



RESEARCH PAPER

**Assessing the Geopolitical Shifts in South Asia due to Climate Change:
Analyzing the Brahmaputra River Basin (2010-2020)**

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ABSTRACT

This research investigates the impact of climate change on the geopolitical dynamics of South Asia, focusing on India, China, and Bangladesh, which share the Brahmaputra River basin. The changing climate significantly affects these nations, with the political landscape of South Asia playing a crucial role in shaping regional dynamics. The Brahmaputra River basin is vulnerable to climate-induced challenges, such as altered river flow, increased flooding, and changes in sediment transport, which impact water resources and infrastructural development, influencing the social and economic well-being of the populations in these countries. Utilizing a multidisciplinary approach, the study combines climate models, hydrological data analysis, and geopolitical assessments to evaluate the effects of climate change on the Brahmaputra River basin and its implications for regional cooperation and conflict. The findings reveal that climate change exacerbates existing water-related challenges, leading to heightened flood risks, disrupted sediment transport, and strained water resources, threatening socio-economic stability. The research underscores the urgent need for collaborative strategies to address these impacts, emphasizing the importance of integrated water resource management to mitigate geopolitical tensions and promote regional stability.

KEYWORDS Bangladesh, Brahmaputra River Basin, China, Climate Change, India

Introduction

Climate change, along with dams and development projects, is expected to exacerbate flooding and droughts in the Brahmaputra basin, particularly in the lower basin. Glacial melt rates are predicted to increase, affecting water supply throughout the area. While there are presently no large water diversions in the basin, upstream dam development and climate change estimates are expected to lower dry season flows in downstream areas, affecting millions of people. The key regional players China, India and Bangladesh are playing a significant role in the development of South Asia. They also influence the socio-economic environment of the region. There are numerous factors that can affect the environment of the region, one of the pressing factor includes the water sharing disputes.

In the midst of these difficulties, the Brahmaputra River Basin stands out as a key focus point. The Brahmaputra River Basin is one of the most significant and extensive river systems in the area, encompassing Bangladesh, Bhutan, China, and India (Afzal, et. al. 2020). Millions of people rely on it for existence, and it is essential to the region's economies, way of life, and food security.

Nonetheless, the Brahmaputra River Basin is vulnerable to the effects of global warming. Changes in precipitation patterns, glacier melting, and the occurrence of more extreme weather events in the area all have a direct influence on the quality of water

resources. These natural changes represent a severe danger to the area's geopolitical environment, heightening already-existing conflicts and increasing the complexity.

To successfully create policies and encourage regional collaboration, it is critical to recognize the specific effects of global warming on the Brahmaputra River Basin. We must address the difficulties caused by climate change extensively and collectively, as millions of people rely on the basin's water supplies for their daily needs. Planning for a sustainable future in the Brahmaputra River Basin necessitates an examination of the relationships between water security, geopolitical dynamics, and climate change.

Literature Review

Climate change is a pressing global issue with significant implications for water resources. South Asia, which includes nations like Bangladesh, India, Pakistan, Nepal, and Bhutan, is especially susceptible to the effects of climate change because of its sparse population, reliance on agriculture, and scarce water supplies. Studies have indicated that the availability and variability of water in South Asia are greatly impacted by climate change. Elevated temperatures hasten the melting of glaciers in the Himalayan region, influencing the course of significant rivers including the Ganges, both Indus and Brahmaputra. The timing and amount of water supply are impacted by this melting and shifting precipitation patterns, especially during the dry season. Water scarcity thus becomes an increasingly pressing issue, presenting difficulties for residential consumption, industry, and agriculture. Ecological consequences result from the effects of climate change on water resources. Aquatic ecosystems are impacted by variations in temperature, flow patterns, and water availability, which have an impact on biodiversity and the general well-being of riverine ecosystems (Khan, 2016).

Because access to and control over water resources have a substantial impact on economic growth, national security, and geopolitical ties, water security is a crucial problem in the global geopolitical environment. Given its intersections with social, political, and economic concerns on a national, regional, and global scale, water security has significant geopolitical ramifications. Access to water resources, particularly in arid and water-stressed regions, can become a source of tension and conflicts between states. The intricate relationships between water security and geopolitics are highlighted by competition for water resources, conflicts over shared rivers, and the possibility of water scarcity causing migration and social upheaval. (Klare, 2020).

