Focus

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Pakistan and the Carbon Challenge

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Introduction and the Background

Carbon dioxide is the most important greenhouse gas that absorbs and radiates heat in the atmosphere to keep the earth's temperature below the freezing point. Plants, through the process of photosynthesis have been absorbing and releasing carbon into the atmosphere since the existence of the planet earth. However, the pace of carbon emissions from plants is in tandem with the ecosystem. Anthropogenic activities on the other hand, emit more carbon into the atmosphere than the natural cycle. Rapid industrialization and excessive burning of fossil fuels for energy purposes have resulted in a steady increase in the global temperature over the years. There are many causes behind global warming but human activity is an overpowering cause behind the phenomenon.

Pakistan's contribution to global Greenhouse Gas (GHG) emissions is almost negligible, yet it is amongst the eighth most vulnerable country to climate crises according to the Global Climate Index.[1] Pakistan's climate profile has projected a rise in the

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annual mean temperature by 3 to 5 degrees Celsius by the end of this century. This projection has been made at a moderate level, i.e., central global emission scenario. It might further increase by 4 to 6 degree Celsius in case of high emissions globally. The increase of 3 degrees Celsius, though, the least estimation in the annual mean is significant in comparison to 0.5 Celsius recorded in the last 50 years.[2]

With the above projected rise, Pakistan could face the worst heat waves on the planet. The level of heat and humidity could exceed the level where one cannot survive without protection. The rise in temperature is bound to impact the glaciers as well. Pakistan has the largest glaciers outside of polar regions. Increase in temperature of such magnitude will lead to flood outbursts from glacial lakes and communities living downstream will be the first in the line of devastation. It is also bound to impact the sea level, which has been estimated to rise 60 centimetres by the end of 2100. With this, Pakistan's low-lying coastal areas will face an existential threat such as submergence as a result of intense coastal flooding in the future.

Recently, Pakistan experienced temperatures soaring above 49 degrees in the months of March and April in 2022, which inevitably will bring a drastic change in the pattern of the coming monsoons. Besides, the rising temperature is also one of the leading causes of droughts in Pakistan. Increased emissions as well as the mismanagement of water reservoirs are to be blamed for this particular phenomenon.

Pakistan is a resource-deficient country and, therefore, global assistance is crucial for the country to deal with climate vulnerabilities. For its part, Pakistan needs to work aggressively on

adopting climate-friendly measures in almost every sector. Additionally, Pakistan needs to identify major as well as minor carbon hotspots that bear the potential to become larger emitters in the future, in the first place. Secondly, Pakistan needs climate legislation either through amendments to the constitution or by introducing standalone legislations to protect forests and agricultural areas and make local and international industries liable for breach of carbon-induced government protocols. Thirdly, Pakistan needs a consistent approach towards gradually shifting its economy to clean energy.

This paper observes that though Pakistan's contribution is comparatively low as compared to the global emissions, the local carbon emissions amid unregulated urbanization is adding to Pakistan's vulnerability. Given that, the paper argues that without regulating the existing carbon hotspots, Pakistan cannot progress in transforming its industry to low-carbon technology and also to deal with the negative impacts of fossil fuel-dependent economy on its environment. The paper further argues that global assistance in terms of both finances and climate expertise is indeed crucial for meeting the above target. In line with this thinking, this study discusses Pakistan's existing efforts as well as major policy gaps. It also sheds some light on Bhutan's experience and its relevance to Pakistan. Finally, the study concludes the discussion with a few policy recommendations.

Understanding the Subject- What is GHG Emission?

