours of load-shedding daily (Dawn, 2016). In the same year, shortage in power sector triggered a loss of 14 billion



to the national economy. In order to overcome its power sector shortfall, Pakistan has proposed several energy projects under CPEC. The energy projects will play a crucial role in bolstering Pakistan's power sector, but the coal-dominated energy projects will have environmental risks as these are considered major contributors of greenhouse gases which ultimately lead to global warming and climate change. According to the climate risk index 2019, Pakistan ranks seven among the top ten countries (Relief World, 2021), but the CPEC projects, especially coal-based power plants, could worsen Pakistan's rank at the global climate risk index.

The recent studies reveal that the CPEC-related projects could adversely affect water, air, and biodiversity in Pakistan. The possible environmental risks may lessen the potential benefits of CPEC projects. Though Pakistan is presently responsible for only 0.43% of global greenhouse gas emissions, but it is among the most affected countries of the world due to climate change (Saeed, 2017). The CPEC projects could damage eco-tourism and glaciers. It could also damage wild-life in Pakistan by changing the natural landscape.

CPEC Energy Projects in Pakistan

The lingering energy crisis in Pakistan is posing a serious threat for its fragile economy and volatile national security environment. Pakistan's energy crisis is deep and complex, being rooted more in lack of good governance and political will than in pure supply. Pakistan's energy issues have their roots in policy decisions formulated in the 1990s. In 2010, power demand was at around 14,680 MW and supply at 10,200 MW, the power remained at 4,480 MW (Brookings, 2010). In year 2011, shortage in power sector surpassed 6,000 Mega Watts (MW) (Qasim, 2014). Against the backdrop of critical energy crisis with the country facing a shortfall of 5860 Mega Watts in 2013, the Chinese government announced to help Pakistan in getting rid of the lingering energy shortfall through CPEC (Shakel, 2020).



Table 1: Pakistan's power deficit

Fiscal year	Installed Capacity	Maximum generation capability MW	Demand During Peak hours	Deficit MW
2006	19,550	15,168	15,223	-55
2007	19,681	15,575	17,487	-1,912
2008	20,532	14,707	19,281	-4,754
2009	20,566	16,040	20,314	-4,274
2010	21,614	15,144	21,029	-5,885
2011	23,342	15,430	21,086	-5,656
2012	23,342	15,896	22,654	-6,758
2013	23,725	16,846	21,605	-4,759
2014	24,702	18,771	23,505	-4,734
2015	24,961	19,132	24,757	-5,625
2016	25,374	20,121	25,754	-5,625
2017	28,399	22,148	28,476	-2,969

Source: (NEPRA, 2017)

Pakistan has been experiencing gaps in power generation for decades, with its energy shortfall presently around 4000MW. According to International Energy Agency (IEA), in 2017 Pakistan's average energy demand was about 19000 MW, while it had the potential to generate only 15000 MW. During the months of summer air conditioning places an extra burden on the national power grid, causing load-shedding for several hours. According to IEA, total electricity demand in the country will rise to more than 49000MW by year 2025 (Saleem, 2017). According to the World Bank merely 67% of Pakistan's population have access to electricity (See Table 1).

Pakistan has been experiencing deficiency in its energy sector for decades. Pakistan has proposed several energy projects under CPEC which reflects its long-standing goals to diversify its energy generation from fuel towards indigenous coal in order to reduce generation costs and conserve foreign exchange. Successive governments in Pakistan have recognized the utility of coal to bolster capacity of energy sector (Dadwal, 2012). Although the country has huge potential of renewable energy, but solar and wind energy were deemed too costly and difficult to integrate into electric grids. In November 2014, Pakistan and China signed an agreement for cooperation in the energy of Pakistan. In first phase, 14 ventures of 10,400 MW was targeted to be completed by year 2018, entitled as "Prioritized Projects" (Raza, 2018).



