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CLIMATE CHANGE: VULNERABILITY ASSESSMENT AND ADAPTATION IN SOUTH ASIA

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ABSTRACT

The climate of the earth is changing. Regardless of what happens to global emissions today, the global surface of the planet shall continue to increase until at least 2050. What the climate of the earth will look like beyond 2050 depends on the speed and magnitude at which humanity manages its greenhouse gas emissions. Now, the Paris Agreement is the preeminent framework of the world for preventing the worst impact of climate change. The Intergovernmental Panel on Climate Change (IPCC) is additionally the key source of technical guidance and scientific information to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. IPCC reports recognize the interdependence between human societies, biodiversity, ecosystems, and climate. The assessment of climate change impacts, risks and adaptation is set against concurrently unfolding non-climatic global trends, such as rapid urbanization, human demographic shifts, overall unsustainable consumption of natural resources and economic inequalities. This study focuses on the climate change adaptation strategy in South Asia, with a special emphasis on India. South Asia is among the most vulnerable regions on the planet to the impact of climate change. The region is experiencing a "new climate normal" in which intensifying cyclones, floods, droughts, and heat waves are testing the limits of the citizens and government. The changing climate might hamper the living conditions of up to 800 million people in South Asia. However, at the same time, South Asia is pioneering many climate-smart solutions starting from scaling up renewable energy to innovative community approaches to coastal resilience. Scaling up such efforts is vital to building resilience to the rapidly warming climate in the area and curbing emissions. The National Action Plan on Climate Change (NAPCC) in India was launched in 2008 by the Prime Minister's Council on Climate Change, and is aimed at creating awareness among the representatives of the public, scientists, industries, and different agencies of the government on the threat posed by climate change and the steps to counter it. The conclusions made in this study are based on secondary data sources from government websites, reports, news articles, and research papers.

Keywords: *Climate Change, National Action Plan, Climate Change Adaption Strategy, UNFCC.*

Introduction

The phenomenon of “climate change” refers to an ongoing trend of changes in the general weather conditions of the planet, as a result of an average rise in the temperature of the earth’s surface, also known as global warming. Increases concentration of greenhouse gases (GHGs) in the atmosphere is among the key factors causing the rise in the average global temperature. The greenhouse gases form an insulating layer in the atmosphere that cuts down the amount of heat from the sun radiates back into space, thereby making the planet warmer.

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While weather changes on a regular basis, climate implies to the statistical distribution of weather patterns over a span of time. On a global scale, climate has changed very slowly in the past, typically over a span of tens of thousands of years or even millions of years. This long-time frame provides the bio-physical systems of the earth adequate time to adapt to the changing climatic conditions naturally. However, now, the global climate is changing the way more rapidly due to global warming, leading to ocean acidification, melting of polar and glacier ice, frequent floods and droughts and more.

The United Nations Framework Convention on Climate Change or the UNFCCC defines climate change as a "change of climate that is attributed indirectly or directly to human activity that alters the composition of the global atmosphere, and is in addition to natural climate variability observed over comparable periods of time". World Health Organization has documented the fact that climate change has the potential to affect human health in a plethora of ways, including, but not limited to: disturbing food-producing ecosystems, altering the seasonality and geographic range of infectious diseases, rise in sea level and increasing the frequency of extreme weather events, like hurricanes.

Climate change poses a severe threat to the global economy and human welfare, and the timeframe to invest in opportunities to steer clear of the most catastrophic impacts of this crisis gets narrower with every passing day. Extreme weather events can get exacerbated by climate change, thereby disrupting supply chains. Flooding can become worse due to the rise in the sea level and destroy important infrastructure.

The impact of climate change on communities and businesses is quite expansive, and the lost revenue as an indirect or direct result of climate change can be quite significant. Considerable harm from climate change will fall on socially vulnerable populations disproportionally, including ethnic and racial minority communities. It is critical to develop and implement policies, mechanisms, measures, and infrastructure across the world to strengthen the resilience of societies and economies to climate change impacts.