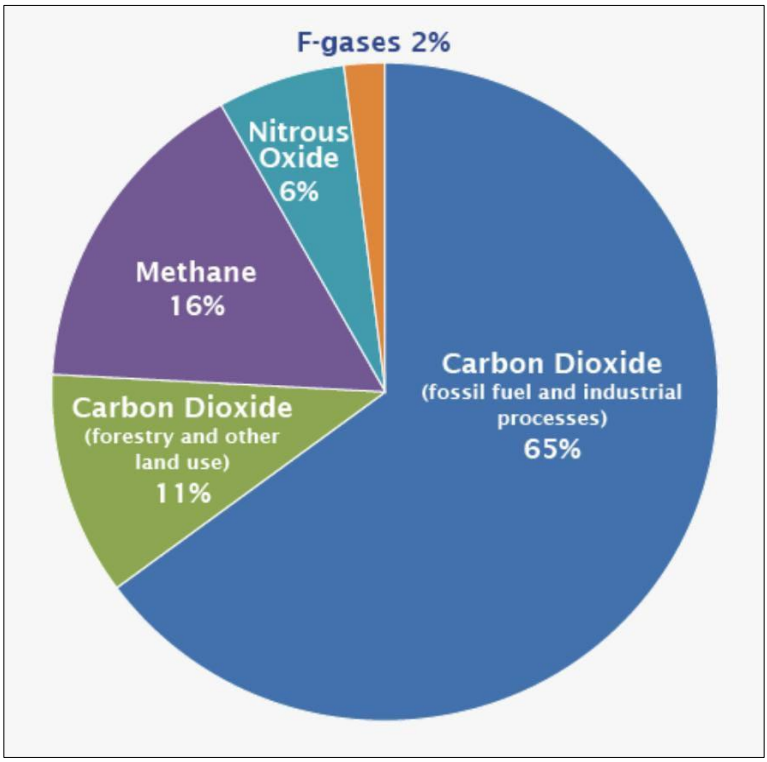
The causes of global warming are both natural and anthropogenic. Natural causes cannot be reversed or stopped, but anthropogenic ones can be dealt with. Excessive carbon dioxide

emissions, that are a leading cause of temperature rise are rooted in the increased anthropogenic activities. Rapid industrialization, technological advancement, and the excessive use of coal, oil, and natural gases have resulted in a high concentration of carbon dioxide in the atmosphere, posing existential threat to glaciers, people, as well as wildlife across the globe.

The greenhouse gases present on the surface of the earth entrap the heat in the atmosphere to keep the planet warm and habitable otherwise it would be too cold to live. The prominent gases are carbon dioxide, nitrous oxide, methane, fluorinated gases or F-gases, and lastly water vapours (see Figure 1). All these gases are produced naturally. Among these gases, carbon dioxide can absorb large amounts of heat that are enough for the existence of the earth for millions of years. Human activities like the burning of coal, natural gas, and oil have increased the emission of greenhouse gases especially carbon dioxide which resulted in enormous heat absorption in addition to natural absorption. Sector-wise distribution of data shows that electricity and heat production contribute 25 per cent, agriculture, forestry, and land use 24 per cent, industry 21 per cent, transportation 14 per cent, buildings 6 per cent, and other energy resources 10 per cent.[3] In the breakdown of greenhouse gases, carbon dioxide is the largest and the primary greenhouse gas emitter, making the earth warmer.

Figure 1

Global Emission in Percentage



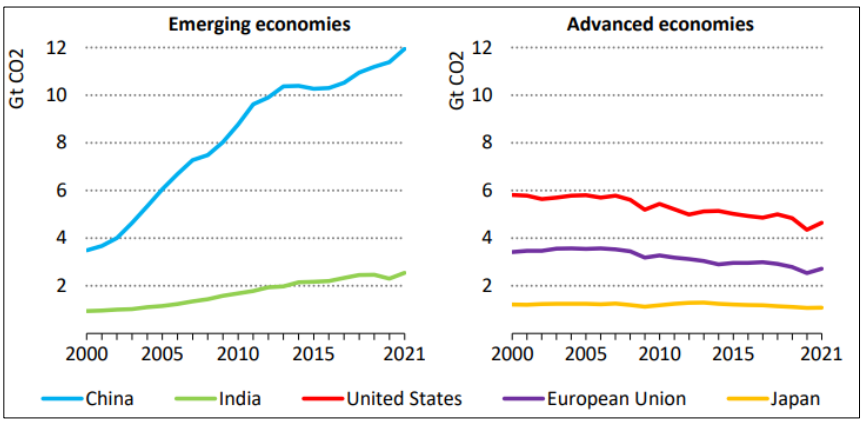
Source: The United States Environmental Protection Agency