Table 2 CPEC-Energy Projects

#	Projects	Mega Watt	Estimated Cost
1	Sahiwal 2x660MW Coal-based Power Plant, Punjab	1320	1912.2 USD M
2	2x660MW Coal-fired Power Plants at Port Qasim, Karachi	1320	1912.2 USD M
3	Coal Power Project, Hub Balochistan	1320	1912.2 USD M
4	Thar Coal field, 3.8 million tons/year		630 USD M
5	HUBCO Thar Coal Power Project	330	497.70 USD M
6	ThalNova Thar Coal Power Project	330	497.70 USD M
7	Imported Coal Based Power Project Gwadar	300	542.32
8	Solar Park, Bahawalpur	1000	1301 USD M
9	Hydro China Dawood Wind Farm (Gharo, Thatta)	49.5	112.65 USD M
10	UEP Wind Farm (Jhimpir, Thatta)	99	250 USD M
11	Sachal Wind Farm (Jhimpir, Thatta)	49.5	134 USD M
12	Three Gorges Second and Third Wind Power Project	100	150 USD M
13	Thar Coal Block-I 6.8 mtpa & Power Plant(2x660MW)	1320	1912.12 USD M
14	Suki Kinari Hydropower Station, Naran Khyber Pukhtunkhwa	870	1707 USD M
15	Matari to Lahore ±660kV HVDC Transmission Line Project		1658.34
16	Kohala Hydel Project, AJK	1100	2364.05
17	Azad Pattan Hydel Project, AJK	701	1,650

Source: Ministry of Planning & Development <http://cpec.gov.pk/energy>

In addition, several coal-based power projects proposed by Pakistan under CPEC reflects its significance for the country in power generation. In 2015, the contribution of coal in electricity generation was 0.1%. In the same year, the global electricity generation from



coal was 38%. The successive power sector policies prioritized the role of coal in the power generation of the country. In year 2002, Pakistan sought to bring foreign and local investment in order to utilize indigenous resources including coal. In 2004, the federal minister for Water and Power stated that “the objective of the Government is to facilitate investors in developing coal mines and coal power plants in Pakistan” (Erica, 2019).

In the same way in 2013, the National Power Policy aimed to develop the coastal energy corridors based on coal, use of indigenous coal for energy generation, especially the Thar coal reserves. According to estimation of ‘Geological Survey of Pakistan’, which discovered the coal deposits with help of US Agency for International Development in 1992, the coal deposits at Thar area consists of 175 billion tons, making it the world’s largest lignite coal reserves. According to Pakistan’s Ex-federal minister for Water and Power, “God has blessed Pakistan with immense coal resources of more than 185.5 billion tones, and if half of these resources are exploited properly, it would be sufficient for generating 100,000 MW of electricity for 30 years” (Sindh Board of Investment, 2013).

It is evident that Pakistan had long been in want to utilize its indigenous coal for energy sector. However, the huge reserves of coal at Thar area remained unexploited until the launch of China Pakistan Economic Corridor. Pakistan’s huge deposits of coal remained untapped due to lack of financing, absence of infrastructure and technical expertise. The global financial institutions, the World Bank and European Bank for Reconstruction had limited investment for the use of coal for power generation due to concerns of CO₂ emissions. In 2009, the World Bank cancelled its investment for coal and power projects. Eventually, China announced to support Pakistan in the development of power plants (Belt & Road Portal, 2017). Special assistant to Prime Minister on power sector stated that “Finding international financing for coal has been difficult, with China the only country willing to invest” (SCIO, 2018).

At global level, observers and experts are also of the view that CPEC helps Pakistan to get rid of its chronic energy crisis. CPEC has the potential to zero out Pakistan’s energy shortfall. Energy projects under CPEC would significantly provide cheaper energy for the country. Exploiting its indigenous natural resources will enable the country to be less dependent on imported oil which costs heavily (Kugelman, 2017). Moreover, it will Pakistan in achieving its long-standing goals of diversifying its energy sector.

