CLIMATE CHANGE
PROGRAM
2023
South Asian
CONFERENCE

Dhaka, November 25-26

1ST SOUTH ASIAN CONFERENCE ON "UNFOLDING EMERGING ISSUES IN THE CONTEXT OF CHANGING CLIMATIC SCENARIO"

DHAKA, NOVEMBER 25-26,

2023

CENTER FOR PEOPLE & ENVIRON · Arannayk foundation · OXFAM · BARCIK · LEDARS · CAPS Center for Atmospheric Pollution Studies · DIU

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1ST SOUTH ASIAN CONFERENCE ON "UNFOLDING EMERGING ISSUES IN THE CONTEXT OF CHANGING CLIMATIC SCENARIO"

About the Conference

The South Asian Conference on "Unfolding Emerging Issues in the Context of Changing Climatic Scenario" is a ground-breaking conference designed to address the crucial environmental issues that South Asian countries are facing as a result of climate change. The eminent Academicians, researchers, policymakers, scientists, and activists from across the region will gather at the conference to discuss the complex interactions between climate change and its multiple effects on a range of sectors, including agriculture, water resources, public health, socioeconomic dynamics, gender inequities, renewable energy, resilient cities, migration and displacement, environmental education for the future, and food security. The conference hopes to stimulate creative approaches and legislative frameworks that might lessen the negative consequences of climate change and advance sustainable development throughout South Asia through stimulating intelligent dialogues and knowledge exchange

Aim of the Conference

To start recovering from climate change-related problems and to present current findings and initiatives on climate change and resilience, the conference aims to identify the potential gaps, mitigation issues, and vulnerabilities. This conference will offer a significant action plan for the improvement of climate change, renewable energy, resilient cities, climate displacement solutions, food security, and green education for the future. The conference also serves as a venue for building cooperative relationships and networks between academics, professionals, and development actors with the goal of long-term information sharing and discussion of highly emerging issues.

Conference Theme

- South Asian Commons.
- Sustainable Development Goals.
- Resilient Cities and Urban ecosystem.
- Climate Change (adaptation/ mitigation/ renewable energy, climate policy).
- South Asia Cooperation for Climate Action, Food, Security, and Education.
- Climate displacement, migration, human security, and disability inclusion.

South Asian Climate Conference 2023 Schedule

Venue: Social Science Faculty, Dhaka University
Date: 25-26 November 2023

Program Schedule

Time	Session	Host	Description
Day 1: Saturday 25 November 2023			
9:00 - 9:30	Registration	**Center for People and Environ, OXFAM Bangladesh, BARCIK, Arranayk Foundation, CAPS, Daffodil University, Global Forum for Sustainable Rural Development (GFRSD), Global Center for Climate Change & Environment**	**Registration of participants** **Responsible:** **Mizanur Rahaman Rakib** **Maqbula Monir Mahi**

9:30-11.30	Opening session	**Center for People and Environ, OXFAM Bangladesh, BARCIK, Arranayk Foundation, CAPS, Daffodil University, Global Forum for Sustainable Rural Development (GFRSD), Global Center for Climate Change & Environment**	**Opening Speech** **Muhammad Abdur Rahaman**, Director, Center for People and Environ. **Conference Speaker** **Dr. M. Monirul Qader Mirza**, Adjunct Professor and Graduate Faculty Member, Department of Physical and Environmental Sciences, University of Toronto Scarborough **Discussant** **Masud Khan**, Head of Programs, Arannayk Foundation **Mahmuda Sultana**, Program Director, OXFAM in Bangladesh **ABM Touhidul Alam**, Director, Agro-ecology & Food Security, BARCIK **Professor Dr. Kamruzzaman Mazumder**, Chairman, Center for Atmospheric Pollution Studies (CAPS) **Mohon Kumar Mondal,** Executive Director, LEDARS **Dr. Jayanta Choudhury,** President, Global Forum for Sustainable Rural Development (GFRSD) **Chair** **Dr. M. Shahidul Islam,** Chairman, Department of Geography and Environment, University of Dhaka
11:00-11:30		**Tea Break**	
11:30-1:00	**Plenary 1: Coastal Resilience**	**OXFAM Bangladesh**	**Keynote speaker** **Empowering the Waves: Feminist Climate Movement Building Through Community Based Ecosystem Management in Coastal Bangladesh.** **Dabaraj Dey,** Engineering and Regional Planning Specialist, Climate Justice and Natural Resource Rights, Oxfam in Bangladesh **P1.1.** Assessing Climate-Induced Migration: Factors and Potential Migration in Coastal Part of Bangladesh. Mizanur Rahman, Research Associate, Center for People & Environ (CPE) **P1.2.** Assessment of Community Stewardship over Ecosystem Services Within Climate Nexus: A Pathway Towards Locally-led Adaptation in Nijhum Dwip, Bangladesh. Mehedi Hasan, Oxfam in Bangladesh

