

CLIMATE SECURITY OF PAKISTAN: DISSECTING THE CARBON DILEMMA

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Abstract

Carbon accretion in the atmosphere is having widespread climatic impacts on Pakistan like reduced agricultural productivity, water shortage, and coastal erosion, etc. Tormented with a poor economy, any abrupt scarcity of livelihood resources can breed violence, crime, communal tensions, and a threat to national security. Encumbered by the financial and technical deficit, Pakistan is facing considerable challenges for crafting a pragmatic climate security regime. Significant divergence in the public and academic opinion on the nature of this threat have attributed to a sluggish policy response so far. This paper, therefore, focuses on Pakistan's Carbon dilemma and critically examines its treatment in national climate policies. It calls for an integrated approach across multiple sectors and mainstreaming of a national security policy with climate-smart infrastructure that assimilates core national security resources. It further calls for political discourses that encompass food, energy, agriculture, health, and even diplomacy to overcome this national threat. Towards the end, this paper proffers some recommendations to mitigate threats to our climate security.

Keywords: Public Policy, Climate Change, Environmental Governance, Climate Security, Carbon Sequestration.

Introduction

Climate is the main ingredient of our national ecological system and immensely influences national food, energy, and water security. Climate disasters, their incidence, and potency can have severe implications for the survival of these sectors and consequently, the population livelihood. Absence of public policies to build resilience mean vulnerable people becoming destitute. It exacerbates resource accessibility with profound implications for national security.¹ The UN through its subsidiary, Intergovernmental Panel on Climate Change (IPCC), has warned of a rise in the global temperatures. Such a rise is driven by the population growth and global economic development agendas, which increase emissions of Green House Gases (GHG) of which Carbon is a fundamental element. Interacting with atmospheric Oxygen, Carbon creates the quandary of GHG emissions triggering climate change.

Pakistan is a voluntary signatory to the international protocols on climate change and has, hence, made commitments for reducing GHG emissions. However, like governments, Pakistan is facing considerable challenges for crafting a climate security

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regime. Pakistan's development plans, which now rely a great deal on the China Pakistan Economic Corridor (CPEC), consist of several projects based on fossil fuels. Such fuels are a major source of GHG emissions. The incumbent Prime Minister of Pakistan warned the world of "catastrophic consequences" of climate change while addressing UN General Assembly's annual meeting in 2019. He was unequivocal in recognizing the climate threat in declaring that "our glaciers are retreating faster than in any other part of the world. As an agrarian country of 210 million people, Pakistan faces a clear and present danger from the changing climate especially in terms of water stress and food security."²

In Pakistan, significant differences in public and academic opinions in cognizance of a threat to our climate security had led to a sluggish or virtually a lack of response until 2010. It was disaster and destruction by massive floods in 2010 and 2011 that brought this threat to national focus and built pressure on the government for a policy response to mitigate climate disasters. Consequently, in 2012, Pakistan came up with its first exclusive public policy response and also created the Ministry of Climate Change.³ The policy unveiled Carbon sequestration as its prominent solution to the climate threat. It encompasses capture, removal, and storage of Carbon in a manner to prevent its escape back into the atmosphere. However, the national policy visualizes sequestration exclusively in the forest sector. It requires an integrated approach across multiple levels and sectors for planning, identifying, responding, and making the most appropriate policies that incorporate interlinkages between core national security resources.

This paper examines such voids and strengths of the National Climate Change Policy-2012 (NCCP). It principally focuses on Pakistan's Carbon dilemma and diverse sequestration strategies and options to proffer recommendations to mitigate climate security hazards. Carbon emissions need to be contained to strengthen the development and sustainability of national recourses that are crucial for our national security. The paper theoretically assumes that climate change is a reality and not a "hoax" as asserted by contesting narratives, prominently led by President Donald Trump.⁴ It proceeds with a broad assessment of the climate dilemma and policy of Carbon sequestration to sketch linkages among global and national policies. NCCP-2012 is dilated only with a focus on its Carbon sequestration strategy. It tabulates and analyzes data on Pakistan's GHG inventory and forests. Finally, it comes up with some conclusions and the policy recommendations for improvement in national climate security.

