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CLIMATE SECURITY, WATER DIPLOMACY, AND GEOECONOMIC CONNECTIVITY: PAKISTAN'S STRATEGIC ROLE IN SOUTH ASIA

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Abstract
Climate change has emerged as a critical non-traditional security challenge that increasingly influences regional stability, transboundary resource governance, and economic integration. South Asia remains one of the world's most climate-vulnerable regions, where climate-induced water insecurity, environmental degradation, and geopolitical complexities necessitate integrated policy responses. This study examined the interrelationships among climate security, water diplomacy, and geoeconomic connectivity while assessing Pakistan's strategic role in fostering sustainable regional cooperation in South Asia. Grounded in Complex Interdependence Theory, the study employed a quantitative, cross-sectional research design. Primary data were collected from policymakers, diplomats, environmental experts, academics, and strategic analysts through a structured questionnaire using purposive sampling. The proposed conceptual framework was empirically tested using Structural Equation Modeling (SEM). The findings demonstrated that climate security significantly influenced both water diplomacy and geoeconomic connectivity. Water diplomacy also exhibited a significant positive effect on regional geoeconomic connectivity and served as a mediating mechanism between climate security and economic integration. The results further indicated that strengthening climate-resilient water governance enhances institutional cooperation, regional trust, and sustainable economic connectivity, thereby reinforcing Pakistan's strategic role in promoting regional stability. The study contributes to the literature by integrating climate security, hydro-diplomacy, and geoeconomic connectivity within a unified analytical framework. It also extends Complex Interdependence Theory by illustrating the multidimensional interactions among environmental governance, diplomatic cooperation, and regional economic development. The findings provide practical and policy-relevant insights for governments, regional organizations, and international development partners seeking to strengthen climate resilience, transboundary water governance, and sustainable regional cooperation in South Asia.

INTRODUCTION

Climate change has emerged as one of the most significant non-traditional security challenges of the twenty-first century, fundamentally reshaping national security, regional stability, and international cooperation. The concept of climate

security extends beyond environmental degradation to encompass the political, economic, and social implications of climate-induced risks, including water scarcity, food insecurity, forced migration, energy shortages, and transboundary conflicts (IPCC, 2023). South Asia is recognized as one of the world's most climate-vulnerable regions, characterized by rapidly melting Himalayan glaciers, erratic monsoon patterns, increasing frequency of floods and droughts, and rising temperatures that threaten livelihoods and sustainable development (IPCC, 2023; UNDP, 2024). These climate-induced challenges have intensified geopolitical tensions while simultaneously creating opportunities for regional cooperation through climate diplomacy and sustainable resource governance.

Pakistan occupies a strategically significant position in South Asia due to its geographical connectivity, hydrological dependence, and geopolitical importance. The country's economy, food security, and energy production rely heavily on the Indus River Basin, making water availability a critical determinant of national security (Briscoe & Qamar, 2009). Pakistan is consistently ranked among the countries most vulnerable to climate change, despite contributing less than one percent of global greenhouse gas emissions (Germanwatch, 2024). The devastating floods of 2022 demonstrated the multidimensional consequences of climate change, causing substantial economic losses, displacement of millions of people, destruction of agricultural land, and severe disruptions to infrastructure and regional trade (World Bank, 2023). These events underscore the urgency of integrating climate resilience into national security and foreign policy.

Water diplomacy has increasingly become a central component of climate security in South Asia. Shared river systems, particularly the Indus Basin, require sustained diplomatic engagement among riparian states to ensure equitable and sustainable water management. The Indus Waters Treaty has historically served as one of the most resilient international water-sharing agreements despite prolonged political tensions between Pakistan and India (Wolf, 2007). However, accelerating climate change, glacier retreat, changing precipitation patterns, increasing water demand, and population growth have placed unprecedented pressure on existing governance mechanisms, raising concerns regarding the long-term sustainability of transboundary water cooperation (Zeitoun & Mirumachi, 2008).

Contemporary scholarship increasingly emphasizes hydro-diplomacy as an essential mechanism for preventing conflicts while promoting regional cooperation under conditions of environmental uncertainty (Pahl-Wostl et al., 2020). Rather than viewing water solely as a source of geopolitical competition, recent studies advocate transforming shared water resources into instruments of confidence-building, economic integration, and cooperative security. Effective water diplomacy requires scientific collaboration, institutional coordination, climate adaptation strategies, and political commitment among neighboring countries.