			P1.3. Establishment of Livelihood Vulnerability Index Based on Cyclone Amphan: A Case Study on Shatkhira District, Bangladesh. Tasnim Zarin Meem. Department of Water Resource Development, Bangladesh University of Engineering and Technology **P1.4.** Exploring Tropical Cyclone Vulnerability in Bangladesh: A Climate Change Perspective. Ummul Momanin Coalee, Department of Geography & Environment, Jahangirnagar University **P1.5.** Ecosystem-Based Solutions for Coastal Resilience: An Investigation in Coastal Regions of Bangladesh. Anamul Kabir, Development Studies Discipline, Social Science School, Khulna University **P1.6.** Gender-based Vulnerabilities at the Cyclone Shelters in Coastal Belt of Bangladesh; a Study in Hatiya Upazila. Mahbubur Rashid Ories **Discussant** **Professor Sharmindi Nilormee**, Department of Economics, Jahangirnagar University **Dr. Papiya Dutta,** Associate Professor and Head, Department of Rural Development, University of Science and Technology, Meghalaya. India **Chair** **Dr. Mohammad Emran Hasan,** Head- Climate Justice and Natural Resource Rights, Oxfam in Bangladesh
1:00-1:45			**Lunch**
1:45-2:15			**PP1.** A Comparative Study of Tannery-Induced Environmental Impacts on Dholeshwari River. Shaberu Rahman Shatu, GIS Assistant, BETS Consulting Services Limited **PP2.** Assessment of Soil Pollution Due to Electronic Waste (E-waste) and its Sustainable Management System. Sadman Shihab, Institute of Information in Technology, Jahangirnagar University

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	Poster presentation		**PP3.** Climate Change and Sustainable Health Realities in the Context of Rivers - An Overview and GIS-based Work in the South Asian Region. Mozakkir Azad, Department of Environmental Science and Engineering, Jatiya Kabi Kazi Nazrul Islam University **PP4.** Microplastics and Heavy Metals Contamination in Freshwater Fish Species in the Southwestern Region of Bangladesh and Related Human Health Implications. Mst. Shamima Akter, Department of Environmental Science and Technology, Jashore University of Science and Technology **PP5.** Project Folon Reflecting the Attainment of the Sustainable Development Goals. Rufaida Shafiq Aaneela, Consultant, Give Bangladesh Foundation **PP6.** The Power of 'Pen' Revisited Estimating the amount and the students perceptions towards Academic Plastic Waste Md. Hasan Kuraishi, B.S.S.(Hons) in Sociology, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh
2:15-3:30	**Plenary 2: Local-lead Adaptation (LLA)**	**Center For People and Environ**	<u>**Keynote speaker**</u> **Priority of Climate Change and Local Led Adaptation in Rural Asia** **Dr. Jayanta Choudhury,** President, Global Forum for Sustainable Rural Development (GFRSD) **P2.1.** Adaptation of Smart Farming Techniques and Effects of Crop Management a Descriptive Study of Farmer's Perspective. Katherasala Srinivas, Senior Research Fellow, Department of Social Work, Osmania University, Hyderabad, Telangana, India **P2.2.** Assessing The Impact of Changing Rainfall Patterns on Flood Risks and Agriculture Production Resilience in the North-Central Region of Bangladesh: A Historical Analysis. Mahin Al Mamun, Graduate Research Student, Department of Geography and Environmental Studies, University of Chittagong **P2.3.** Floating Grief: A Study on the Impact of Transboundary River Water Pollution on the Adjacent Community.