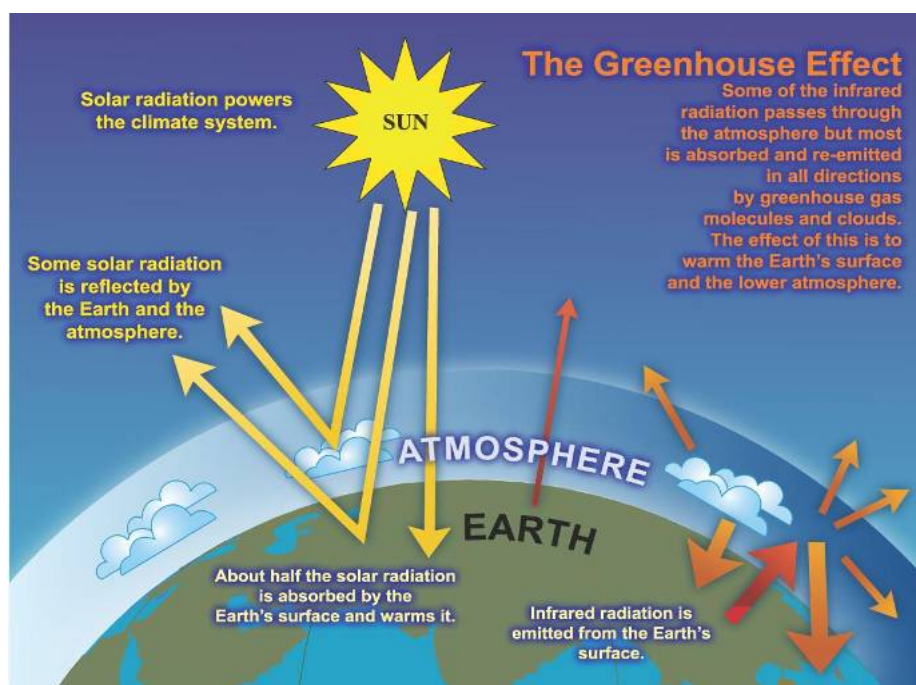
This paper adopts an exploratory methodology to evaluate the Carbon sequestration strategy of NCCP-2012. Very limited climate data is available for Pakistan. The authors have gathered data from climate statistical reports, multiple research studies and expert opinions and discussions with key policy actors from the Ministry of Climate Change, Pakistan Agricultural Research Commission, SUPARCO, Punjab Forest Department, Institute of Space Technology, Planning Commission of Pakistan and NGOs working on climate. Several climate change-related conferences were attended for information and data gathering. These included Reduce Emissions from

Deforestation and Forest Degradation (REDD+) Project, Ideas Conclave-2018 of Jinnah Institute, and discussion with climatologists. A series of climate consultative sessions (Pre COP-23) were also attended to understand the views of stakeholders from across the board.

The Narrative of Climate Change

The roots of climate change narrative lie in the invention of the steam engine by Thomas Newcomen (1664-1729) and the ensuing Industrial Revolution which led to the massive rise in the use of fossil fuels.⁵ In 1824, John Fourier conceptualized Earth's Greenhouse Effect (Figure 1), a container around earth preventing it to get as hot as the sun.⁶ Svante Arrhenius, in 1895, claimed that if Carbon emissions get doubled, earth temperature would rise by 5-6°C, albeit in millennia if not centuries.⁷

Figure-1: The Greenhouse Effect



Source: IPCC Fourth Assessment Report-2007

The scientific debate from here onwards was taken to the arena of politics and public policy. The climate community cultivated linkages with charismatic political leaders and international institutions, like the UN Environment Program (UNEP) and the World Meteorological Organization (WMO). President Lyndon Johnson was the first to be confronted with a climate report titled "Restoring the Quality of Our Environment" in 1965 that set the ball rolling on contemporary climate change narrative.⁸ In 1968, Sweden suggested a UN conference on Human Environment. This led to the holding of the first Earth Summit in Stockholm in 1972.⁹ A World Commission

on Environment and Development was created in 1983-84, which delivered its most influential climate change document called “Brundtland Report” in 1987.¹⁰ Progressively, climate debate got an intertwined environment with sustainable development. International public opinion was captured by The TIME magazine with its cover title “Planet of the Year: Endangered Earth” in 1989, prompting the UN to declare climate change as a collective problem for humanity.¹¹ The Earth Summit in Rio de Janeiro in 1992 instituted the UN Framework Convention on Climate Change (UNFCCC) and created an organizational structure called “Conference of Parties” (COP) under it. COP has, thus, by now become the supreme governance body for global climate change.