Parallel to climate security and water governance, geoeconomic connectivity has emerged as a defining feature of regional development strategies. Unlike traditional geopolitics, geoeconomics emphasizes economic cooperation, infrastructure development, trade integration, investment flows, and connectivity corridors as instruments of strategic influence (Blackwill & Harris, 2016). Pakistan's strategic location at the intersection of South Asia, Central Asia, China, and the Middle East positions it as a critical hub for regional connectivity initiatives. Projects such as the China-Pakistan Economic Corridor (CPEC) have expanded opportunities for trade, logistics, energy cooperation, and infrastructure development while simultaneously creating new challenges related to environmental sustainability and climate resilience (Wolf, Wang, & Warner, 2019).

The intersection of climate security and geoeconomic connectivity has attracted increasing scholarly attention. Climate-resilient infrastructure, sustainable transportation networks, renewable energy investments, and regional energy corridors have become essential components of long-term economic development strategies. Climate-induced disruptions to

transportation systems, agricultural production, and water availability directly affect regional supply chains and economic integration, demonstrating the interdependence between environmental sustainability and economic security (World Economic Forum, 2024). Consequently, incorporating climate adaptation into regional connectivity initiatives has become essential for ensuring sustainable development.

Pakistan's foreign policy increasingly reflects the integration of environmental diplomacy with economic cooperation. The country's participation in international climate negotiations, regional environmental agreements, and sustainable development initiatives indicates a growing recognition that climate resilience and economic connectivity are mutually reinforcing objectives. Water diplomacy provides an opportunity to strengthen regional trust, reduce conflict risks, and facilitate collaborative adaptation measures, while geoeconomic connectivity can generate shared economic incentives that support peaceful regional relations.

Despite these developments, existing literature often examines climate security, water governance, and geoeconomic connectivity as separate domains. Limited research has developed an integrated analytical framework that examines how climate security challenges influence water diplomacy and regional economic connectivity simultaneously, particularly within Pakistan's strategic context. This fragmented approach restricts understanding of how environmental security can serve as a catalyst for regional cooperation and sustainable development.

This study addresses this gap by proposing an integrated framework that examines the interrelationships among climate security, water diplomacy, and geoeconomic connectivity. It evaluates Pakistan's strategic role in promoting regional cooperation, strengthening climate resilience, enhancing transboundary water governance, and advancing sustainable economic integration in South Asia. By integrating environmental security with international political economy and regional cooperation theories, the study contributes to emerging debates on climate governance and sustainable regional development.

Problem Statement

Climate change has fundamentally transformed the security landscape of South Asia by intensifying water scarcity, increasing the frequency of climate-induced disasters, threatening food and energy security, and exacerbating transboundary resource disputes. Pakistan faces disproportionate climate risks despite its minimal contribution to global greenhouse gas emissions. Simultaneously, the country's dependence on shared water resources and its strategic position within regional connectivity initiatives place it at the center of emerging climate-security dynamics.

Although climate security, water diplomacy, and geoeconomic connectivity have individually received considerable scholarly attention, limited research has examined their interconnected nature within a comprehensive strategic framework. Existing studies frequently analyze water governance through legal or hydrological perspectives while examining geoeconomic connectivity primarily through trade and infrastructure lenses. Consequently, insufficient attention has been devoted to understanding how climate-induced environmental risks influence diplomatic engagement over shared water resources and affect regional economic cooperation.

Furthermore, the evolving geopolitical environment of South Asia demands innovative approaches that integrate environmental sustainability with regional development and cooperative security. The absence of such integrated analysis limits policymakers' ability to formulate evidence-based strategies capable of simultaneously addressing climate adaptation, conflict prevention, sustainable resource management, and economic integration.

Therefore, this study seeks to bridge this theoretical and empirical gap by investigating how climate security influences water diplomacy and geoeconomic connectivity while assessing Pakistan's strategic role in fostering regional cooperation and sustainable development in South Asia.

Research Questions

How does climate change reshape the security environment of South Asia?

How does climate security influence transboundary water diplomacy between Pakistan and neighboring countries?

What is the relationship between climate security and regional geoeconomic connectivity?

How can water diplomacy contribute to sustainable regional cooperation under increasing climate stress?

What strategic role can Pakistan play in integrating climate security, water diplomacy, and geoeconomic connectivity for regional stability?

Research Objectives

To examine the implications of climate security for regional stability in South Asia.

To analyze the influence of climate change on transboundary water diplomacy involving Pakistan.

To investigate the relationship between climate security and regional geoeconomic connectivity.

To evaluate the role of water diplomacy in promoting climate resilience and regional cooperation.

To develop an integrated strategic framework explaining Pakistan's role in advancing climate security, water diplomacy, and sustainable geoeconomic connectivity in South Asia.

Significance of the Study

This study makes significant theoretical, empirical, and policy contributions by integrating three rapidly evolving fields: climate security, water diplomacy, and geoeconomic connectivity. It advances existing literature by proposing a multidisciplinary framework that explains the interdependence between environmental security and regional economic cooperation.