There has been a decline in CO_2 emission globally due to Covid-19 in the last two years, however prior trends showed a steady rise. From a regional perspective, India and China are leading countries in terms of carbon emission, whereas Bhutan has emerged as the first carbon-negative (see Figure 2 for major countries' CO_2 emission level). Pakistan hitherto has little share in the global emission but unregulated urbanization, and overreliance on fossil fuel in almost all sectors with no stringent climate-induced policies to be followed by both local as well as

foreign companies, are gradually making carbon emission a challenge for the sustainable growth.

Figure 2

Top Carbon-Emitting Countries



Source: International Energy Agency

Figure 2 shows the emission trends from 2000 to 2021 wherein CO_2 emissions by China and India show a rebound after a decline during the pandemic. In both countries, the rising energy demands have resulted in an upward trend and this continues to surge. The US, and the EU, however, have recovered to pre-pandemic level with a minimal increase. Another source, i.e., the Global Carbon Project placed the US on the top with an estimation of 509 GT (approximately 20.3 per cent of the total global emission) by the end of 2021 whereas China's contribution stood at 284.4 GT (i.e., 11.4 per cent of the global total). With these figures, both the US and China are historically responsible for warming up the earth to 0.2 degrees and 0.1 respectively since 1850 to 2021.[4] Both statistics combined show that the US, China, the EU, India, Russia, and Japan are the largest carbon emitters in the world in terms of fossil fuels in particular.

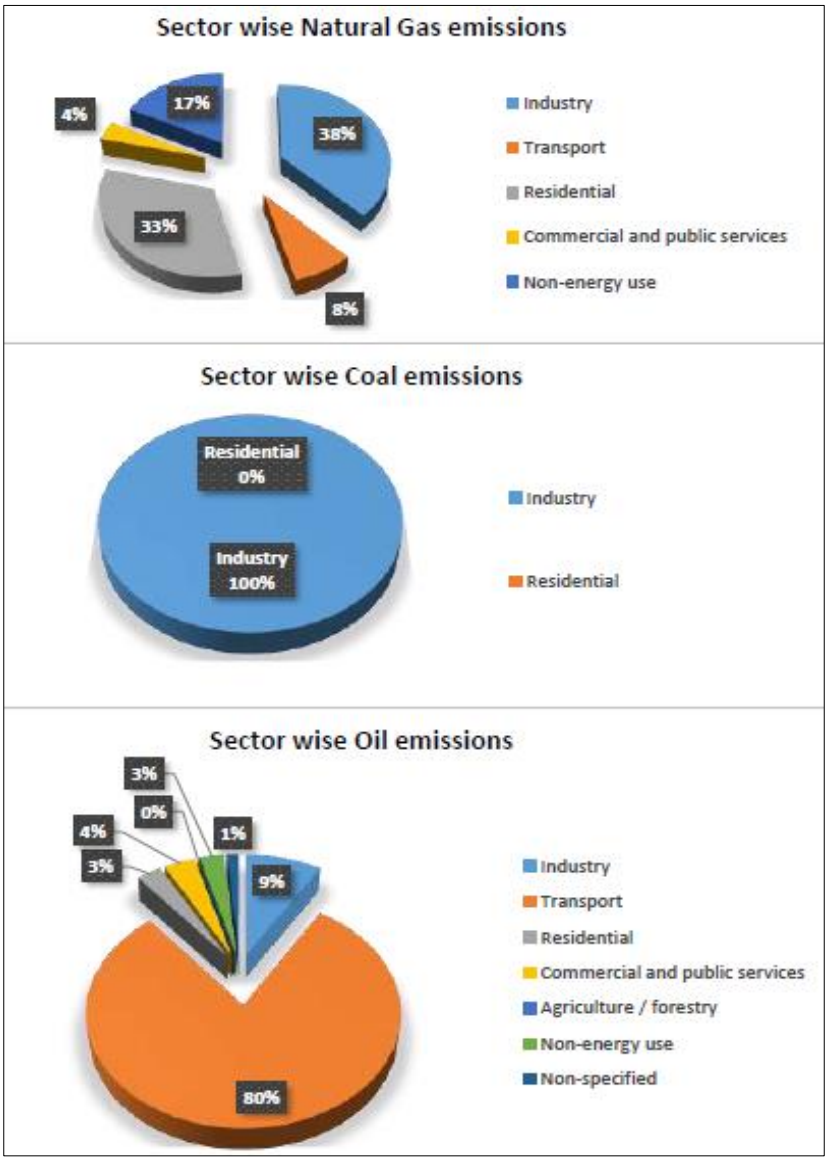
Where does Pakistan Stand?
The GHG Emission Status