IPCC Climate Change Report

The Intergovernmental Panel on Climate Change (IPCC) is a leading international body that focuses on climate change assessment. It is known to be the prime source of technical guidance and scientific information to the UNFCCC or United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement and the Kyoto Protocol. The IPCC provides governments at multiple levels with scientific information that can be used for developing climate policies.

For decades, the IPCC has been sounding the alarm on climate change, and putting comprehensive, regular assessments that summarize many of the current research on the warming of the earth. In its Sixth Assessment Report, IPCC uses the words "intensifying, rapid and widespread" to describe climate change. This report provides a robust picture of the present and future impact of climate change. The conclusions of the Sixth Assessment Report are based on the latest generation of climate models. It highlights that changes observed in the biosphere, cryosphere, oceans and atmosphere offer unequivocal evidence of a planet that has been warmed, and human activity is "indisputably" the cause.

The panel also makes it clear in the latest IPCC report that the world is not doing enough to adapt to the worsening impact of climate change, especially in vulnerable communities where the current climate crisis may exacerbate existing economic and social inequities. The panel says that adaption efforts so far has been "incremental" and "fragmented", when the government should have been making "transformational" changes with urgency to secure food supplies, create more resilient electricity grids and protect the health of people.

The Kyoto Protocol

Adopted on 11 December 1997, the Kyoto Protocol was meant to operationalize the United Nations Framework Convention on Climate Change (UNFCC) by committing industrialized nations and economies in transition to reduce and limit greenhouse gases (GHG) emissions as per agreed individual targets. The convention itself asks only those nations to adopt measures and policies on mitigation and to report periodically.

At the sustainable development summit held in Paris in 2015, all UNFCC participants signed another pact known as the Paris Climate Agreement that effectively replaced the Kyoto Protocol.

The Green Climate Fund

The Green Climate Fund or GCF is a vital element of the historic Paris Agreement. It is the largest climate fund in the planet, and mandated to support developing nations to raise and realize their NDC or Nationally Determined Contributions ambitions towards low-emission, climate-resilient pathways. GFC is known to operate through a network of more than two hundred delivery partners and accredited entities who work with developing countries directly for project design and implementation.

Climate Change Vulnerability Assessment in South Asia

The impact of climate change in South Asia can be quite considerable, and will impact the distinctive countries in the region in quite a varied manner. This region comprises of distinguished climatic conditions that are spread over a diverse and expansive geographic area. Landscapes in South Asia includes tropical zones prone to devastating and frequent cyclones, arid zones subject to droughts, hilly and mountainous parts that are affected by melting of glaciers, islands whose existence is threatened due to rise in sea levels, as well as low lying coastal regions subject to coastal erosion and flooding. On the whole, South Asia is among the most vulnerable parts in the planet to climate change, as many of its nations have a considerable part of their populace living in coastal regions, making them more vulnerable to severe weather events and rising sea levels. Having high poverty levels and population density, the region is ideally considered to be susceptible to natural disasters. As per a 2009 World Bank study, more than 50% of South Asians had suffered from at least a single natural disaster in the preceding two decades.

Table 1

Climate Risk Rank 2018	Climate Risk Rank 1999–2018	Global Risk Rank	Natural Disaster Risk Rank
India (5)	Bangladesh (7)	Bangladesh (22)	Bangladesh (10)
Sri Lanka (6)	Nepal (9)	India (29)	Sri Lanka (73)
Nepal (20)	India (17)	Nepal (46)	India (85)
Bangladesh (98)	Sri Lanka (22)	Sri Lanka (97)	Nepal (116)
Maldives (118)	Bhutan (103)	Bhutan (115)	Bhutan (143)
Bhutan (135)	Maldives (175)	Maldives (136)	Maldives (169)

Sources: INFORM Global Risk Index 2019, Global Climate Risk Index 2019; UN-World Risk Index.