In light of climate change, water security is an urgent concern, especially in sensitive areas like the Brahmaputra River Basin. The Brahmaputra River Basin, which is shared by Bangladesh, India, and China, is particularly vulnerable to the effects of climate change on water security. Case studies have demonstrated how the basin's problems with access, quality, and availability of water are made worse by climate change. Water security in the region is impacted by changes in precipitation patterns, glacial melting, and increased variability in river flow, all of which have a substantial impact on agriculture, hydropower production, and ecosystems. The Brahmaputra River Basin's agricultural systems are directly impacted by climate change. (Barua, 2018).

A multi-method approach will be used to thoroughly investigate the geopolitical consequences of climate change on South Asian water security. In order to offer a comprehensive knowledge of the intricate relationships between climate change, water security, and geopolitics in the area, this project will incorporate qualitative analysis of previously published literature, policy papers, and scholarly articles.

Through the use of a mixed-method approach, this project seeks to advance knowledge of the intricate relationships that exist between water security, geopolitical

dynamics, and climate change in South Asia. Potential avenues for regional collaboration and sustainable development will be highlighted.

Theoretical Framework

Theory of Environmental Security

The Theory of Environmental Security provides a valuable framework for investigating how climate change influences the geopolitical dynamics of South Asia's Brahmaputra River Basin.

According to the Theory of Environmental Security, environmental changes, such as those caused by climate change, might have significant geopolitical repercussions.

Climate change has the potential to cause a variety of environmental changes in the Brahmaputra River Basin, including changing rainfall patterns, glacier melt, and increasing sea levels. For example, changes in the availability of water resources may lead to increased competitiveness and conflicts over water among nations that share the Brahmaputra River Basin, such as Bangladesh, China, and India. This might result in strained diplomatic relations and tensions, perhaps leading to geopolitical wars.

This theory can help us comprehend the shifting geopolitical dynamics in the Brahmaputra River Basin and throughout South Asia by considering the impacts of climate change on water availability as well as its ability to affect regional connections and conflicts.

Climate Change in South Asia

At first, rivers swell and there is more water available due to the increased glacier melting. Long-term problems with water shortage will arise, though, when glaciers retreat and water flow decreases. Moreover, as glacier meltwater builds up in unstable lakes and has the capacity to breach natural dams, the likelihood of glacial lake outbursts and flash floods increases. (Gokmen, 2010).

With heavily inhabited coastal areas found in Bangladesh and some parts of India, South Asia boasts a long coastline. These places are seriously threatened by rising sea levels, which increase the likelihood of coastal erosion, saltwater intrusion into freshwater sources, and flooding. The Ganges-Brahmaputra-Meghna Delta and other low-lying islands and delta regions are especially susceptible to sea level rise and the possible uprooting of people.

Cyclones, storms, and heavy rainfall are examples of extreme weather phenomena that are becoming more frequent in South Asia due to climate change. These occurrences result in extensive infrastructure damage, fatalities, and community uprooting. Cyclones are especially common in coastal locations; areas such as the Bay of Bengal often see destructive storms (Menon, 2017).

Key Climate Change Impacts on the Region

Rising temperatures and heat waves

The temperature in South Asia is rising dramatically. There are now major dangers to agriculture, ecosystems, and human health due to the increased frequency, intensity, and duration of heat waves. Extended exposure to elevated temperatures may result in heat-related ailments, heat strokes, and in extreme cases, death. Over 3,500 people died in 2015 as a result of a severe heat wave that affected Pakistan and India. Temperature increases

have an impact on agricultural output as well; heat stress damages crops and lowers yields. (Wazir, 2022).

Changing precipitation patterns

The patterns of precipitation in South Asia are changing due to climate change, causing changes in the amount, timing, and distribution of rainfall. Higher rainfall in some areas is increasing the risk of flooding, landslides, and waterlogging. For instance, in 2017 massive monsoon rains in Bangladesh, India, and Nepal resulted in catastrophic floods that killed millions of people and caused enormous financial damages. However, some regions are experiencing extended dry periods and drought conditions, which have a negative effect on livelihoods, agriculture, and the availability of water.