Pakistan's contribution to GHG emissions stands at 0.9 percent of global GHG which is negligible in comparison to many other countries. According to the Ministry of Climate Change, the emission rate was below average in 2008 estimated to be almost 310 million tons.[5] The largest contributor to GHG emissions in Pakistan is its energy sector followed by the agricultural and industrial sectors and lastly a smaller portion of other anthropogenic human activities. Pakistan's emission trends disclose that the agricultural, transport, and energy sectors are responsible for 90 per cent of gas emissions.[6] The total of Pakistan's greenhouse gas emissions have increased by 123 per cent in the last two decades according to Pakistan's Intended Nationality Determined Contribution (INDC) report.[7] It is expected to increase to 300 per cent by 2030 in light of the country's growth targets envisioned for 2025, more precisely, the estimation is based on 9 per cent of GDP growth.

In addition to nationally determined contributors, the local carbon footprints analysis of fossil fuel gives a clearer picture of sectoral carbon emission. In terms of natural gas, the major contributors are industry, transportation, and the households. For oil, the transport sector is leading with 80 per cent of carbon emission and for coal, the industry is taking the lead with 100 per cent carbon emission.[8] Since Pakistan heavily relies on the fossil fuels to meet its energy demands, its emission trend is bound to increase manifold in the coming years as mentioned above. The geography is also factored in Pakistan's climate vulnerability.

Figure 3

Fossil Fuel Carbon Emission-1990-2017



Source: Muhammad Wajid Saleem et.al, "Fossil Fuel based Carbon Footprint of Pakistan and Its role towards sustainable Development", Conference Paper, available at www.researchgate.net

Existing efforts to Limit GHG emissions

To deal with this global challenge, the landmark Paris Agreement was signed in December 2015. This agreement is a legally binding treaty that was signed by 192 parties including Pakistan. All parties committed to working together to reduce greenhouse gas emissions to limit global temperatures well below 2 degrees till the mid-century.[9] Prior to this, the Kyoto Protocol of 1997 took an initiative to bind the industrial countries to reduce GHG emissions as per the specified formula for every five years.[10]

On the domestic level, the 2021 National Climate Change Policy of Pakistan focuses on mitigation efforts for the reduction of GHG emissions, especially in the energy sector as it is emitting almost 50% of carbon dioxide. The policy works to instil climate change objectives within the energy and agriculture sectors and experiment with new and cleaner technological designs to meet the future needs of "Intended Nationally Determined contribution" (INDC) which is committed to the Koyoto Protocol was submitted to the UN convention on climate change to portray the efforts Pakistan is putting to curtail climate change. The document is believed to have set goals for the reduction of emissions by almost 30% from 2008 to 2025 as a new deal that is in accordance with Paris Agreement. Under this article, the developed countries are obligated to assist in mitigation, finance, and technology transfer as well as finance to the developing countries including Pakistan so they can work on adaptation, capacity building, and sustainable development.