While joining the global climate agenda voluntarily, Pakistan was among the first few countries to join and ratify UNFCCC on June 13, 1992. The Ministry of Environment was created within a month after the Rio Summit which enacted the Environmental Protection Agency Act in 1997. Pakistan is currently listed as the 7th most vulnerable country to climate change by UNFCCC. In the past two decades, it has suffered 150 disasters and a loss of \$2 billion in the shape of flash floods, smog, forest fires, melting glaciers, freaky heat waves, landslides, and displaced population, etc.¹² These catastrophes led to the formulation of NCCP and re-designation of the Ministry of Environment into the Ministry of Climate Change.

Combating the Climate Change

There are two approaches to battle the climate change; Adaptation and Mitigation. Adaptation is to reduce the vulnerability to climate impacts. It focuses on creating an environment that builds capacity through a sustainable funding because reactive funding is costly. It hinges on stabilization of GHG in the atmosphere through:

- Greater awareness and education on climate change with focus on both individual and institutional capabilities;
- Enhancement of scientific capabilities for assessing and strengthening adaptation methods and tools;
- Technology developments; and
- Specialized local strategies (national or provincial, etc.).

Mitigation focuses on the reduction of adverse economic and social impacts of climate change. It encompasses energy, transport, agriculture, waste management, forestry, and industrial sectors. COP has mandated countries to maintain inventories of their GHG emissions taking attenuation measures and developing climate-friendly technologies. The aim is to achieve Carbon negativity despite national developmental aspirations and anthropogenic GHG emissions. NCCP’s Carbon sequestration strategy is the main option that provides such a solution for Pakistan.

Carbon Sequestration

Carbon Dioxide (CO₂) is one of the most commonly emitted GHG. Nature has created its control mechanism in the atmosphere. However, when anthropogenic

emissions rise beyond a threshold of Nature, Carbon sequestration remains the only human solution. As the atmosphere is globally shared, COP has mandated a global Carbon sequestration approach to battle climate change. The Kyoto Protocol-1997 (COP-3) has set up a limit upon national GHG emissions.¹³ Most nations have committed to emission reductions while some nations including the US (a major emitter) have not. Interestingly, Pakistan, being a low emitter, was not required to reduce emissions but intriguingly, she voluntarily committed to doing so. This is an exclusive topic for public policy research. Carbon sequestration is a natural process but can be artificially emulated with suitable methods and technologies. The process has the following general elements:

- **Capture:** It is the liquification of CO₂ to allow its economical and efficient handling. There are three methods to capture Carbon. Post-Combustion Capture (absorption from exhaust), Oxyfuel Combustion (use of pure oxygen gas), and the Re-Combustion which separates CO₂ by a 'Scrubbing' process using Integrated Gasification Combined Cycles (IGCC) plants.
- **Transport:** Captured carbon can be transported by pipelines, tankers, trains, and ships.
- **Storage:** It has three broad groups; Oceanic, Geological, and Biological. Oceanic: The largest carbon sinks are in the form of underwater lakes of gas existing deep within the oceans. As opposed to 750 Gigatons capacity of the atmosphere, the oceans have approximately 40,000 Gigatons capacity of CO₂ storage.¹⁴ There are two methods for this sequestration. Direct injection of captured CO₂ under the ocean or bolstering the ocean sequestration through an iron fertilization process.¹⁵ The Intergovernmental Panel on Climate Change (IPCC) has, however, warned that it carries the risks of oceanic acidification.¹⁶ Geological: It is embedding Carbon within the earth's subsurface. There are three types of geological sites, i.e., Saline Aquifers, Exhausted Oil and Gas Fields, and Deep Coal Beds.¹⁷ This method has been criticized for its effects on the groundwater and leakage risks. In Lake Nyos, 1800 people lost their lives when 1.6 million tons of CO₂ escaped back into the atmosphere.¹⁸ However, globally over 25 million tons of CO₂ is injected annually using this method.¹⁹ Biological: Also known as terrestrial, it relies on natural processes in the soil and forests, which biologically decompose Carbon, making the land highly fertile. Several agricultural practices, like conservative tilling, cover cropping, and crop rotation, have this sequestration potential.
- Other methods are Biochar and Forests. Biochar: It is the most attractive option for Pakistan since it carries economic potential and gives better land production. Critics, however, dismiss its effectiveness and benefits.²⁰ Forests: The trees account for the most rapid and natural exchange of CO₂. Their potential is linked to the forest type