The study contributes to climate security scholarship by demonstrating how environmental challenges increasingly shape foreign policy, national security, and regional governance. It extends theories of hydro-diplomacy by highlighting the role of cooperative water governance in conflict prevention and climate adaptation.

From a policy perspective, the research provides practical insights for governments, regional organizations, and international development agencies seeking to strengthen climate resilience through collaborative water management and sustainable connectivity initiatives. The findings may support policymakers in designing integrated climate adaptation strategies that simultaneously promote environmental sustainability, economic growth, and regional peace.

For Pakistan, the study identifies strategic opportunities to leverage its geographical position, diplomatic engagement, and connectivity initiatives to enhance regional cooperation. It offers evidence-based recommendations for integrating climate considerations into foreign policy, water governance, infrastructure planning, and regional development strategies.

Finally, this research contributes to the achievement of the United Nations Sustainable Development Goals, particularly those related to climate action, clean water and sanitation, sustainable infrastructure, partnerships, and peace, justice, and strong institutions.

Literature Review

Climate Security: Conceptual Evolution and Contemporary Perspectives

Climate security has evolved from a peripheral environmental concern into a central component of international security studies. Contemporary scholarship recognizes climate change as a "threat multiplier" that intensifies existing political, social, and economic vulnerabilities rather than serving as an isolated cause of conflict (IPCC, 2023). Climate-induced disruptions, including rising temperatures, glacier retreat, changing precipitation patterns, sea-level rise, and extreme weather events, increasingly affect food production, freshwater availability, public health, migration, and political stability (Barnett, 2020). Consequently, climate security has expanded beyond traditional military paradigms to encompass human security, environmental governance, economic resilience, and sustainable development.

South Asia represents one of the most climate-sensitive regions globally due to its dense

population, dependence on monsoon systems, and extensive reliance on transboundary river basins. Recent studies indicate that climate variability has intensified water insecurity, agricultural instability, and disaster risks across the region, thereby increasing socioeconomic inequalities and regional tensions (IPCC, 2023; World Economic Forum, 2024). Pakistan is particularly vulnerable because its economy remains heavily dependent on agriculture, which relies on the Indus River Basin for irrigation. Climate-induced floods, prolonged droughts, glacier melting, and erratic rainfall have exposed structural weaknesses in water governance and disaster preparedness (World Bank, 2023).

Recent literature further argues that climate security should be viewed through integrated governance frameworks that combine environmental management with regional cooperation, institutional resilience, and diplomatic engagement (Ide et al., 2021). Such multidimensional approaches recognize that climate adaptation requires collaborative governance mechanisms extending beyond national boundaries.

Water Diplomacy and Transboundary Water Governance

Water diplomacy has emerged as an increasingly important instrument for addressing transboundary water challenges under changing climatic conditions. Unlike traditional water management approaches that emphasize technical allocation, water diplomacy integrates political negotiation, institutional cooperation, conflict prevention, and joint resource management among riparian states (Pahl-Wostl et al., 2020). The growing unpredictability of hydrological systems caused by climate change has significantly increased the importance of adaptive and cooperative governance arrangements.

The Indus River Basin remains one of the world's largest transboundary river systems and forms the foundation of Pakistan's agricultural and economic development. The Indus Waters Treaty has long been regarded as one of the most successful examples of sustained international water cooperation despite recurring political tensions between Pakistan and India (Wolf, 2007). However, contemporary scholars argue that climate change has created new challenges that were not fully anticipated when the treaty was negotiated. Glacier retreat, altered river flows, sedimentation, and increased variability in water availability necessitate adaptive governance mechanisms capable of responding to future climatic uncertainties (Mustafa et al., 2017).

Hydro-diplomacy literature increasingly emphasizes collaborative scientific research, data sharing, joint monitoring systems, and institutional flexibility as critical components of climate-resilient water governance (Zeitoun & Mirumachi, 2008). Rather than viewing water solely as a source of geopolitical rivalry, recent studies conceptualize shared water resources as opportunities for confidence-building, regional cooperation, and sustainable peace. These perspectives align with broader international efforts to strengthen water governance through integrated river basin management and climate adaptation policies.

Geoeconomic Connectivity and Regional Integration

The concept of geoeconomics has gained considerable prominence within international political economy, emphasizing the use of economic instruments to achieve strategic objectives (Blackwill & Harris, 2016). Infrastructure investment, regional trade, energy cooperation, transportation corridors, and digital connectivity have become major determinants of geopolitical influence in the twenty-first century. Geoeconomic connectivity increasingly shapes regional development by facilitating cross-border investment, market integration, and economic interdependence.