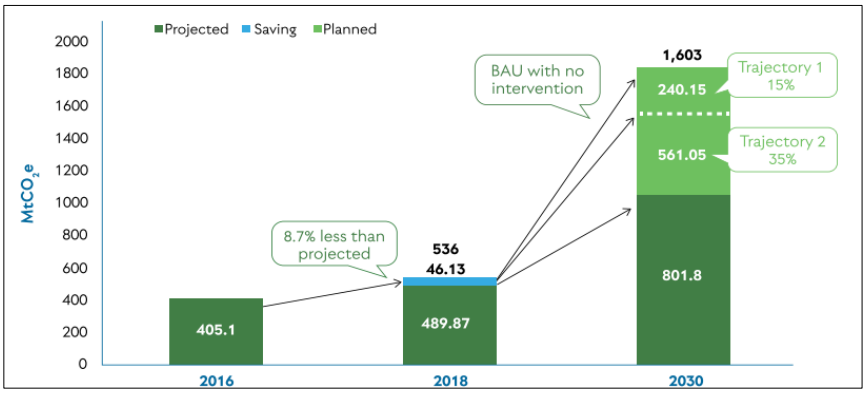
Another effort by the Government of Pakistan is to restore its protected areas. The one billion tree tsunami is a step in the right direction if Pakistan wants to curtail its GHG emissions.[11] To

limit carbon emissions, the INDC draft of Pakistan specifically proposed the conversion of millions of diesel-run tube wells to biogas by 2030. The government has also set a target to convert 60 percent of its energy mix to renewable by 2030. Furthermore, it has also targeted shifting 30 percent of vehicles to electric and a complete ban on imported coal. Overall, Pakistan has set the target of both conditional and voluntary reduction in the projected carbon emission of 50 percent by 2030.[12] It is important to mention here that Pakistan is following an emission trajectory of 1603 million tons of carbon dioxide for 2030 (see figure below).

A mass transport system is being established in the main cities that will reduce up to 1 lac cars from the roads which can reduce the emissions that take place due to the transport sector. Moreover, a shift to battery-operated transport is under consideration and a lot of work is being done. China is set to commence the largest world carbon emission trading scheme by 2025. However, the history of Pakistan with the Carbon market has been patchy throughout all these years. However Pakistan can benefit from China's trading scheme since both countries having close partnerships in various fields of mutual interests.[13] In line with this, the government of Pakistan in 2018, formed National Committee on Established of Carbon Markets to asses potentials in this field. Apart, Pakistan is working on introducing domestic emission trading scheme to cover the large carbon emitting companies.

Figure 4

Carbon Limit Target 2030



Source: UNFCCC

The figure shows that Pakistan has surpassed the set target for 2018 and contributed to reducing emissions by 8.7 percent. In the trajectory of 1603 million tons of carbon dioxide, a 15 percent reduction is set to achieve by indigenous sources which term as Business As Usual (BAU) with no intervention. However, a 35 percent reduction target is set to achieve through foreign assistance.

In a nutshell, Pakistan's efforts to limit carbon emissions can be divided into four broad categories: renewable energy transition; shift to the electric vehicle; coal-control in the energy sector; and nature-based solutions (NBS) such as afforestation under the Ten Billion Tree Tsunami Program (TBTTP), and enhancing protected areas for fauna/flora under Protected Areas Initiatives (PAI). Moreover, Pakistan Climate Change Authority established in 2017, is tasked to formulate low-carbon and green growth strategies. It is important to mention here that Pakistan is working in coordination with various international institutions that specifically deal with climate change. For instance, the

International Institute for Sustainable Development (IISD) is assisting the government of Pakistan in setting the baselines of energy emissions, and the sectoral targets. Besides, many projects including pilot projects under the United Nations Development Programme umbrella are currently underway that are aimed at enhancing Pakistan's institutional capacity to deal with climate risk reductions, and improve measures towards climate change adaptation.