and its biomass. Over 4 Giga hectares of forests cover 30% of the global landmass.²¹ IPCC, therefore, recommends afforestation limiting consumption of timber and terrestrial land management. This is the option that NCCP-2012 has visualized as a sequestration strategy for the climate security of Pakistan.

National Climate Change Policy: The Carbon Dimension

National Climate Change Policy-2102 aims “to ensure that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy and to steer Pakistan towards climate-resilient development.”²² It identifies “threats which are the cause of major survival concerns for Pakistan, particularly, in terms of country’s Water Security, Food Security, and Energy Security considerations.”²³ These include the increase of extreme weather events, erratic monsoon rains causing intense floods and droughts; global warming from trans-boundary pollution sources threatening water inflows into Indus River System; water dams siltation caused by floods; increased temperature leading to reduced agriculture productivity; scanty forest cover adversely affected plant species; the intrusion of saline water in the Indus delta adversely affecting coastal ecology; threat to coastal areas due to projected sea-level rise and increased cyclonic activity; increased stress between upper riparian and lower riparian regions on sharing the water resources; and increased health risks and climate change-induced migration.

The Carbon Dilemma

Carbon emissions of Pakistan have been compiled and projected till 2050 in Table-1. The data was taken from the Asian Development Bank’s climate change profile of Pakistan and the Government of Pakistan’s Intended Nationally Determined Contributions (INDC).²⁴ The data is in million tons.

Table-1: Carbon Emissions of Pakistan (1994-2050)

Sector	1994	2008	2012	2020	2030	2050
Energy	86	157	169	358	898	2685
Agriculture	72	120	165	245	457	1395
Industrial	13	18	14	26	130	200*
Land Use from Forestry	7	9	10	13	29	38
Waste	4	6	10	7	89	110*
Total:	182	310	368	649	1603	4333

Source: Authors’ Compilation - Unofficially adapted data points to reflect the trend set by novel data in Pakistan’s INDC

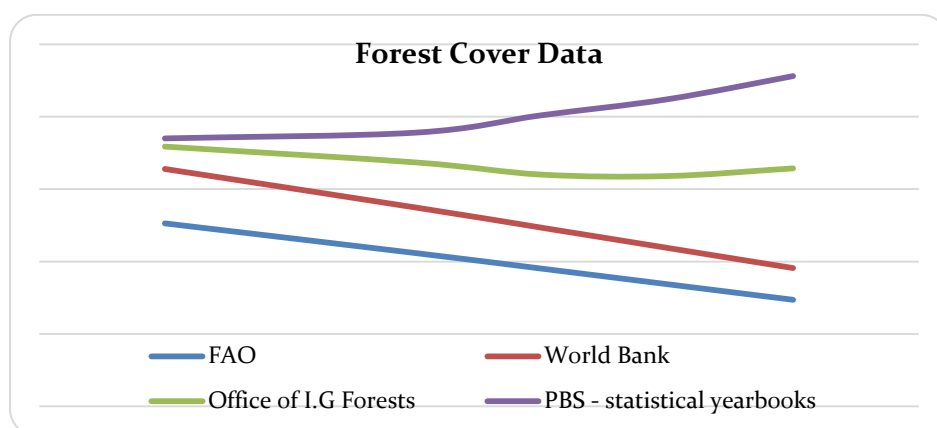
Table-1 reflects that the energy sector is the largest emitter producing approximately 46% of total emissions followed by the agriculture sector at 43%, industrial sector 5%, and waste sector just a minor proportion. Rapid urbanization trends will cause a rise in waste emissions and if not controlled, this sector will exceed