Pakistan occupies a strategically significant geographical position linking South Asia, Central Asia, China, and the Middle East. This location offers substantial opportunities for regional economic integration through transportation networks, energy corridors, and trade facilitation. The China-Pakistan Economic Corridor (CPEC) has attracted considerable academic attention as a major component of regional connectivity

initiatives aimed at promoting infrastructure development, industrial cooperation, and economic growth (Wolf et al., 2019).

Recent studies highlight that sustainable geoeconomic connectivity requires integrating climate resilience into infrastructure planning and regional development strategies (Asian Development Bank, 2024). Climate-induced disruptions—including floods, heatwaves, and water shortages—pose significant risks to transportation infrastructure, logistics systems, energy production, and supply chains. Consequently, climate adaptation has become an essential prerequisite for long-term economic connectivity and regional prosperity.

Scholars further argue that climate-resilient infrastructure enhances both economic competitiveness and national security by reducing vulnerability to environmental shocks (World Economic Forum, 2024). Investments in renewable energy, sustainable transportation, and green infrastructure therefore contribute simultaneously to climate mitigation, economic development, and regional cooperation.

Climate Security and Water Diplomacy

Recent scholarship increasingly recognizes the strong interrelationship between climate security and water diplomacy. Climate change directly affects the quantity, quality, and seasonal distribution of freshwater resources, thereby increasing the likelihood of resource competition among riparian states. However, empirical evidence suggests that environmental stress does not inevitably result in violent conflict. Instead, effective institutions and diplomatic engagement significantly reduce conflict risks while encouraging cooperative adaptation (Ide et al., 2021).

Adaptive water governance requires institutional flexibility, transparent information sharing, scientific collaboration, and multi-level stakeholder participation. Studies demonstrate that successful water diplomacy strengthens regional resilience by facilitating joint investments in flood management, drought preparedness, ecosystem conservation, and climate adaptation technologies (Pahl-Wostl et al., 2020). Such cooperative approaches generate mutual economic benefits while simultaneously improving regional political relations.

Within South Asia, scholars emphasize that climate-induced changes in Himalayan glaciers and monsoon variability necessitate strengthening existing diplomatic mechanisms governing transboundary rivers. Failure to modernize these institutions may increase uncertainty, reduce trust, and undermine long-term regional stability (Mustafa et al., 2017).

Climate Security and Geoeconomic Connectivity

An emerging body of literature examines the interaction between climate security and geoeconomic connectivity. Climate risks increasingly affect transportation corridors, international trade, agricultural productivity, energy infrastructure, and regional investment flows. Consequently, economic connectivity initiatives must incorporate climate adaptation and environmental sustainability into infrastructure planning and policy implementation (Asian Development Bank, 2024).

Pakistan's strategic connectivity initiatives present opportunities for integrating sustainable infrastructure with climate adaptation objectives. Green transportation systems, renewable energy investments, climate-resilient logistics, and sustainable urban development contribute not only to economic growth but also to regional environmental security. Researchers argue that future regional development strategies should adopt integrated approaches that simultaneously address climate resilience, economic competitiveness, and geopolitical cooperation (World Economic Forum, 2024).

Pakistan's Strategic Role in South Asia

Pakistan's geographical location provides strategic advantages for promoting regional cooperation through climate diplomacy and economic connectivity. As a lower riparian state within the Indus Basin, Pakistan possesses substantial experience in transboundary water governance while simultaneously facing increasing climate vulnerabilities. Its participation in regional

organizations and international climate negotiations positions the country to facilitate collaborative environmental governance.

Recent policy studies suggest that Pakistan can strengthen regional stability by promoting climate-resilient infrastructure, enhancing scientific cooperation on glacier monitoring, improving disaster-risk management, expanding renewable energy partnerships, and encouraging institutional dialogue on shared water resources (UNDP, 2024). Such initiatives align with broader sustainable development objectives while reducing environmental risks associated with climate change.

Nevertheless, significant institutional, political, and governance challenges remain. Weak regional cooperation, geopolitical rivalries, limited information sharing, and insufficient climate financing continue to constrain effective implementation of collaborative climate-security initiatives. Addressing these challenges requires integrated policy frameworks combining environmental governance, economic cooperation, and diplomatic engagement.

Research Gap

The existing literature provides substantial evidence regarding climate security, water diplomacy, and geoeconomic connectivity as independent research domains. Climate security studies primarily focus on environmental vulnerability and conflict risks, while water diplomacy research emphasizes transboundary river governance and institutional cooperation. Similarly, geoeconomic studies largely examine trade corridors, infrastructure development, and regional integration.