The Loopholes

While Pakistan is rigorously working on limiting GHG emissions, there is still much room for improvement. The policies of Pakistan on climate change do talk about shifting to cleaner energies but there are no proper guidelines available for local industries on how to pursue and synchronize themselves with the government's clean energy strategy. In addition, low awareness of the benefits of renewable energies amongst the public is leading to un-acceptance and low confidence in alternative technologies. Several studies have been conducted nationally and internationally highlighting the potential of solar and wind energy in Pakistan, however, the progress has remained below expectations. The power sector in Pakistan is running on decades-old technology. There is a strong realization of shifting to energy-mix but unfortunately, there are no prior studies and surveys on optimizing the energy mix of Pakistan are available.

Little attention is given to the urbanization and Foreign Direct Investment factors that are increasingly contributing to upscaling carbon emissions. Urban migration, demand for vehicles, and increased household appliance usage is leading to

the formation of a volatile and capricious atmosphere. Foreign enterprises, on the other hand, are producing more carbon because of less stringent environmental regulations. Illegal logging is still an issue that has not been addressed effectively on both fronts, the legislation and the implementation of existing protocols. Military forces have reduced illegal logging activity but a proper mechanism of training local people and engaging them to play a role in protecting the environment is absent.

Above all, the lack of dedicated institutions and ill-defined role of policy-making institutions, as well as the conflict between the institutions both at the center and provincial level, are serious challenges in the way forward. Therefore, potential inputs from provinces such as provincial-based climate targets, floods, and drought prevention strategies, have not been entertained into a national climate policy. This lack of coordination appears to be a major reason for more centralized climate policy.

Conclusion and Recommendations

Although Pakistan has surpassed the target of limiting carbon emission in 2018, GHG emissions have shown an upward trend. From 2015 to 2018, there is an average increase of 16.5 per cent in the last three years in energy and agriculture together. That means there is an annual increase of 5 per cent in GHG. With that, we need to be cautious and aggressively work on the targets that are achievable through indigenous efforts. The global warming indeed playing a role in intensifying weather patterns and bringing unprecedented floods and droughts together in climate vulnerable countries that include Pakistan. However, unregulated urbanization, flexible environmental laws for local as well as

foreign industries, heavy reliance on fossil fuel for power generation, industry, transportations, agriculture etc., are making Pakistan more vulnerable.

Given the above context, a two-pronged climate approach is required. One, seeking global assistance in terms of both finances and climate expertise to transform the economy to low carbon technology; and two, regulating the existing domestic emissions through legislation. Strict environmental laws for both the local and foreign enterprises, energy, transportation, agriculture sectors, and housings are crucial for limiting the adverse impact on local environment and the sustainable growth in Pakistan.

In addition, a clear roadmap for the energy mix is required. For that purpose, there is a need to carry out feasibility studies on optimizing Pakistan's energy mix potential. Currently, energy generation in Pakistan is heavily dependent on fossil fuels that are not only insufficient to fulfill the existing energy demands but also impacting the global weather patterns that likely to bring more droughts and floods.

So, there is a need to exploit untapped potential other energy sources that have minimum impact on emissions such as nuclear, solar, wind, and hydel energy options that has minimum impact on emissions. Reaping the full benefits of hydro potential in Pakistan is still a pipedream. The politicization of Dams projects has made the matters even more complicated. The same is the case with wind and solar energy. Hydro, wind, and solar together can produce surplus energy that can be exported to neighbouring countries. To limit carbon emission, Pakistan can turn the industrial unit that runs on coal and gas to waste energy. This can

be done by identifying and regularizing major emission hotspots in the country. The power sector needs to be upgraded before transferring it to renewable and that requires huge investments and technological support.