industrial emissions. CPEC impacts are also expected to raise emissions. These have not been mapped so far but can cause proportional increases in GHG emissions.²⁵ The deforestation phenomenon in Pakistan is double jeopardy. It increases land emissions and simultaneously reduces natural sequestration potential. Forestation and Reforestation projects, like Billion Tree and Green Earth Program, target an increase in forests to 6% till 2020 and further to 10% by 2030 at the cost of \$ 3.74 billion.²⁶ NCCP-2012 claims to mitigate national emissions by 20% at the cost of \$ 40 billion.²⁷ Thereafter, it will require \$7 to 14 billion annually for the maintenance of such levels.

Pakistan's Forests

Pakistan has a low forest cover of 0.3 hectares per capita compared to that of the global cover of one hectare.²⁸ The Forest data of Pakistan are given in Table-2. There is a high degree of variance between data of government and that of international agencies. However, each reflects the consistent trend of decline except the Pakistan Bureau of Statistics (PBS).

Table-2: Forest Data of Pakistan



Source: Authors' Compilation

A reliable estimate for forest cover has been prepared through the readings from Atlases of SUPARCO.²⁹ Table-3 provides the compilations of the land cover share of each province of Pakistan. It is concluded that approximately 10 million tons of carbon can be sequestered in 2030 by the forests in Pakistan.

Table-3: Land-cover Share (Province-wise) – Pakistan

Province	Forested (Age%)	Forested (KM ²)
Punjab	3.3%	6774
KP	14.10%	10512.7
Sindh	3%	4232.57
Baluchistan	5.40%	18,751.58

Source: Authors' Compilation

The Carbon Solution

The national policy solution to the Carbon dilemma of Pakistan is narrated in the following enactments. All policies generally dilate on the contextual dimension of Pakistan's climate problem, relying on the data retrieved from international studies. There is a prominent absence and insufficiency of indigenous perspectives and knowledge. It is essentially public policy-making with ignorance.

- The principle policy umbrella is provided by the National Climate Change Policy-2012. It aims to promote a climate-resilient approach to ensure that the measures to combat climate change are mainstreamed in the economic and social development plans.
- The Framework for Economic Growth-2011 provides strategic guidelines for development. This policy has a subtitle related to climate as "Ensuring Economic Growth is Sustainable and Climate Resilient," which underlines various strategies related to climate disaster, climate proofing the economic growth in crucial sectors like agriculture, water, and energy. It also covers some mitigation strategies like 'green growth' and the use of low carbon technologies.
- Other important policy documents are National Environmental Policy-2005, National Energy Conservation Policy-2005, and a number of similar provincial legislation. NCCP-2012 includes important ideas from all these legislations.

Carbon Sequestration Policy of Pakistan

National Climate Change Policy-2012 in its Articles 5.7 describes the climate mitigation strategy with the sole mention of Forest Sequestration. The measures under this article are: Increasing forest cover through afforestation and reforestation activities; increasing degree of control over deforestation activities; using the international fora to secure aid; and using farm forestry and incentivizing carbon forestry project development.³⁰ Its framework for the implementation is as follows:

- Objective 7.1.1 identifies and hopes to address the existing significant gap in awareness and implementation at the local level. The Policy commits to increase understanding of the relationship of forests with the climate and of preservation of the species.
- Objective 7.1.2 commits to the improvements in governance and development of the response to catastrophic situations. This is to be achieved through the prevention of encroachments in forests.
- There are some actions stipulated under Section 8 of the Policy which focus on the development of carbon sink potential through REDD+ projects, Clean Development Mechanism (CDM), and effective monitoring systems for implementation.