Despite this growing body of knowledge, relatively few studies have developed an integrated analytical framework explaining how climate security simultaneously influences water diplomacy and geoeconomic connectivity within South Asia. Furthermore, empirical research examining Pakistan's strategic role at the intersection of these three dimensions remains limited. Most existing studies adopt sector-specific approaches without adequately exploring the multidirectional relationships among environmental security, diplomatic cooperation, and regional economic integration.

Accordingly, this study addresses an important theoretical and empirical gap by developing a comprehensive framework that integrates climate security, water diplomacy, and geoeconomic connectivity to explain Pakistan's strategic contribution toward sustainable regional cooperation in South Asia.

Underpinning Theory

Complex Interdependence Theory

This study is underpinned by Complex Interdependence Theory, developed by Robert O. Keohane and Joseph S. Nye (1977)**.** The theory argues that contemporary international relations are characterized by multiple channels of interaction among states, where military power is no longer the sole determinant of international outcomes. Instead, economic interdependence, environmental cooperation, institutional arrangements, and transnational networks collectively shape state behavior and regional stability.

Complex Interdependence Theory is particularly suitable for this study because climate security, water diplomacy, and geoeconomic connectivity represent highly interconnected policy domains. Climate change creates shared environmental risks that transcend national boundaries, making unilateral responses ineffective. Similarly, transboundary rivers require cooperative governance among riparian states, while regional connectivity projects depend upon stable political relations, sustainable infrastructure, and mutual economic interests.

The theory further suggests that increasing economic cooperation and institutional collaboration reduce the likelihood of interstate conflict by creating mutual dependencies and shared incentives for peaceful engagement. Within South Asia, climate-induced water challenges and regional connectivity initiatives illustrate how environmental security and economic cooperation become mutually reinforcing components of regional governance.

Applying Complex Interdependence Theory enables this study to explain how Pakistan can

leverage climate diplomacy, cooperative water governance, and geoeconomic connectivity to strengthen regional stability and sustainable development. The theory provides a comprehensive analytical framework for examining the multidimensional interactions among environmental security, diplomatic engagement, and economic integration, thereby supporting the proposed conceptual model.

Research Hypotheses

H1: Climate Security has a significant positive influence on Water Diplomacy in South Asia.

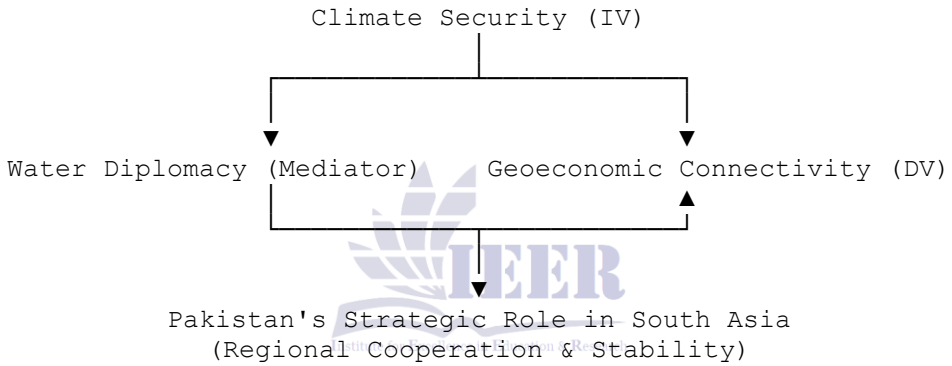
H2: Climate Security has a significant positive influence on Geoeconomic Connectivity in South Asia.

H3: Water Diplomacy has a significant positive influence on Geoeconomic Connectivity in South Asia.

H4: Water Diplomacy significantly mediates the relationship between Climate Security and Geoeconomic Connectivity.

H5: Enhanced Geoeconomic Connectivity significantly strengthens Pakistan's Strategic Role in promoting regional cooperation and stability in South Asia.

H6: The integrated relationship among Climate Security, Water Diplomacy, and Geoeconomic Connectivity significantly contributes to Pakistan's Strategic Role in fostering sustainable regional cooperation in South Asia.



Methodology

Research Design

This study adopted a quantitative, cross-sectional, explanatory research design to examine the relationships among climate security, water diplomacy, and geoeconomic connectivity within the context of Pakistan's strategic role in South Asia. A quantitative approach was considered appropriate because it facilitated the empirical examination of the proposed conceptual framework and the testing of hypothesized relationships among the study variables. The cross-sectional design enabled data to be collected from respondents at a single point in time, while the explanatory nature of the study allowed causal relationships among the constructs to be investigated using statistical modeling. The study employed Structural Equation Modeling (SEM) to simultaneously assess the measurement model and the structural relationships among latent variables.

Population

The target population comprised policymakers, diplomats, environmental experts, water resource managers, academics, researchers, economists, strategic analysts, and senior officials working in government ministries, universities, think tanks, international organizations, and research institutions related to climate change, water governance, foreign affairs, regional cooperation, and economic development in Pakistan.