The Table I illustrates that India, Sri Lanka, Nepal, and Bangladesh have been especially exposed to extreme climate related events over the last two decades on so. The impact of melting glaciers on Nepal and Bhutan, on the other hand, along with the rising sea levels in the Maldives are likely to become more severe in the coming years. These ranks are in parentheses, which means that the lower the rank, the higher the risk. Combination of unpredictable rainfall patterns and extreme weather events, in the context of rapid urbanization and population growth in South Asia is projected to escalate the growing competition for scarce water resources, and lead to loss of biodiversity and reduction in food production. When considering the impact of climate change on projected crop yields in South Asia, the reduction can be as high as 16% for maize by 2050s, as per Knox et al. (2012). Matthews et. al., (1995) reported that the relationship between agriculture and climate change is especially important as the global food production is under pressure due to an increasing population. Moreover, as per crop studies, crops are pretty sensitive to inter-annual variations in climate. Year-to-year fluctuations in rain and temperature can cause major losses for farmers. The IPCC (2014) underlines that heat stress may cause a 50% decline are the most high-yielding and favourable wheat area in the Indo-Gangetic Plains. Such trends highlight a clear risk in terms of food security and income, in the context of demographic growth. A 2018 World Bank study focuses on the impact of precipitation and temperature changes in South Asian nations in the 2050 horizon, indicating that the temperatures in the region are expected to increase by 1.6°C in a climate sensitive situation that assumes collective global action aligning with the 2015 Paris Agreement commitments. The increase is, however, expected to be 2.2°C in a carbon intensive situation that assumes no global action. Average monsoon precipitation is projected to increase by 6.4% in the carbon-intensive scenario and 3.9% in a climate sensitive scenario. As weather changes will exacerbate the frequency and intensity of coastal erosion, cyclones, flooding, and glacier melting, they are expected to prompt a decrease in the living standards of people, and are likely to especially have a major negative impact on Sri Lanka, India, and Bangladesh. Even though a warmer climate can have a positive impact on productivity in Nepal, Bhutan, and other cold, hilly regions, it shall considerably cut down agricultural productivity in many parts of South Asia, and even increase the propagation of infectious diseases, causing a reduction in labour productivity.

Adaptation Strategy in South Asia

South Asia is both a major contributor to climate change, as well as among the most vulnerable to its impacts. Distinctive nations in the region have their own approach and strategies for adaptation to climate change, in regards to resilience building, structural and non-structural interventions, fiscal actions, and so on.

Adaptation is the key policy response to climate change, and involves making improvements in the infrastructure of the nation to lower the impact of climate change. Apart from making physical infrastructure more resilient, adaptation also involves educating families and businesses on their role in curbing climate change, improving policy-making processes, internalizing climate risk in areas like land use laws and procurement, and so on.

Non-Structural Interventions and Structural Resilience Building

All South Asian nations have developed a national disaster management plan and national climate change action plan, comprising of operation frameworks and guidelines to guide both pre and post resilience building activities. Such plans are pretty granular in nature and involve sectoral action plans for distinctive vulnerable domains. As per (UNFCCC, 2019), Sri Lanka was the only South Asian nation to have released its National Adaptation Plan (NAP) officially, while other nations made progress in regards to certain parts of the process. India has additionally encouraged its states to prepare their very own action plans that are revised and updated on a regular basis.

South Asian countries have also started to develop adaptive capacity, in line with the proposals in many of their action plans. Adaptive capacity implies to human, natural, economic, and physical capital that are resilient to climate change risks. Its examples include improving early-warning systems, developing better livestock and crop production practices for better farmer income and food security, water management, and climate-resilient building measures, as well as safeguarding communities in coastal areas.

Both Maldives and Sri Lanka have undertaken initiatives to boost the resilience and safety of their built environment through participation in BRR or Building Regulation for Resilience, starting in 2019. The current level of building regulatory capacity in both the nations shall be assessed as part of the program, and customized recommendations will be provided and infused into the existing regulatory framework. Leveraging such programs and upgrading the regulations can be instrumental in developing adaption capital.

South Asia, however, has started to transition from the planning stage to implementation stage pretty recently, and therefore due to their high exposure to climate risks, the countries in the region would require higher investment in climate resilience and green growth initiatives in the future. As lack of access to basic amenities and poverty are strong predictors of vulnerability to climate change, these countries need to promote inclusive growth strategies as well.