			Habiba Jahan Bithi, Department of Sociology, Hajee Mohammad Danesh Science and Technology University
			P2.4. Impact of Climate Change on Some Select Components of Physical and Man-Made Environment of Sivasagar District, Assam, India A Geospatial technology-based Approach. Sanjay Das, Associate Professor, Department of Geography, Sibsagar Girls' College, Assam, India
			P2.5. Oxide-Based Thermoelectric Materials for Power Generation. K. Park, Faculty of Nanotechnology and Advanced Materials Engineering, Sejong University, Republic of Korea
			P2.6. Contrasting Responses of Fluorescence Dissolved Organic Matter (FDOM) to the Salinity Gradient Due to Upcoming Global Warming. Dr. Mohammad Mohinuzzaman, Associate Professor, Department of Environmental Science and Disaster Management, Noakhali Science and Technology University
			P2.7. Unseen Scars of Disaster: A Comprehensive Analysis of Gender Inequities in Disaster Management Policies of Bangladesh. Mst.Tajnin Nahar Tonni, Department of Sociology, Hajee Mohammad Danesh Science and Technology University
			Discussant **Fazle Rabbi Sadeque Ahmed,** Director, Climate Change Program, Palli Karma-Sahayak Foundation **Professor Dr. MD. Shamsuzzoha**, Department of Emergency Management, Faculty of Environmental Science and Disaster Management, Patuakhali Science and Technology University. **Chair** **Abu Sadat Moniruzzaman Khan,** Programme Head, Climate Change Programme, BRAC
3:30-5:00	**Plenary 3: Nature Based Solution**	**LEDARS**	**Keynote speaker** **Nature based solution: Challenges and Opportunities in Coastal Areas of Bangladesh.** **Koushik Roy**, LEDARS

			P3.1. Green Technologies Intervention in Sugarcane in the Context of Nepal. Abhisek Shrestha, Agriculture and Forestry University, Bradibas, Nepal **P3.2.** Multi-Hazard Vulnerability Assessment and its Impacts on Kishoreganj District. Asma Akther Popy, Research Assistant, Center for People and Environ (CPE) **P3.3.** The Nexus of NDVI and UHI: A Comprehensive Analysis from Bangladesh. Abdulla Al Imran, Department of Geography and Environment, Jahangirnagar University **P3.4.** Variation in Drought Resilience and Climate Sensitivity of Zanthoxylum Rhetsa at three Sites Along Environmental and Disturbance Gradient. Kanta Bhattacharjee, Department of Forestry and Environmental Science, Shahjalal University of Science and Technology, Sylhet **P3.5.** Enhancing River Ecosystem through Nature-based Solutions: A Case Study on Sucker Fish in the Buriganga River Khaled MD. Mehzabin Alam Prottoy, Research Assistant, Center for People and Environ (CPE) **P3.6.** Assessment of Noise Pollution and its Impact on Human Health of Jatiya Kabi Kazi Nazrul Islam Univerisity Area- a GIS base Overview. Mozakkir Azad, Department of Environmental Science and Engineering, Jatiya Kabi Kazi Nazrul Islam University **Discussant** **Dr. Mohinder Kumar Slariya**, Associate Professor (Sociology), Department of Higher Education, Government of Himachal Pradesh, India **Dr. Saptashi Mitra**, Department of Geography and Disaster Management, University of Tripura, India **Chair** **Dr. Hasib Irfanullah**, NbS Expert