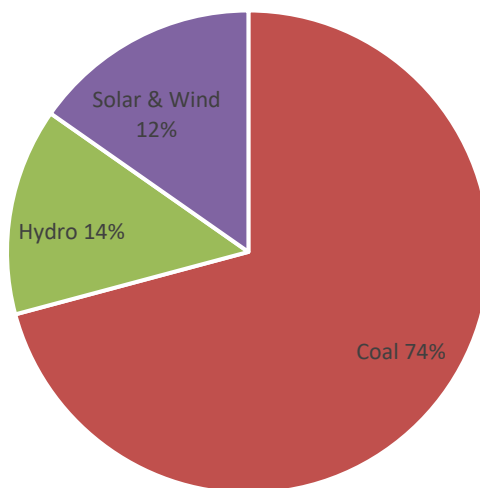


Figure : 1 Generation capacity of CPEC Power Plants

Source: CPEC Secretariat, CPEC Energy Priority Projects accessed June 27, 2019

<http://cpec.gov.pk/energy>

Under CPEC energy projects, new power plants are being built and existing transmission lines being upgraded keeping in view future energy demands of the country. Although the CPEC energy projects comprise of coal, hydro, solar and wind, but major investment is being made through coal-based power plants (Figure 1). The energy projects include 10 coal-based power plants with an estimated potential of 8880 Mega Watt, three hydro projects having the capacity of 27000 Mega Watt MW (Erica, 2019), and number of renewable energy projects with the capacity of 1000 Mega Watt (Ministry of Planning & Development, 2020). Coal consumption in Pakistan is estimated to rise at 9% per year by 2020 (China Dialogue, 2020).

Environmental Impacts of Coal-Fired Energy Projects

Coal has been that main source of electricity generation in the world, for decades. According to International Energy Agency (IAE), as of year 2014, about 41% of the world's electricity needs were provided by coal (IAE, 2017). The generation of electricity from coal is one of major sources of CO₂ emissions (EIA, 2017). Coal is an abundant source of fuel that is relatively cheap to generate and convert into usable energy. In many countries, the coal-based power plants represent a significant component of the energy



mix. However, the use of coal for power generation impacts the environment, causing climate change and depletion of biodiversity (Bartan & Kuchkali, 2017).

Though the CPEC projects are significant to overcome Pakistan's long-standing energy crisis, yet it is deemed fatal for environment. The energy projects, especially the coal-fired coal power plants are considered major concerns of environmental risks as these are considered major contributors of carbon emission which ultimately cause global warming and acid rain (Erica, 2019). The Punjab and Sindh provinces of Pakistan already are facing the issue of smog, resulting in road accidents due to lower level of visibility. Once these power plants are fully operational, it would worsen the environment of these areas (Ali, 2018). In addition, poor quality of air in these areas will result in increasing health problem.

Furthermore, it will increase the already exist water woes of Pakistan. According to the predictions of environmental experts Pakistan may run out of water if timely and corrective measures are not made. Basharat Saeed, an environmentalist, believes that the "coals power plants will also create scarcity of water in Thar and Gawadar. These two cities are already facing water scarcity, the opening of coal power plants would increase the demand of water" (Diplomat, 2018).

Air pollution has chronic health effects and contribute to rise the ratio of morbidity and hospital admissions. Emission of CO₂ at massive level will drastically melt the glaciers, thus resulting in frequent flash foods. In 2019 Balochistan experienced worst floods, adversely affecting the population (WHO, 2019). Ex- state minister for environmental, currently serving as global vice-president International Union for Conservation of Nature stated that "Coal power plants have very negative impacts on the environment and health. The most worrying part of the coal projects under CPEC is that there has been a lack of, or equally no, economic cost benefit analysis and Environmental Impact Analysis (EIA) of the said coal-based projects in Pakistan," (Diplomat, 2020). In year 2012, 46% of Pakistan's total carbon emissions was due to energy sector, especially the coal-based power plants were the major contributor (Climate Links, 2016). The coal consumption in the country is increasing, but around the globe it fell by almost 2% in year 2016. China, which is responsible for half of world's coal consumption, decreased consumption of coal by about 1.5%. In United Kingdom, demand for coal fell by around 52.2%.

Moreover, the coal-based power plants will increase greenhouse emissions to a massive level, undermining climate change mitigations measures. "No Objection Certificate" (NOC) has been issued by Environmental Protection Agency (EPA) for Sahiwal coal-fired power plant. However, experts are of the opinion that ensuring low emissions will not be



possible with coal-based power plants. “No matter how effective and efficient of technology is used, it would impact the environment because there will be carbon emissions,” an energy and environmental expert (Diplomat, 2018).