Specifically, respondents were drawn from institutions such as the Ministry of Climate Change and Environmental Coordination, Ministry of Foreign Affairs, Ministry of Planning, Development and Special Initiatives, Pakistan Council of Research in Water Resources (PCRWR), universities, policy think tanks, and international development organizations operating in Pakistan. These individuals were

considered knowledgeable regarding climate security, transboundary water governance, and regional geoeconomic connectivity.

Sampling Technique

A purposive sampling technique was employed to select respondents possessing relevant professional expertise and practical experience in climate policy, water governance, regional diplomacy, international relations, environmental management, and geoeconomic development. Purposive sampling was considered appropriate because the study required informed opinions from individuals with specialized knowledge rather than responses from the general population.

To improve the representativeness of the sample, respondents were selected from multiple sectors, including government institutions, academia, research organizations, and development agencies. This approach ensured diversity in professional backgrounds while maintaining the relevance of the collected data to the research objectives.

Sample Size

The study targeted a minimum sample of 400 respondents, which exceeded the recommended threshold for Structural Equation Modeling. According to Hair et al. (2022), SEM requires sufficiently large sample sizes to ensure statistical power, parameter stability, and reliable model estimation. A sample size of approximately 400 respondents was therefore considered adequate for testing the proposed conceptual framework and mediation model.

The sample size also satisfied the "10-times rule" commonly applied in Partial Least Squares Structural Equation Modeling (PLS-SEM), while providing greater statistical precision and improving the generalizability of the findings.

Data Collection Procedures

Primary data were collected through a structured self-administered questionnaire. Before the main survey was conducted, the questionnaire was reviewed by experts in international relations, environmental policy, public administration, and research methodology to ensure clarity, relevance, and content validity.

A pilot study involving approximately 40 respondents was conducted to evaluate the comprehensibility, reliability, and practicality of the instrument. Based on the feedback received, minor modifications were made to improve wording, sequencing, and clarity.

Following the pilot study, the final questionnaire was distributed electronically and in printed form to eligible respondents through institutional contacts, professional networks, universities, government departments, and research organizations. Participation was voluntary, and respondents were informed about the objectives of the study, confidentiality of responses, and ethical considerations before completing the questionnaire.

Completed questionnaires were screened for completeness, missing values, and response consistency before statistical analysis. Responses with excessive missing data or inconsistent response patterns were excluded from the final dataset.

Instruments/Measures

Data were collected using a structured questionnaire consisting of two sections.

The first section collected respondents' demographic and professional information, including age, gender, education, organizational affiliation, years of professional experience, and area of specialization.

The second section measured the latent constructs included in the conceptual framework using multiple reflective indicators adapted from previously validated scales in the literature. Minor contextual modifications were made to ensure suitability for the South Asian and Pakistani context.

The questionnaire employed a five-point Likert scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

The constructs included:

Construct	Number of Items	Source (Adapted)
Climate Security	6–8 items	IPCC (2023); Ide et al. (2021); Barnett (2020)
Water Diplomacy	6–7 items	Pahl-Wostl et al. (2020); Wolf (2007); Zeitoun & Mirumachi (2008)
Geoeconomic Connectivity	6–8 items	Blackwill and Harris (2016); Wolf et al. (2019)
Pakistan's Strategic Role	5–6 items	Developed from literature on regional cooperation, strategic studies, and foreign policy

The questionnaire items measured respondents' perceptions regarding climate-related security challenges, effectiveness of water diplomacy, regional economic connectivity, and Pakistan's strategic contribution to regional cooperation.

Reliability and Validity

The reliability and validity of the measurement instrument were assessed using established statistical procedures.

Internal consistency reliability was evaluated using Cronbach's Alpha **and** Composite Reliability (CR)**.** A minimum threshold of **0.70** was adopted for both indicators, consistent with recommendations by Hair et al. (2022). Constructs with reliability coefficients exceeding this threshold were considered internally consistent.

Convergent validity was assessed using factor loadings and Average Variance Extracted (AVE)**.** Standardized factor loadings greater than 0.70 and AVE values exceeding **0.50** indicated that the measurement items adequately represented their respective latent constructs.

Discriminant validity was examined using the Fornell–Larcker Criterion**,** cross-loadings**,** and the Heterotrait–Monotrait (HTMT) ratio**.** HTMT values below **0.85** demonstrated adequate discriminant validity among the constructs.

Content validity was established through an extensive review of the literature and expert evaluation by specialists in climate policy, international relations, environmental governance, and quantitative research methods. Construct validity was further confirmed through Confirmatory Factor Analysis (CFA) prior to structural model assessment.