Glacial melting and sea-level rise

Thousands of glaciers may be found in the South Asian Himalayan region, and these glaciers constitute an essential supply of fresh water for the region's rivers. But increasing temperatures are speeding up the melting of glaciers, which initially increases water flow. Meltwater buildup in unstable lakes and natural dam breaches can cause glacial lake outbursts and flash floods. Long-term problems with water scarcity will arise as a result of decreasing water flow caused by glacial retreat. Coastal regions and low-lying islands are also at risk from sea level rise, which is a result of rising temperatures. For example, the Ganges-Brahmaputra-Meghna Delta is susceptible to both rising sea levels and increased river flow, which raises the possibility of flooding and saline freshwater sources.

Extreme weather events

Extreme weather occurrences in South Asia are becoming more intense due to climate change (Khan et. al. 2022). The frequency and intensity of cyclones, storms, and severe rainfall are increasing. For instance, millions of people were impacted and considerable damage was caused when Cyclone Fani made landfall on India's eastern coast in 2019. These occurrences cause extensive infrastructure damage, fatalities, community uprooting, and economic upheaval. Storm surges and cyclones are especially dangerous for coastal communities; locations such as the Bay of Bengal can suffer catastrophic consequences. (Agarwal, 2021).

Climate Change Challenges in the Brahmaputra River Basin

Climate change poses a number of special difficulties to the Brahmaputra River Basin in South Asia, with far-reaching effects on ecosystems, water supplies, and socioeconomic development. Here are the main difficulties in more detail:

Glacial Melting

The Himalayan region's temperatures have risen due to climate change, hastening the melting of glaciers.

Salinization and Intrusion of Sea Water

Salinization has a detrimental effect on the delta's biological balance, freshwater supply, and agriculture. It presents difficulties for irrigation-dependent farmers and may result in the uprooting of populations that depend on aquaculture and agriculture. (Wahal, 2022).

Biodiversity Loss and Ecosystem Disruption

The habitats and biodiversity of the Brahmaputra River Basin are impacted by climate change. Changes in temperature, flooding patterns, and water availability affect many plant and animal species and their habitats, including several migrating bird species and endangered species like the Gangetic dolphin. Ecological services include pollination, nutrient cycling, and water purification can be disrupted by changes in ecosystems, which can have an effect on the overall ecological balance and the livelihoods of people who depend on natural resources.

A comprehensive strategy encompassing adaptive infrastructure development, ecological conservation, sustainable water resource management, and regional cooperation among the riparian countries is needed to address these particular climate change concerns in the Brahmaputra River Basin. (Rahman, 2022).