Day 2: Sunday 26 November 2023			
9:00-10:30	**Plenary 4: Climate Migration, social protection, and human security**	**Center For People and Environ**	**Keynote speaker** **Rehabilitation Initiatives for The Climate Induced Displaced Persons in Bangladesh: A Critical Evaluation on some NGO Interventions in Chittagong.** **Professor Dr. Amir Mohammad Nasrullah,** Department of Public Administration, Chittagong University **P4.1.** Disability Inclusion in Climate Resilient Infrastructure: A Cross-Sectional Study in Four Coastal Sub-Districts of Bangladesh. Zereen Saba, Research Officer, Center for People & Environ (CPE) **P4.2.** Escalating Climate Change Risks and the Plight of South Asian Climate Refugees. Sumaiya Islam, Intern, District Legal Aid Service Office, Chattogram **P4.3.** From Crisis to Crisis: The Dual Burden of Legal Injustice and Humanitarian Challenges on Climate Migrants in Bangladesh. Naeem Ahsan Talha, Research Assistant, Bangladesh Institute of Labor Studies (BILS) **P4.4.** The Wage Dynamics in the Climate-vulnerable Areas of Bangladesh from the Perspective of Gender, Age, and Seasonality. MD. Rafiqul Islam, Lecturer, Department of Economics, Tejgaon College **P4.5.** Vulnerability Assessment of Environmental Migrants in Urban Slums in Bangladesh: A Case Study in Kalshi Slum, Mirpur, Dhaka. Iftehadul Islam **P4.6.** The Impact of Climate-Induced Migration on Rural Livelihoods in Bangladesh. Khadijatul Kubra **Discussant**

			Dr. Jayanta Choudhury, Assistant Professor, Department of Rural Studies, Tripura University
			Dr. Mohan Kumar Das, Executive Director, National Oceanographic and Maritime Institute (NOAMI)
			Chair **Dr. A K M Nazrul Islam**, Former Associate Professor, Environmental Economics at Dhaka School of Economics (DScE)
10:30-11:00		**Tea break**	
11:00-1:00	**Plenary 5: Resilient City**	**BARCIK**	**Keynote speaker** **Climate Crisis and Urban Resilience**. **MD. Jahangir Alam**, Coordinator, BARCIK. **P5.1.** Assessing Urban Expansion and Land Use/Land Cover Changes for Sustainable Development in Gazipur City Corporation Area. Bustanul Zannat, Undergraduate Researcher, Department of Geography and Environment, Jahangirnagar University **P5.2.** Correlation between Land Surface Temperature (LST) and Major Air Pollutants (MAP) in Greater Dhaka Region: A Geospatial Approach. S M Sium, Department of Geography and Environment, University of Dhaka **P5.3.** Geospatial Modeling for Air Quality Mapping of Dhaka City. Ehsan Reza, Research Consultant, Center for Environmental Geographic Information Services **P5.4.** Plastic Recycling and Political Embodied Ness. Khadiza Tul Kubra Shapu, **P5.5.** Time Series Assessment of Air Pollution in the Dhaka North City Corporation based on Concentration of PM2.5 using Linear Regression Model. Sumaiya Zakir, Department of Geography and Environment, Jahangirnagar University **P5.6.** Riverbank Erosion Impact Assessment of Rural Households with Morphohydrological Analysis and Main Adaptation Barriers in Northern Part of Bangladesh.