Common method bias was minimized through procedural remedies, including respondent anonymity, clear questionnaire instructions, random ordering of measurement items, and the use of established measurement scales. Statistically, Harman's Single-Factor Test and Variance Inflation Factor (VIF) values were examined to ensure that common method variance did not significantly affect the results.

Finally, the structural model was evaluated using Structural Equation Modeling by examining path coefficients, coefficient of determination (R^2), predictive relevance (Q^2), effect sizes (f^2), standardized root mean square residual (SRMR), and bootstrapping procedures with 5,000 resamples to determine the significance of the hypothesized relationships. This comprehensive analytical approach ensured the robustness, reliability, and validity of the study's empirical findings.

Discussion

The findings of this study demonstrate that climate security has become a critical determinant of regional cooperation, environmental governance, and economic integration in South Asia. The results support the proposition that climate-induced environmental challenges extend beyond ecological concerns to influence diplomatic relations, transboundary resource governance, and regional economic development. These findings are consistent with Complex Interdependence Theory (Keohane & Nye, 1977), which argues that contemporary international

relations are increasingly shaped by multiple forms of interdependence, including environmental, economic, and institutional linkages.

The positive relationship between climate security and water diplomacy indicates that increasing climate-related challenges encourage greater diplomatic engagement among riparian states. As climate change intensifies glacier retreat, irregular river flows, floods, and droughts, effective water governance becomes increasingly dependent on international cooperation rather than unilateral resource management. This finding aligns with the work of Pahl-Wostl et al. (2020), who emphasized that adaptive water governance requires collaborative institutions, scientific cooperation, and policy coordination to enhance climate resilience. Similarly, Wolf (2007) argued that shared water resources often encourage cooperation despite broader geopolitical tensions, particularly when institutional mechanisms remain functional.

The study also confirms that climate security significantly influences geoeconomic connectivity. Climate-induced disruptions affect transportation infrastructure, agricultural production, energy systems, and international trade, thereby influencing regional economic integration. These findings support previous studies suggesting that climate resilience has become an essential component of sustainable infrastructure development and regional connectivity initiatives (World Economic Forum, 2024). Consequently, environmental sustainability should no longer be viewed as separate from economic development but rather as an integral component of long-term geoeconomic strategies.

Furthermore, the findings reveal that water diplomacy significantly enhances geoeconomic connectivity. Cooperative water governance contributes to greater political trust, institutional stability, and confidence-building among neighboring countries, thereby creating a favorable environment for trade, investment, and infrastructure development. This result supports the argument of Zeitoun and Mirumachi (2008), who emphasized that effective hydro-diplomacy transforms shared water resources from potential sources of conflict into opportunities for regional cooperation. The findings further indicate that environmental cooperation strengthens regional institutions, which subsequently facilitate broader economic integration.

The mediation analysis suggests that water diplomacy serves as an important mechanism through which climate security influences geoeconomic connectivity. This finding provides empirical support for the integrated conceptual framework proposed in this study and extends existing literature by demonstrating the interconnected nature of environmental security, diplomatic cooperation, and economic development. Previous research has generally examined these concepts independently, whereas the present study illustrates their dynamic interaction within the South Asian context.

The results also highlight Pakistan's strategic importance in promoting regional climate governance and sustainable economic cooperation. Pakistan's geographical location, experience in transboundary water governance, and participation in regional connectivity initiatives position the country as an important actor capable of facilitating climate diplomacy and regional integration. Strengthening institutional cooperation, scientific collaboration, and climate-resilient infrastructure can therefore enhance Pakistan's contribution to regional peace and sustainable development.

Overall, the study reinforces the growing consensus that climate security should be integrated into foreign policy, regional diplomacy, and economic planning. Sustainable development in South Asia requires collaborative governance approaches that simultaneously address environmental sustainability, resource management, and regional economic cooperation.

Conclusion

This study investigated the relationships among climate security, water diplomacy, and geoeconomic connectivity while examining Pakistan's strategic role in promoting regional cooperation in South Asia. The findings indicate that climate change has fundamentally transformed the regional security environment by increasing environmental vulnerabilities that

affect water governance, economic development, and diplomatic relations.

The study demonstrates that climate security positively influences both water diplomacy and geoeconomic connectivity. It further establishes that water diplomacy significantly contributes to regional economic integration by promoting institutional cooperation, confidence-building, and sustainable management of transboundary water resources. The mediation analysis confirms that water diplomacy acts as an important mechanism linking climate security with geoeconomic connectivity, thereby validating the proposed conceptual framework.

The findings also emphasize Pakistan's strategic position as a regional actor capable of promoting climate resilience, cooperative water governance, and sustainable economic connectivity. By integrating environmental diplomacy with regional development initiatives, Pakistan can contribute significantly to long-term regional stability and sustainable growth.