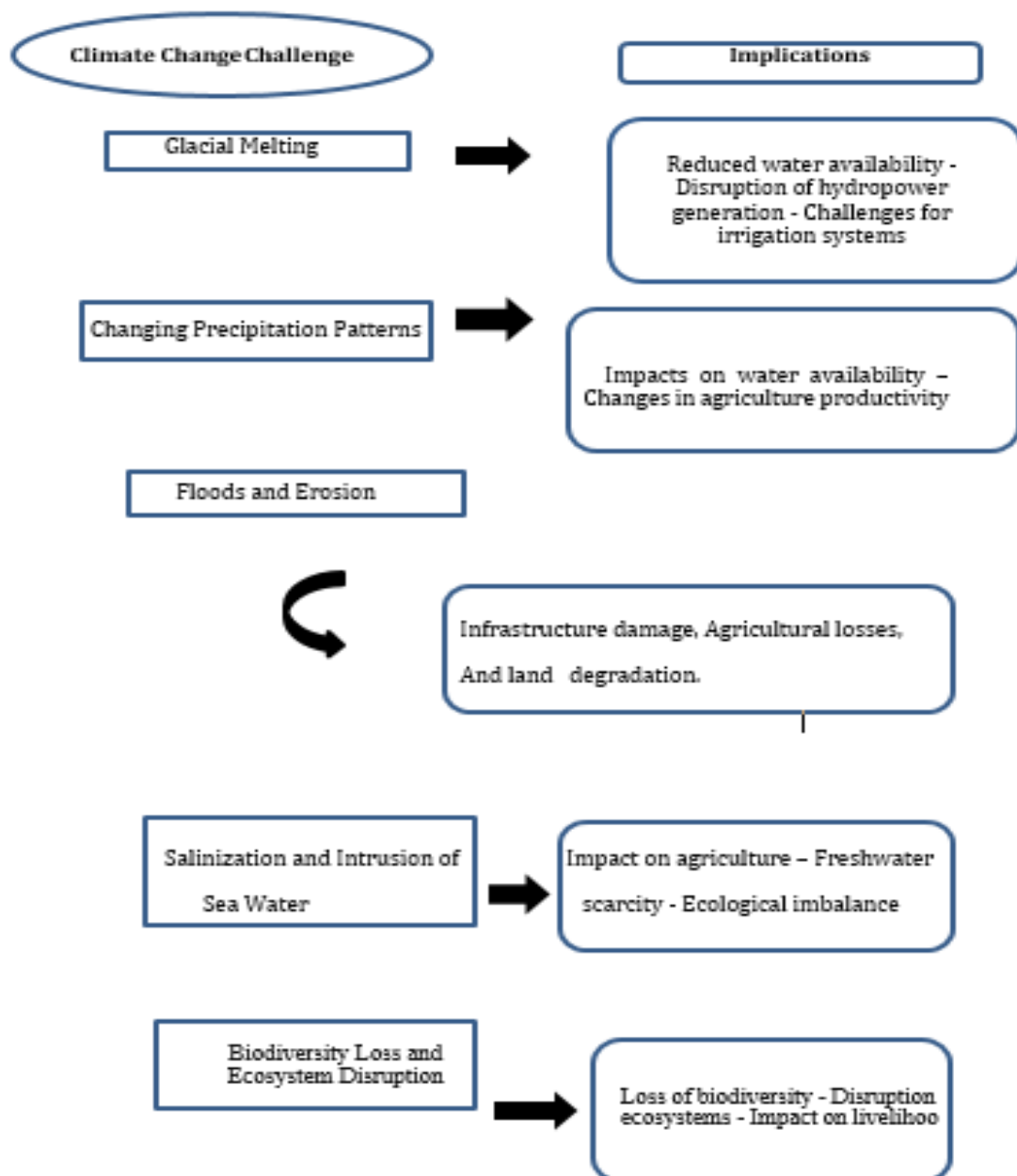


Figure 1 Climate Challenges

This chart provides a concise overview of the specific climate change challenges facing the Brahmaputra River Basin, along with their implications for water resources, ecosystems, and socio-economic development.

Geopolitical Dynamics of South Asia

India

India is the biggest and most populous nation in South Asia, and it is crucial to the geopolitics of the area. Its considerable military and economic might affects the dynamics of the area. India has been embroiled in territorial conflicts with a number of its neighbours, including China over the border in the Himalayan area and Pakistan over Kashmir. Furthermore, Prime Minister Narendra Modi's administration's "Act East Policy," which aims to improve connectivity, trade, and strategic ties with Southeast Asian nations, is one of the strategies India has used to increase its regional influence. (Kugelman, 2021).

Pakistan

Pakistan's strategic location and nuclear weapons make it a major player in South Asia. There have been several wars between the two nations as a result of the long-running territorial dispute the country has with India over the Kashmir area. Pakistan's connection with China also affects the country's geopolitical dynamics. The \$46 billion China-Pakistan Economic Corridor (CPEC) is the centrepiece project of China's Belt and Road Initiative. It was publicly introduced in 2015. It has strengthened Pakistan's status as a regional hub and the two nations' economic links. (Siddiqui, 2022).

China

In recent years, China's influence and presence in South Asia have grown significantly. The nation has contributed significantly to regional infrastructure development initiatives, including as the previously mentioned CPEC (Shah, et. el. 2020). The goal of China's Belt and Road Initiative is to increase commerce and connectivity with South Asia, which has strategic and economic ramifications. But some nations are worried about China's influence and potential for regional dominance as a result of its growing presence. (Bhatti, 2019).

Bangladesh

Bangladesh is a heavily populated nation situated in the Ganges-Brahmaputra-Meghna River basin. It has a number of geopolitical difficulties, such as managing transboundary rivers, population density, and susceptibility to the effects of climate change. Bangladesh and India have continued to work together on matters including trade, security, and water sharing. Additionally, it has made an effort to broaden its range of foreign contacts by cooperating on development and investment with nations like China and Japan. (Raza, 2022).

Bhutan

The tiny landlocked nation of Bhutan is situated in the eastern Himalayas. It has a special relationship with India that is defined by mutual reliance and close cooperation. India has been a major player in Bhutan's security and economic issues. Bhutan's strategic location between China and India affects its geopolitical dynamics. For Bhutan's security and growth, it is imperative that it maintain a careful balance in its relations with these two nations. (Prescia, 2021).