Fiscal Actions

Fiscal policies are important to financing resilience building; however, most countries in South Asia have limited fiscal space to deal with the impacts of climate change to the economy. Dealing with the increasing severity and frequency of natural disasters owing to climate change, alongside coping with the shocks of crisis situations like Covid-19 pandemic is undoubtedly quite challenging. Certain South Asian nations have reserve funds or contingent budgets meant to cover disaster expenses. For example, the Druk Gyalpo Relief Fund of Bhutan, which is of around US$ 1.5 million is funded through annual budget appropriations by the Ministry of Finance. Such funds are unfortunately limited in size and scope to cover recurring losses from landslides, local floods, and more. They are not adequate buffers again the extreme impact of climate change. Hence, South Asian nations can benefit from adopting other risk-coping strategies like ex-ante financing arrangements, risk-transfer instruments, self-insurance, and, more importantly, investing in risk reduction.

Many South Asian nations have started to create a resilience fund for adaptation building for risk reduction. For example, the Climate Fiscal Framework (CFF) in Bangladesh, where around 2% of the nation budget is allocated to resilient infrastructure building. On the other hand, Maldives levied a green tax of 6 US dollars per person per day from hotels, vessels, and resorts, and 3 US dollar per person per day from guest houses from 2016, and the revenue from the tax would go into resilience building. In India, the National Action Plan for Climate Change (NAPCC) was launched to fulfil the development objectives of the nation with focus on reducing emission intensity of its economy.

India and Climate Change

India is among the most vulnerable countries to climate change. It has a large number of poor people who depend on natural resource base for their livelihoods, along with a high reliance on rainfall. UN Intergovernmental Panel on Climate Change (IPCC)' s sixth assessment report has painted a bleak picture for the nation, warning that the country can face several climate change induced disasters in the coming 2 decades. According to the report, unless greenhouse gas emissions are reduced drastically in the country by 2030, it shall become almost impossible for Indian authorities to reverse an imminent climate catastrophe. IPCC report delineates that several non-climatic and climatic risks shall interact with each other, resulting in an increase in the overall risks that cascade across regions and sectors in India.

IPCC's latest report suggests that more than forty percent of the population of India will face water scarcity by 2050. At the same time, the coastal areas of the nation, including major cities like Mumbai, would be impacted by rising sea levels. Flooding would intensify in the Brahmaputra River and Ganges River basins. At the same time, crop production shall be disrupted due to water scarcity and droughts. The report further underlines that climate change is already impacting infrastructure, livelihood and health in the urban areas of India. This impact, however, is likely to be felt more by socially and economically marginalized urban residents who live in informal settlements.

National Action Plan on Climate Change

The National Action Plan on Climate Change (NAPCC) was released on 30th June 2008 by the Prime Minister. It outlines a strategy that focuses on enabling the nation to adapt to climate change, and improve the ecological sustainability of the development path of the country. NAPCC puts emphasis on the fact that it is essential to maintain a high growth rate for improving living standards of most people in India, while minimalizing their vulnerability to the impact of climate change. The missions under NAPCC are developed and executed for natural resource conservation, energy efficiency, promoting understanding of climate change, as well as adaptation and mitigation.

The eight missions that come under the National Action Plan for Climate Change are:

- **National Solar Mission**

National Solar Mission was launched in January 2010 with the goal of establishing India as a global leader in solar energy by developing policy conditions for solar technology diffusion in diverse parts of the nation. The initial target of the mission was to install 20 GW of solar power by 2022, and it got up-scaled to 100 GW in early 2015. A number of facilitative schemes under National Solar Mission have been executed, driving connected solar power installed capacity from 25 MW year 2010-11 to approximately 36.32 GW as of 31st October 2020.