Moreover, the coal-based power plants will be hazardous for human health in Pakistan. Thus, the energy plants have no doubt the potential to overcome Pakistan’s lingering load shedding crisis which has been a blocking factor in the country’s industrial growth and economic development, but it will remain a matter of concern for environment. Pakistan is already facing the issue of toxic air pollution resulting from diesel, petrol and coal that is consumed as a non-industrial economy. Air-quality will be worsened by local coal-based power plants. The Global temperature could increase as much as 4.9C by the end of this century. In most parts of Pakistan agriculture will not be possible by then (China Dialogue, 2020).

Infrastructure Development and Environmental Risks

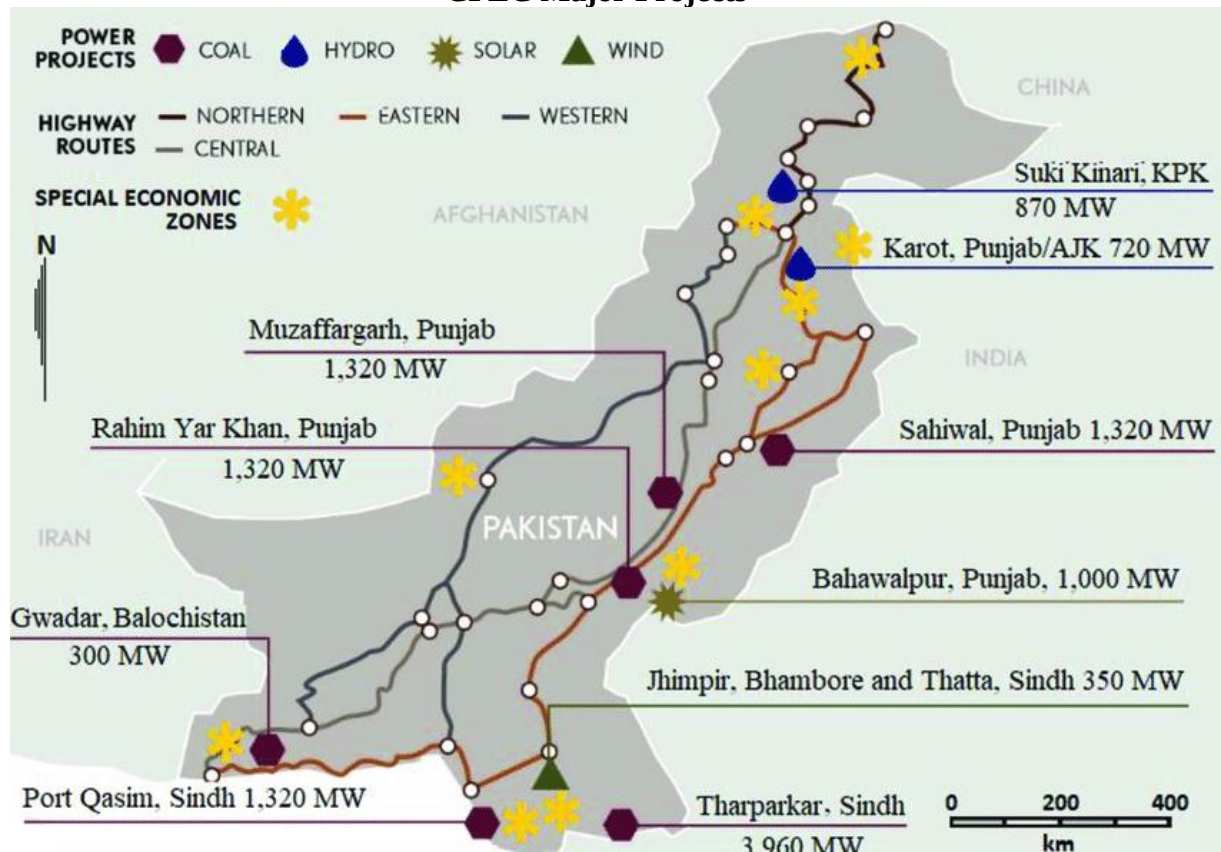
Transportation is fundamental for the development of a country. The Chinese Belt and Road Initiative has opened window of opportunity for economy development of the region. CPEC, the flagship project of BRI, has brought opportunities of infrastructural development in Pakistan. Various networks of roads are being constructed which comprise of; northern section, and three alignments; western, eastern, and central which starts from Kashghar in China to Gwadar in Pakistan (CPEC, 2019). The infrastructure development is no doubt significant for Pakistan, but construction of road networks is resulting in cutting of trees at massive level. In 2017, more than 54,000 trees were chopped down in Abbottabad, Nowshera, Lower Dirabo, and Swabi, Mardan and Malakand area (Sadaqat, 2017).