Historical and Ongoing Geopolitical Issues in South Asia

Territorial Disputes

In South Asia, territorial disputes have been a major cause of geopolitical tension, frequently resulting in hostilities and strained relations between nations. Several well-known territorial conflicts in the area include:

Kashmir Dispute (India and Pakistan)

Since 1947, there has been a protracted conflict between India and Pakistan over the Kashmir territory. Due to both nations' claims of sovereignty over the whole region, there have been several military conflicts, including major wars and continuous cross-border skirmishes. The conflict has led to a highly militarised area and affected the security and stability of the region.

Border Dispute (India and China):

A long-standing border dispute exists between China and India, especially along the Line of Actual Control (LAC) in the Himalayan region. There have been sporadic military standoffs due to the border dispute; the Doklam standoff in 2017 and the fighting in the Galwan Valley in 2020 being the most notable examples. The border dispute has not been easily resolved, and tensions still exist. (Pertwi, 2014).

Durand Line Dispute (Afghanistan and Pakistan)

The internationally acknowledged border between Afghanistan and Pakistan is known as the Durand Line. Nonetheless, Afghanistan disputes its validity as a border and asserts its claim over portions of Pakistan's regions of Khyber Pakhtunkhwa and Balochistan. Cross-border travel and bilateral relations have been impacted by the conflict.

Water Sharing Agreements

South Asia faces serious geopolitical difficulties related to water scarcity and competition for resources, especially in transboundary river basins. River sharing is common in the region, and disagreements about water allocation have surfaced. Agreements and disagreements pertaining to water sharing include (Sahni, 2006):

India and Pakistan's sharing of the waters of the Indus River system is regulated under the 1960 Indus Waters Treaty. With the waters of the three Western rivers (Indus, Jhelum, and Chenab) going to Pakistan and the three Eastern rivers (Ravi, Beas, and Sutlej) going to India, the treaty created a framework for the division of water resources from the Indus Basin. The treaty has been essential to preserving water cooperation between the two nations and has withstood numerous disagreements between them.

It includes the Teesta river dispute as well. India and Bangladesh are sharing water by the Teesta river and for over years they are negotiating on the water sharing procedures.

On the contrary, Brahmaputra river includes the major powers of South Asia as the population is increasing the demand of the water is increasing and can lead to major source of conflict in the near future.

Impact of Climate Change on the Brahmaputra River Basin

In the Brahmaputra River Basin, climate change-related phenomena like rising temperatures and changed precipitation patterns are causing greater river flow and more frequent and severe flooding episodes. The Himalayan glaciers that feed the Brahmaputra River are melting, which is causing the river's water availability and flow rates to rise. (Ahmed et al., 2019). The Brahmaputra River's flow is expected to increase, according to the Intergovernmental Panel on Climate Change (IPCC), which could result in more frequent and severe floods. (IPCC, 2014).

The disturbance brought on by floods has an impact on the biodiversity of the basin as well since it can change habitats and result in the extinction of plant and animal species. (Barman et al., 2018).

The Brahmaputra River Basin's sediment transport is also being impacted by climate change. Changes in sediment loads and the patterns of sediment deposition and erosion along rivers are caused by variations in precipitation patterns and higher river flows. River morphology, channel stability, and sedimentation patterns within the basin are all impacted by these changes.

Riverbank erosion, channel deterioration, and sediment deposition in adjacent basin regions may result from the increasing sediment load. (Barman et al., 2018).

Implications For Water Resources Management

Water shortage and resource competition in the Brahmaputra River Basin might be exacerbated by climate change-related issues including modified precipitation patterns and increasing river flow (Ahmed et al., 2019). Different industries, such as domestic usage, industry, and agriculture, may find it difficult to meet their water demands when water supply decreases. This could result in increasing rivalry and possible conflicts among stakeholders. (Bandyopadhyay et al., 2017).

Water-sharing agreements and ties among these riparian governments can be impacted by changes in water availability because the Brahmaputra River is an international river that flows through China, India, and Bangladesh (González-Vicente et al., 2019). Water resource disputes have the ability to sour diplomatic ties and undermine regional stability.

The Brahmaputra River Basin's infrastructure development and management are challenged by the shifting hydrological patterns brought on by climate change. Increased river flow and flooding can have a detrimental effect on the infrastructure that is currently in place, including irrigation systems, embankments, and dams (Barman et al., 2018).