- **National Mission for Enhanced Energy Efficiency**

National Mission for Enhanced Energy Efficiency or NMEEE puts emphasis on strengthening the market for energy efficiency by creating conducive policy and regulatory regimes. This mission fosters sustainable and innovative business models under the energy efficiency sector, and comprises of 4 prime initiatives, which are:

  - Market Transformation for Energy Efficiency (MTEE)
  - Perform, Achieve, and Trade (PAT)
  - Energy Efficiency Financing Platform (EEFP)
  - Framework for Energy Efficient Economic Development (FEEED)

- **National Mission on Sustainable Habitat**

Approved by the Council for Climate Change of the Prime Minister of India in June 2010, the National Mission on Sustainable Habitat focuses on the development of sustainable habitat standards that pave the way for robust development strategies, while also addressing concerns related to climate change. Development plans prepared under the mission address mitigation and adaptation concerns in a comprehensive manner. They also prepare robust mobility plans that allow cities to undertake affordable, energy efficient, and long term transport planning.

- **National Water Mission**

National Water Mission ensures integrated water resource management that helps in conserving water, reducing wastage and providing assurance of equitable distribution of water both within and across states. National Water Mission takes provisions of the National Water Policy into account to create a framework that optimizes water use by increasing the water use efficiency by 20% with the help

of regulatory mechanisms, along with differential entitlements and pricing. It seeks to make sure that a significant share of water requirements are met with the help of recycling of waste water, while ensuring that the water requirements of coastal cities without adequate alternative water sources are met through the adoption of appropriate innovations like temperature desalination technologies that facilitate the use of ocean water.

- **National Mission for Sustaining the Himalayan Eco-system**

This mission sets the goal of preventing the melting of the Himalayan glaciers, and protecting the biodiversity of the region. Himalayan eco-system as a national mission puts emphasis on rapid generation of 4 types of national capacities that include:

  - Institutional capacities
  - Knowledge and human capacities
  - Capacities for evidence-based governance and policy building
  - Continuous self-learning for balancing between the actions of mankind and the forces of Nature

- **National Mission for a Green India**

The Green India Mission aims at enhancing, restoring, and protecting the green cover of India in response to climate change. This mission has a cumulative target of increasing forest cover on 5 million hectares of land, as well as providing livelihood to three million people through distinctive forest-based activities, while augmenting the provisioning capacity of Indian forests along with their carbon sequestration capacity. Green India Mission strives to respond to climate change via a combination of mitigation and adaptation measures that shall help in:

  - Adaptation of forest-dependent communities
  - Adaptation of vulnerable species and eco-systems to climate change
  - Enhancing carbon sinks in forests that are managed sustainably

- **National Mission for Sustainable Agriculture**

Made operational from the year 2014-15, National Mission for Sustainable Agriculture (NMSA) is aimed at making agriculture more climate resilient, remunerative, sustainable and productive with the promotion of location specific composite/integrated farming systems, comprehensive soil health management, soil and moisture conservation measures, mainstreaming rain-fed technologies, as well as efficient water management practices.

- **National Mission on Strategic Knowledge for Climate Change**

The National Mission on Strategic Knowledge for Climate Change is meant to foster the development of a dynamic and vibrant knowledge system that shall support national action for effectively responding to the goal of ecologically sustainable development. This sub-mission involves the formation of knowledge networks related to climate science, and facilitating data exchange and sharing through institutional support and a suitable policy framework.

Conclusion

Tacking the distinctive challenges associated with climate change shall require collective action. Local communities, private sector, and governments have to work together to reduce these risks. Rather than trying out quick fixes, transformational adaptation is required to reduce the root causes of climate change vulnerabilities by steering systems away from unsustainable trajectories.

South Asia is a highly vulnerable region to climate change. Hence mitigation policies are extremely critical dour South Asian nation to reduce carbon emissions and in turn, the human impact on the climate. They also require adaptation policies that can make the economy and the population more resilient to the changing climate. South Asian countries, including India, can play a leading global role by pursuing plans and policies that seek to limit carbon emissions more aggressively. Indian Prime Minister Narendra Modi pledged at the Glasgow climate summit in 2021 that India shall reduce its total projected carbon emissions by 2030, as well as cut down the carbon intensity of its economy by 45% by the same year and achieve net-zero emissions by 2070. He also mentioned that India can meet 50% of its energy requirements by accelerating non-fossil energy capacity to 500 gigawatts by 2030.

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