			Umma Salma, Department: Forestry and Environmental Science, Shahjalal University of Science and Technology (SUST) **Discussant** **Dr. Lalin Chowdhary,** Public Health Expert. **Professor Dr. Adil Mohammad Khan,** Department of Urban & Regional Planning, Jahangirnagar University. **Dr. Debashish Kundu,** Associate Professor, Department of Social Science, University of Dhaka. **Dr. Neelopal Adri**, Assistant Professor, Urban and Regional Planning, Bangladesh University of Enineering and Technology. **Dr. Soma Dey,** Associate Professor, Department of Women and Gender studies, University of Dhaka. **Dr. Md. Touhidul Islam,** Associate Professor, Department of Peace and Conflict Studies, University of Dhaka. **Bushra Afreen,** Heat Officer, Inclusion and Environment, Dhaka North City Corporation (DNCC). **Rebaka Sun-Yat,** Executive Director, Coalition for the Urban Poor. **Chair** **Dr. Golam Rabbani,** Head, Climate Bridge Fund, BRAC
1:00-2:00		Lunch	
2:00-3:30	**Plenary 6: Environmental Conservation**	**Arannayk Foundation**	**Keynote Speaker** **Forest Landscape Restoration Planning and Piloting in Chittagong Hill Tracks: Arrannayk Foundation's Experience and Way Forward.** **Dr. Mohd. Abdul Quddus,** Senior Adviser, Arannayk Foundation **P6.1.** A Review on the Status of Fish Diversity and Its Degradation in Cholon Beel. Farjana Khatun, Institute of Remote Sensing and GIS, Jahangirnagar University **P6.2.** Environmental Education for Nature-based Solutions. Anusree Ghosh, Senior Officer, Climate Change Programme, BRAC **P6.3.** Soil Carbon Stock and CO2 mitigation potential and impact on environment in the Ratargul Swamp Forest of Sylhet, Bangladesh.

			Umme Hani Asha, Research Intern, Center for People & Environ (CPE) **P6.4.** Nepal's Mountain Tourism: A Beacon of Climate Resilience for South Asia. Shanti Tamang, LLM in International Law, South Asian University **P6.5.** Transition from Linear Economy to Circular Economy: A Prospect of Minimizing Economic and Environmental Cost. Ikhtiarul Arefeen **P6.6.** Climate Justice in Nepal: Exploring Equity and Sustainability in a Developing Nation Prakriti Adhikari **Discussant** **Professor Dr. Om Katel,** Department of Environment & Climate Studies, College of Natural Resources, Bhutan **Dr. Mohammad Mohinuzzaman,** Associate Professor, Department of Environmental Science and Disaster Management, Noakhali Science and Technology University **Chair:** **Prof. A.Z.M Manzoor Rashid** Chairman, Arannayk Foundation
3:30-3:45			**Tea Break**
3:45-5:00	**Closing Session**		**Dhaka Declaration** **Muhammad Abdur Rahaman,** Director, Center for People and Environ (CPE) **Discussant** **Dr M. Monirul Qader Mirza**, Adjunct Professor and Graduate Faculty Member, Department of Physical and Environmental Sciences, University of Toronto Scarborough **Dr. Mohammad Emran Hasan,** Head- Climate justice and natural resource rights, Oxfam in Bangladesh. **Dr. Poornika Kumari Seelagama,** Senior Lecturer, Department of Sociology, University of Peradeniya, Sri Lanka

			ABM Touhidul Alam, Director, Agro-ecology & Food Security, BARCIK **Professor Dr. Kamruzzaman Mazumder**, Chairman, Center for Atmospheric Pollution Studies **Masud Khan**, Head of Programs, Arannayk Foundation **Dr. Jayanta Choudhury,** President, Global Forum for Sustainable Rural Development (GFRSD) **<u>Chair</u>** **Dr. Qazi Kholiquzzaman Ahmad**, Chairman, Dhaka School of Economics (DScE)

THE SOUTH ASIAN CONFERENCE ON "UNFOLDING EMERGING ISSUES IN THE CONTEXT OF CHANGING CLIMATIC SCENARIO"

CONFERENCE ABSTRACTS

Plenary 1: Coastal resilience   **DATE: 25TH November, Time 11:30-1:00**

P1.1. Assessing Climate-Induced Migration: Factors and Potential Migration in Coastal part of Bangladesh

<u>**Mizanur Rahman[1*]**</u>**, Zereen Saba, Asma Akther Popy, Khaled Md. Mehzabin Alam, Umme Hani Asha, and Musrat Jahan Momo**