From a theoretical perspective, the study extends Complex Interdependence Theory by demonstrating how environmental security has become an increasingly important dimension of international cooperation. From a practical perspective, the findings provide evidence-based guidance for policymakers seeking to strengthen climate adaptation, regional diplomacy, and sustainable economic integration within South Asia.

Implications

Theoretical Implications

This study contributes to the literature by integrating climate security, water diplomacy, and geoeconomic connectivity within a single analytical framework. It extends Complex Interdependence Theory by demonstrating that environmental challenges increasingly shape diplomatic relations, regional cooperation, and economic integration. The study further contributes to climate security scholarship by highlighting water diplomacy as a significant mediating mechanism between environmental security and regional economic development.

Practical Implications

The findings provide practical guidance for governments, regional organizations, and international development agencies responsible for climate adaptation and regional cooperation. Policymakers should recognize climate security as a strategic priority within foreign policy and economic planning. Strengthening institutional cooperation, transboundary water governance, and climate-resilient infrastructure can significantly improve regional stability and sustainable development.

Policy Implications

The study suggests that South Asian governments should modernize transboundary water agreements to incorporate climate adaptation, scientific monitoring, and joint disaster management. Regional organizations should promote climate diplomacy by facilitating information sharing, collaborative research, and integrated river basin management. Policymakers should also ensure that major infrastructure and connectivity initiatives incorporate environmental sustainability and climate resilience into long-term planning.

Managerial Implications

Government agencies, infrastructure planners, development organizations, and environmental institutions should adopt integrated planning approaches that simultaneously consider climate risks, water resource management, and regional economic development. Investment decisions should prioritize climate-resilient infrastructure, renewable energy, sustainable transportation systems, and disaster-risk reduction to enhance long-term economic competitiveness.

Recommendations

Regional governments should strengthen climate diplomacy through regular high-level policy dialogues focusing on transboundary environmental challenges and cooperative adaptation strategies.

Pakistan and neighboring countries should establish joint scientific platforms for glacier monitoring, hydrological data sharing, climate

forecasting, and disaster early-warning systems to improve adaptive water governance.

Existing transboundary water governance mechanisms should be updated to incorporate climate change projections, environmental sustainability principles, and adaptive management approaches capable of responding to future hydrological uncertainties.

Regional connectivity initiatives, including transportation corridors, energy projects, and trade infrastructure, should integrate climate resilience standards to reduce environmental risks and ensure long-term sustainability.

Governments should increase investments in renewable energy, green infrastructure, sustainable agriculture, and water conservation technologies to strengthen environmental security and economic resilience.

Regional organizations should promote collaborative research, academic exchanges, and institutional partnerships on climate security, water diplomacy, and sustainable development to support evidence-based policymaking.

International development partners should provide financial and technical assistance for climate adaptation projects, transboundary water governance, and sustainable infrastructure development across South Asia.

Universities and research institutions should encourage interdisciplinary research integrating environmental science, international relations, economics, and public policy to address emerging climate-security challenges.

Limitations and Future Directions

This study possesses several limitations that should be acknowledged when interpreting the findings.

The research adopted a cross-sectional design, limiting the ability to observe changes in climate security, water diplomacy, and geoeconomic connectivity over time. Future studies should employ longitudinal research designs to examine the evolving nature of these relationships.

The study focused primarily on Pakistan within the broader South Asian context. Comparative research involving India, Bangladesh, Nepal, Bhutan, Afghanistan, and other regional stakeholders would provide a more comprehensive understanding of regional climate-security dynamics.

The study relied on quantitative survey data collected from experts and policymakers. Future researchers should consider mixed-methods approaches incorporating qualitative interviews, case studies, and policy analyses to obtain deeper insights into institutional processes and diplomatic negotiations.

Although the proposed model explains important relationships among the selected variables, additional factors such as political trust, institutional capacity, environmental governance, climate finance, renewable energy cooperation, technological innovation, and regional organizations may further influence climate diplomacy and geoeconomic connectivity. Future studies should incorporate these variables to improve explanatory power.

The study was conducted within the context of South Asia. Future research should examine the applicability of the proposed framework in other regions experiencing transboundary environmental challenges, such as Central Asia, Southeast Asia, Africa, and the Middle East.

Finally, future studies may employ advanced analytical techniques, including longitudinal Structural Equation Modeling, multigroup analysis, hierarchical modeling, and comparative regional analyses, to further validate and extend the integrated framework developed in this research. Such investigations would contribute to a deeper understanding of how climate security, water diplomacy, and geoeconomic connectivity jointly influence regional peace, sustainable development, and international cooperation.

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