- Agroforestry, reforestation, and afforestation projects are to be established in tandem with the introduction of techniques within the lumber industry to minimize damage to forests.
- For the industrial sector, there will be technology and knowledge transfers to Pakistan from foreign projects. Adaptation of the technical capabilities will be through training of personnel in foreign institutions.
- The Energy sector will focus on developing alternative energy, prioritization of hydropower, and shifting to clean coal technologies. Interestingly, these are the medium term (targeting 10 years) strategies. There is no immediate priority. Similarly, the objective 11.o.2 plans to install new power plants which have the potential to be retrofitted with carbon capture technology but does not contemplate installing plants that are already fitted with this technology. It is not a singular contradiction. The policy is replete with many such incongruities.

As for as the implementation of this policy in the past seven years is concerned, there is not much to document regarding the national response except holding of some conferences or giving media advertisements on climate-related events. The governance focus of NCCPs has been on conferences and visits to various countries, attending international climate events, and seeking foreign loans and grants to implement the self-assigned targets of NCCPs. Beginning with being the first few 'volunteers' to ratify UNFCCC, Pakistan was also the first few to submit its INDCs to UNFCCC at the COP-21. Being prepared without much public deliberation input, these INDCs were returned by UNFCCC for revision due to their inadequacy. These INDCs have given commitments to follow a path that remains well under its emission quota. Going a step further, it has been committed to reducing emissions by 20% at the cost of \$40 billion, a totally unworkable and hence, unrealistic self-imposed target. INDCs give special consideration to forests and claim 5% forests cover of Pakistan. Even this exaggerated data is insufficient for its self-adopted mitigation goals.³¹ To acquire foreign funds, Pakistan has submitted eight Nationally Appropriate Mitigation Actions (NAMAs) to the UNFCCC since 2013. Many countries, who submitted NAMAs after Pakistan, have been provided funding while Pakistan's NAMAs have not seen any progress despite being its flagship projects under UNFCCC.

The Policy Analysis

A Tunneled Approach: NCCP-2012 fails to visualize Carbon sequestration from diverse worldwide practices and mentions only the option of Forestry. This presents a very constricted focus of this policy. Such omissions in national policy are mind-boggling. Some examples are as follows:

- For our agricultural society, friendly Biochar sequestration has not been mentioned and farmers continue to burn their fields after

harvest. Smog in Punjab is a testament to the air pollution caused by these methods.

- Agroforestry has been omitted because of its financial burden, which has been assumed without statistical studies and evaluations. A similar omission is that of the soil sequestration. Restoration of wastelands has a dual advantage of increasing national productivity and providing livelihood to the jobless and resourceless. Similarly, Sprinkler and Drip irrigation systems have been ignored.
- Pakistan does not have any record of its geological sequestration sites. Academic research has an estimated storage capacity of 1.7 Giga Tons of CO₂. Northern Areas of Pakistan have mineral sequestration potential of 1410 million tons.³² A geological survey will play a vital role in identifying ideal sites for sequestration.
- Experience of underground Industrial Pumping of Carbon extends well over 40 years. The global capacity has been estimated to be around two trillion tons, with projections of being much larger.³³ This sequestration potential is sufficient to control Pakistan's GHG emissions.
- Enhanced Oil Recovery (EOR) has also been explored by some researchers in Pakistan but with economic and not sequestration focus. In the US, more than 50% of EOR activities use natural CO₂.³⁴
- The Ministry of Climate Change remained dormant and complacent on the creation of coal-based energy plants in Pakistan. Pakistan is committing further into coal at a time when the world is abandoning it.
- Oceanic sequestration also finds no mention in the policy despite a long coastline. Presently, it is the costliest technology but NCCPs should have not ignored this option. Technologies can improve and become cheaper in the future.
- Climate policy has also neglected a discriminate and predominantly commercial approach towards land use in Pakistan. There are no serious efforts to plan or restrict urban expansion and forest depletion.