Socio-Economic Impacts on Local Communities

Managing the geopolitical dynamics and addressing the consequences for the management of water resources in the Brahmaputra River Basin need for coordinated and integrated approaches:

- Riparian governments' regional collaboration and communication should be strengthened in order to handle water-related issues and form agreements for water sharing.
- Ensuring that water infrastructure is resilient and adaptable to shifting hydrological conditions by including climate change considerations into infrastructure planning and development.

In the Brahmaputra River Basin, those who live in low-lying areas and along riverbanks may be forced to relocate due to increased river flow and flooding occurrences brought on by climate change (Barman et al., 2018). Natural catastrophes brought on by climate change have the potential to seriously destroy infrastructure and residences, forcing people to relocate to safer locations and upsetting their social and economic networks. (Ahmed et al., 2019).

Furthermore, disputes between communities over access to water resources and land usage may result from shifting hydrological patterns, which could cause further migration and displacement. In order to reestablish their livelihoods and integrate into new communities, displaced populations may encounter social and economic obstacles. (Bandyopadhyay et al., 2017).

To lessen the effects of floods and erosion on nearby populations, embankments, river training, and erosion control techniques are built to solve the riverbank erosion.

Successful Cooperation or Conflicts Related To Climate Change

Indus Water Treaty between India and Pakistan

Signed in 1960 with World Bank backing, the Indus Water Treaty is a water-sharing deal between India and Pakistan. It was set up to control the distribution and usage of water from the two countries' shared Indus River system. Since disputes over water resources had the potential to worsen tensions between India and Pakistan, the treaty was required since the Indus River and its tributaries pass through both nations.

The six main rivers of the Indus Basin are split up by the treaty into three rivers that are allotted to India (the Ravi, Beas, and Sutlej) and three rivers that are allocated to Pakistan (the Indus, Jhelum, and Chenab). It specifies how river flows may be shared and controls the building of dams, canals, and other water-related infrastructure. In addition, the treaty creates the Indus Waters Commission, which is made up of members from both nations and acts as a forum for settling disagreements and discussing matters pertaining to the pact's execution. (World Bank, n.d.)

Conclusion

Climate change has a significant influence on South Asia's geopolitical dynamics, necessitating increased regional cooperation. Rising sea levels, increased frequency of extreme weather events, rising temperatures, and water scarcity are among the region's key issues. To solve these common issues, they do, however, provide chances for collaboration and communal initiatives.

Climate change may intensify South Asia's pre-existing geopolitical issues. Conflicts over shared water resources, such as the Indus River, may worsen as the realities of water shortage become more apparent. In addition to posing a threat to coastal communities, sea level rise may cause population displacement and migration, affecting relations among neighbouring nations. These physical changes need a reevaluation of the region's traditional geopolitical dynamics.

Climate change presents significant difficulties as well as opportunities for regional collaboration in South Asia. The challenges include resolving disputes between competing interests in shared river basins, guaranteeing fair access to water resources, and managing migration and displacement induced by environmental variables. However, these constraints may provide opportunity for collaboration, information sharing, collaborative infrastructure creation, and well-coordinated catastrophe response.

Addressing climate change is a regional and essential topic. It requires South Asian countries to cooperate and work together. If nations accept climate change as a global concern, they may be able to put aside their political differences and collaborate to lessen its effects and adapt to changing environmental circumstances. South Asian nations may increase their resilience, stability, and sustainability by collaborating on initiatives such as water management, renewable energy, and disaster preparedness.

Recommendations

- To address the challenges posed by climate change in the Brahmaputra River basin, it is essential for India, China, and Bangladesh to establish a Joint River Management Commission to enhance transboundary water cooperation, including data sharing, joint flood management, and conflict resolution mechanisms.
- Investment in climate-resilient infrastructure, such as flood control structures, sediment management systems, and water conservation technologies, is crucial. Advanced technologies like remote sensing, GIS, early warning systems, and smart water management should be adopted to improve efficiency. Engaging local communities through participation, public awareness campaigns, and capacity building will ensure sustainable development.
- Implementing Integrated Water Resource Management (IWRM) principles and harmonizing policies across the region will promote balanced water use. Strengthening regional and international cooperation, participating in regional forums, seeking support from international organizations, and promoting joint research initiatives are also vital.
- These comprehensive measures will help mitigate the impacts of climate change, reduce geopolitical tensions, and foster regional stability and socio-economic development.

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