Pakistan is a resource-deficient country and its annual economic loss to climate vulnerability is somewhere around $3.8 billion (according to a joint study by the Asian Development Bank and the World Bank).[14] The annual loss is bound to increase manifolds considering the combined impact of global warming and fossil fuel dependent economy of Pakistan. So, in comparison to the gigantic loss, the flow of climate finance is extremely low, that has resulted in the rise of climate-induced poverty in Pakistan. Moreover, low financing is potentially threating the progress that Pakistan has made in the field of climate-friendly economy so far. Apart from climate financing, most of the measures often require more innovative solutions rather than big financing which Pakistan can work on. For instance, community-based awareness programs, switching towards less intensive water crops, introducing several incentive schemes and rewards for keeping the environment clean and green, incentivizing unskilled labor, and establishing a 'mobile climate force' that can work as a watchdog, encouraging the culture of the walk, and cycling, etc.

The loss of vegetation cover, and environmental degradation as a result of unplanned urbanization is significantly contributing in the rise of local carbon emissions.[15] Government intervention is extremely important to regulate urban planning as cities are increasingly becoming 'pollution havens'. There is also a need to ensure that environmental regulations have been followed by the local as the foreign enterprises since less stringent

regulations have incentivized intensive carbon emissions.[16] Green development cooperation with China is a positive step. Such climate control cooperation needs to be expanded to other foreign countries, and enterprises to limit carbon emissions as well as environmental degradations.

It's high time for Pakistan to focus on its forestry as well which is in shambles. Only about 5% of the total land of Pakistan is covered under forest while the country's requirement is 25%. The recent national tree plantation move is a great initiative that needs to be sustained. Like Pakistan, Bhutan too is a developing country albeit significantly smaller in geography and population. Hence comparing both of them directly is somewhat challenging. However, Bhutan's triumph in securing a carbon-negative status did exhibit what can be accomplished if environmental sustainability is the main political agenda.[17] Bhutan achieved this significant status in the carbonized world by giving a more holistic approach to development. Where most countries of the world including Pakistan apply Gross Domestic Product Index in order to appraise development, Bhutan applies the system of the Gross National Happiness index which does not only measure development but values as well. The salient features of Bhutan's climate Strategy are given below.

- Constitutional Cover: Protection of forests has been central to Bhutan's environmental strategy. Recently Bhutan has made important amendments to its constitution for providing legal protection to the country's forests.[18] Under the new amendment, it is mandatory to preserve (all the time) the country's land under forest cover.

- Harmony between the community and environment: At present, almost 81% of the total land is covered in a forest of which half the country is sheltered by national parks which serve as nature reserves and wildlife sanctuaries that are all linked through biological corridors networks. Resources and funds are provided to the community living in parks to manage and preserve the natural environment, wildlife, and biodiversity.
- Renewable Energy Shift: Bhutan opted to propel its carbon-negative status through its commitment to renewable energy and sustainability. It utilizes the extensive river resources it is blessed with to generate a great quantity of renewable hydroelectric energy to such an extent that it is also exporting a large amount to its regional neighbour India.
- Free Electricity: The country's commitment to protecting the environment is also evident in the government's provision to provide free electricity to its rural farmers. Moreover, it is investing in a sustainable type of transport. In order to sustain a respected reputation in the international community, Bhutan is making a partnership with Nissan to provide electric cars.[19]

Learning from Bhutan's experience, Pakistan can go for legal protection of its forests by adding environmental protection clauses in the constitution by putting a ban on log exports and illegal felling. Harmony between the local community and the environment is also an essential element in the preservation of forests and wildlife. For that purpose, the necessary arrangement should be made to engage the local community by providing them

required training and resources. This will help empower the local community to stand up against illegal activities such as illegal felling, and encroachments. Having said that, the path toward limiting carbon emissions and dealing with the negativity of global warming is challenging. A holistic approach with public and private partnership, community support, and green cooperation with regional and international countries can help Pakistan in a significant. Nevertheless. despite marginal contribution to the emission, Pakistan's global commitment to limit GHG speaks volumes about the country's resolve to tackle the climate issues. The international community's role, however, remains crucial in doubling the efforts to limit carbon emissions as well as a shift to a green economy.

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