Policy Muddle

There is generally a poor national understanding of international climate change politics and policies and their implications for Pakistan. Climate problem has only been addressed by legislation and bureaucratizing of structures without any significant implementation thrust or plans. Practically, it has been addressed through international conferences, documents, and occasional rhetoric. The lack of public understanding of the issue is a major cause of popular alienation. Virtually, it remains a top-down policy to resolve a problem that is poorly comprehended even by its framers. The policy adopts lofty targets, intends to resolve some imaginary problems by importing international solutions and at the same time ignoring national ones. The muddle is compounded by information deficit and lack of political patronage. A

succinct example was Pakistan's one-page response in the climate conference in Paris which shocked the nation. This response was the contribution of an official delegation comprising dozens of officials headed by the Prime Minister of Pakistan.³⁵ Authors faced constraints in soliciting general public views as people did not understand that climate was even an issue. The following are a few observations on the sequestration aspect of NCCPs:

- The climate challenges that NCCPs aim to address, need an integration of climate knowledge with our vulnerabilities and response. The current policy remains exclusively in the domain of federal bureaucracy. To build a local and regional context of climate problems and solutions, public participation and consultation are essential. The policy must identify people's constraints to overcome their climate vulnerabilities. The agriculture sector is the one but crucial example where there has been no effort to internalize the climate vulnerabilities by NCCPs or any of the agricultural policies of the country.
- There is an utter lack of consensus on the forest data and, thus, in its future projections and plans. While the government sources show a rosy picture, the international agencies reflect the reverse. This is a serious shortfall in the policy, especially, when it principally relies on the forest sequestration.
- Pakistan is an arid country and, hence, has a limited capacity of forests. The policy envisages increasing forested area from 5.24% to almost 7.1% by 2030, which is an ambitious but still a minuscule target. It, then, ruthlessly assumes that forested areas will have lush vegetation.
- Agroforestry only features as a project in REDD+. The Climate Ministry itself is incredulous about the efficacy of this project.
- Baluchistan has a potential for agroforestry but this province is planning to create power plants under CPEC. Such contradictions may not bring any significant effect on the Carbon situation. The climate dimension of CPEC, hence, must consider a greater number of green power projects.
- Whatever mitigation activities have been recognized within agriculture and industrial sectors, lack active policy initiative despite several viable avenues of sequestration.
- Sequestration word is only mentioned three times within the entire NCCP-2012. It reflects an approach towards national potential and options.
- There is absolute neglect of plans to develop or rely on indigenous knowledge. Similarly, the options of reverse engineering of foreign technologies have not been considered. The Policy focuses on the transfer of technology from developed economies by seeking loans and training opportunities abroad for public savants. The foreign outlook

is strangely based on the logic of easing the national financial burden and improving local technological prowess.

Future Options

Pakistan's selection as the Vice President of the COPs at COP-24 (Katowice, Poland) provides it with an opportunity to capitalize on its status at this important international forum. However, for that, a solid policy approach is paramount to streamline the science and politics of the climate for this nation. A revision of NCCPs to overcome the Carbon dilemma is essential and the foremost. Other parts equally deserve this treatment but are beyond the scope of this paper. Even if our national priorities do not warrant pursuing other avenues of sequestration, the same must still be given appropriate treatment in NCCPs. Omission is absolutely not a prudent option. For any revision, it is critical that climate specialists are embedded with the policymakers to minimize oversights and omissions like those enumerated above. This means creating an integrated national policy response by involving scientific, political, and social stakeholders. The government currently relies only on the input of local and foreign-funded NGOs, whose agendas may be shady given the experience of terrorism. Other recommendations are:

- It must be remembered that in any democratic dispensation, public sensitization and participation are vital without which no public policy can sustain. That entails crafting a narrative response to this national security issue. Participation experience in pre-COP-23 meetings was dismal where, from over 50 delegates from all across the country, only a few could provide any useful insight. There was a deep and distinct lack of Pakistan's climate threat perception and the same was reflected across the board in federal and provincial departments and delegates. Delegates were held hostage to the data of money-seeking NGOs. The Carbon problem can only be solved if it is entrenched in the public consciousness. Interestingly, even preparation of COP national response was contracted out to a cherry-picked NGO by the Ministry of Climate.
- There is a need to push capacity-building strategies of the federal and provincial bureaucracies connected with the climate issue. That entails stronger connections and coordination especially between federal and provincial climate governance structures as well as other laterally relevant government departments. Inter-governmental harmony becomes crucial to overcome conflicts when different political parties rule provinces and federation. Intradepartmental coordination was, in many cases, absent. For example, in one federal organization, its soil management department and the Agroforestry department operated in isolation and sometimes in tandem on similar projects. It has a risk of running redundant ventures and wastage of public funds and foreign loans. Managing the evident devolution complexities in climate governance should become part of the revised national policy.