Tree is responsible for releasing oxygen human breath in every moment of life (Alan, 2019). The proposed area for construction of roads under CPEC has wide-spread forest, especially in the northern parts of Pakistan. These forests are home to diverse wild-life species. The cutting of trees at massive level will disappear wild-life. In addition, it will lead to several health problems.

A tree can absorb 50 pounds of carbon annually and plays vital role in mitigating environmental risks (Alan, 2019). Owing to chopping down of tree at massive level, about seven million pounds of carbon were not absorbed in the area in 2017. These districts are already facing the negative environmental impacts, appearing in the form of increased temperature, droughts, untimely rain, soil erosion, and melting of glaciers (Ali, 2017).

Furthermore, the CPEC infrastructure projects have severely affected the tourism industry of these districts.

CPEC Major Projects



The CPEC infrastructure projects will lead to deforestation, thus ultimately loss of diversity. The eroded and deteriorated soil due construction of roads could cause frequent flooding in the area. The frequent flooding in Pakistan has adversely effected the economy and lives of the people. Moreover, the reduced cover of forest due to anthropogenic activities and development will also affect quality of air. A reduced forest cover will not be able to absorb carbon dioxide and other Green House Gases which are responsible for polluting the air.

CPEC Impacts on Biodiversity and Glaciers



The Global Climate Risk Index ranks Pakistan as the seventh most affected country during the period 1997-2016 (Atlantic Council, 2020). Pakistan has been experiencing worst events of droughts and heat waves, and glacial-lake outburst floods in the northern mountains. The glaciers are vital source of river water and plays significant role in stabilizing both regional and global climate alterations. Three of the world's seven largest glaciers are present in Pakistan's northern area (Gilany & Iqbal, 2016). Unfortunately, global warming and various anthropogenic activities are causing rapid melting of these glaciers.

In year 2010, Pakistan was hit by worst floods, affecting 20 million people. In July 2010, the monsoon rains caused widespread destruction in the northern areas of the country. The flood then moved along the Indus river as a "slow-motion tsunami". Approximately, one fifth of Pakistan was underwater, causing loss in lives and properties. The flood destroyed around 54.8% of homes and compelled around 86.6% people to move, with 46.9% living in an Internally Displaced Persons (IDP) camps (World Food Programme, 2010). According to an estimation, the worst floods of 2010 directly affected about 14-20 million people, and resulted in deaths of 1,700. The impact of the floods lasted for several months, causing \$ 9.7 billion loss (World Bank, 2012).

According to an expert at World Meteorological Organization (WMO) "There's no doubt that clearly the climate change is contributing, a major contributing factor, We cannot definitely use one case to kind of establish precedents, but there are a few facts that point towards climate change as having to do with this" (Scientific American, 2010).

Additionally, with the completion of CPEC road networks, about 7000 trucks will pass through Pakistan's northern areas, causing carbon emission of around 36.5 million tons. The massive level of carbon emission will adversely affect the mass of glaciers and will result in massive and sudden flooding (Lahore, 2013). Water famine is another worrying concern which is predicted to appear by 2025 (Qazilbash, 2017). Ultimately, the consequences of water famine will appear in the form of down regulated agriculture—production of food at lower level growing population (Qazilbash, 2017). The heavily trafficked CPEC road networks will change in pattern, mass, and scale of the glacier which will have severe effects on local biodiversity and marine biodiversity in coastal areas (Nabi, 2017).

According Pakistan Meteorological Department "Today, the fast melting glaciers pose the greatest disaster risk to Gilgit-Baltistan and Chitral. I see massive deforestation that the region has experienced over the decades as a major factor behind this situation" (Dawn, 2018).