- Carbon sequestration is solely covered in its Article 5.7, titled “Forestry and Carbon Sequestration”. It symbolizes that sequestration exists in the realm of Forestry and detracts from the versatility of Carbon sequestration. It should be embarked upon as a separate aspect covering all options of sequestration.
- Aspects of mitigation are littered across various parts of NCCPs under sections like industrial and agricultural, etc. Some of their subsectors also have the potential for Carbon sequestration, which should also have been described therein.
- NCCPs suffer from the lack and even superfluous confidentiality of climate data. Despite that, it does not plan to overcome this handicap. Engaging the academia to create such data is the least expensive measure. It would also help to create public awareness and interest. Weak economies can exploit subject experts to come up with approaches that are viable in national settings. Pakistan must generate indigenous knowledge of Carbon threat and sequestration potential to uncover innovative domestic techniques. The reliance on foreign technologies aim to secure loans can be counterproductive and can undermine national interest and sovereignty.
- The single greatest consideration in managing risks associated with Carbon storage using sequestration technologies comes down to the correct assessment and selection of the reservoir sites. This risk assessment is a core aspect of ensuring preparedness toward remedying any issues. Risk assessment criteria require the elaborate establishment and developmental efforts for monitoring, research, and improvisation approaches to Carbon storage. Pakistan’s unknown potential for carbon sequestration may be significant enough to account for the expected rise in emissions.
- Education czars should comprehend climate challenges and promote research in this sector. Educational institutions should encourage and streamline data mining and its sharing liberally. Climate ministry and climate research centers should have a focused and collaborative approach to handle this problem. Only the local solutions would effectively address socio-economic and cultural vulnerabilities and consequently, lay roots for sustainable national development.

Conclusion

Climate change is a global phenomenon. Actions and inactions of any nation will have both positive and negative externalities for the mother earth. While major emitters are rich nations, poor nations can comparatively suffer a higher degree of climate devastation. Pakistan fits this case where it is not a polluter but has been suffering the impacts of higher global GHG emissions. The Carbon glut is having wide-ranging impacts on Pakistan like reduced agricultural productivity, water shortage, coastal erosion, and extreme climatic events. All this puts pressure on its economic

conditions which then exacerbated tensions in ethnicity, gender, and religion, etc. Struggling already with its weak economy, any abrupt scarcity of resources will breed violence threatening its national security. Addressing climate risks, thus, requires the mainstreaming of a national security policy with climate-smart plans in infrastructure, businesses, and skills. This paper has taken up the core ingredient of the climate problem, i.e., Carbon and its sequestration strategy. While Pakistan may continue to seek support through its NAMA, the paper exhorts to look inwards to remain prepared for the worst. It must also be careful in making voluntary commitments to the international community, which cannot be upheld. There is a need to promote political discourses encompassing energy, agriculture, health, transport, urban development, industries, crime, and even diplomacy to overcome the climate threat. Complacency and business as usual will be catastrophic.

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- ²⁷ www.mocc.gov.pk/userfiles1/file/INDC%20PAKISTAN%20-zero%20draft.pdf
- ²⁸ "Pakistan Forestry Outlook Study." *FAO, Office Inspector General Pakistan - Ministry of Environment*, 2009.
- ²⁹ SPOT-5 imagery is used to map the geography. Definiens Software was used to process the image and FAO's Mapping Device Change Analysis Tool (MADCAT) was used to interpret the image
- ³⁰ Government of Pakistan, Ministry of Climate Change, *National Climate Change Policy-2012*
- ³¹ Government of Pakistan, Ministry of Climate Change, *INDC, Mocc.gov.pk*
- ³² Tazeem Tahirkheli, et al., "Mineralogy and Geochemistry of Diorites-----Chitral" *Journal of Himalayan Earth Sciences* 45.1 (2012): 31-52
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