Undoubtedly, CPEC is blessing for the deteriorated economy of Pakistan, but on the other way it could be devastating for natural environment; glaciers and biodiversity of Pakistan's northern region. The CPEC projects could have negative impacts on the aquatic life and could also affect the aquatic biodiversity in Pakistan. The CPEC construction projects have no alternative for waste dumping, affecting the quality of ground and surface water bodies and harmful effects on the health of the surrounding communities (Zhang, 2017).

Conclusion

The study explored the Environmental impacts of China-Pakistan Economic Corridor. The China-Pakistan Economic Corridor is considered a "game-changer" project for Pakistan and China in terms of trade economic growth and development. The multi-billion-dollar project would provide economic benefits for the two countries. The CPEC-projects are expected to overcome economic issues faced by underdeveloped regions of Pakistan. It provides opportunities of infrastructure development, industrial development, and enhance potential of Pakistan's energy sector. The study reveals that CPEC projects play crucial role in the economic growth of Pakistan, but on the other hand it lead to environmental risks. As majority of energy projects are coal-based, it have become major environmental concern. The coal-fired power plants are considered major source of carbon emission, thus leading to global warming and climate change.

The main environmental concern of CPEC is related to its energy projects as major portion of investment is being made through coal-fired power plants which are considered major contributors of carbon emission, thus leading to global warming and climate change. Chopping down trees at massive live is another cause of concern. Cutting of trees for construction highways is posing serious threats to environment. Thus, these projects are cause of carbon emission, threatening environment and biodiversity.

The energy projects under CPEC are expected to overcome Pakistan's long-standing issue of energy shortfall, but its possible environmental risks also needs considerations. Infrastructural development is undoubtedly vital for economic development, but construction of road networks under CPEC is leading towards deforestation, thus affecting environment, creating threats to biodiversity and environmental sustainability. It will also cause deforestation, floods, melting glacier, climate change, and global warming.

It is time that Pakistan make pragmatic measures in order to reduce the negative effects of CPEC projects on environment. If timely and corrective measures are not made, the environmental impacts would adversely affect Pakistan. Lastly, CPEC has opened window



of opportunity for economic development, but it is essential for Pakistan to make urgent and concrete measures in order to mitigate environmental effects.

Recommendations

- There is an urgent need for corrective and effective planning to contain environmental risks. In order to reduce CO₂ emission, advance technologies should be used in energy projects.
- Measures such as improving the aerodynamic character of vehicles, adopting alternative fuels e.g., biodiesel; improving road infrastructure should be adopted in order to reduce the effect of CO₂ emissions.
- Scientist from the China and Pakistan should collaborate in order to manage the environmental risks of CPEC projects.



References

- China Dialogue. (2020). *Why don't CPEC projects factor in the climate crisis?*
Retrieved from <https://chinadialogue.net/en/business/11750-why-don-t-cpec-projects-factor-in-the-climate-crisis/>
- Dawn. (2016, August 5). 7 facts about Pakistan's energy crisis .
- Dawn. (2018). *Experts link glacier melt to climate change, call for risk assessment.*
- Erica, D. (2019). *China-Pakistan Economic Corridor Power Projects: Insights into Environmental and Debt Sustainability.* Columbia: SIPA.
- Government of Pakistan. (1994). *Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan.* . Islamabad.
- Government of Pakistan. (2017). *Long Term Plan or China-Pakistan Economic Corridor (2017-2030).* Ministry of Planning and Development Reform.
- Ministry of Planning & Development. (2020). CPEC-Energy Priority Projects.
Retrieved from <http://cpec.gov.pk/energy>
- Qasim, M. (2014, June). AN EMPIRICAL ANALYSIS OF ENERGY SHORTAGE.
Asia-Pacific Development Journal, 21(1).
- Relief World. (2021, June 25). Global Climate Risk Index 2021. Retrieved from
<https://reliefweb.int/report/world/global-climate-risk-index-2021>
- Saeed, F. (2017, March 30). In China and Pakistan's coal romance - where is the love for the climate? Climate Analytics.
- Scientific American. (2010). *2010 Devastating flooding in Pakistan may foreshadow extreme weather to come as a result of global warming.* Retrieved from
<https://www.scientificamerican.com/article/is-the-flooding-in-pakistan/>
- World Bank. (2012). *ADB-WB assess Pakistan flood damage at \$9.7 billion.*
- World Food Programme . (2010). *Pakistan flood impact assessment.*