[1*]Research Associate, Center for People & Environ (CPE)

Abstract: Bangladesh faces several climatic disasters due to its geographical location. The country suffers from natural disasters regularly, resulting in the loss of human life and livelihoods and the forced migration of people or whole communities to nearby areas. Sea level rise and frequent cyclones in coastal areas, as well as flooding and riverbank erosion, combined with the socio-economic situation are the causes of climate displacement. Internal and external migration are both common scenarios found in the study area. A combined method with qualitative and quantitative methods are used for the study. Primary information (qualitative and quantitative) was collected through participatory research (620 sample of Household Questionnaire Survey), Focus Group Discussion (FGD), and Key Informant Interview (KII). For the study, secondary information and relevant policies and articles were collected from different pertinent institutions and sources. The study was conducted in coastal districts (Barguna, Patuakhali, and Cox's Bazar); here, three districts are coastal region to aim 1. Causes of coastal climate-induced displacement, 2. The socio-economic factors that causes force migration from one place to another. 3. Identify potential climate displacement locations in coastal area of Bangladesh. The study reveals that the coastal region of Barguna and Patuakhali, has the highest migration threat, and 39.56% and 27.5% of the respondents in this district are respectively interested in migrating immediately. The study findings shows that frequent cyclones, flooding, erosion, losing land, crop production, socio-economic crisis, and freshwater crisis are the primary causes of climate displacement in coastal areas. Increasing temperatures, untimely rainfall, and losing crops in those regions are the leading causes of internal migration. The study concludes by highlighting the serious hazards of displacement imposed on by climate change in the area. This study shows that immediate adaptive solutions and policies are required to address the socioeconomic effects of climate-induced displacement in Bangladesh's vulnerable coastal communities.

Keywords: Climate change, natural disaster, climate indiced migration, Coastal Communities, Bangladesh

Plenary 1: Coastal resilience

P1.2. Assessment of Community Stewardship over Ecosystem Services within Climate Nexus: A Pathway Towards Locally-led Adaptation in Nijhum Dwip, Bangladesh.

Mehedi Hasan1 , Mohammad Emran Hasan1 , Rafiul Alam1*

1*Climate Justice and Natural Resource Rights, Oxfam in Bangladesh, House No: 23, Road No: 28, Block K, Banani, Dhaka-1213, Bangladesh.

Abstract: Imposed restrictions in the name of protection are progressively exacerbating the vulnerabilities of marginalized coastal grower communities by limiting their livelihood options. These are the communities being no or least emitters bear the double-edged impacts posed by climate change-induced disasters and non-inclusive natural resource governance that deprives them of harnessing ecosystem services, critical for their sustenance. Considering the situation, the study aims to assess community stewardship over ecosystem services in contrast to conservation restrictions such as the Marine Protected Area (MPA) in Nijhum Dwip, Hatia Upazila, Bangladesh. The study employs a mixed-method approach of integrating both qualitative and quantitative analysis along with the Earth Observation (EO) technology to assess the overall situation. That includes interviews with the key stakeholders, focus group discussions with the natural resource-dependent communities, transect walks and geospatial analysis to get a holistic and comprehensive outcome. A spatiotemporal GIS analysis indicates substantial changes in the land cover of 245 km2 in Nijhum Dwip that impact river navigability and fisheries resources. Besides, limited collaboration amongst multi-stakeholders was found in managing and accessing natural resources. Furthermore, women's participation was observed in the decision-making process as well as in livelihood activities was found inadequate where gender stigma is also prevailing. Despite many initiatives taken, marginalized communities are struggling with the climate change impact coupled with the restriction imposed on accessing ecosystem services. Moreover, the overall study findings can be utilized in establishing inclusive community-based ecosystem management that would contribute towards climate adaptation and resilience strategies of the inhabitants of Nijhum Dwip.

Keywords: Nijhum Dwip, Resource Rights, Climate Adaptation, Ecosystem Management, Stewardship.

Plenary 1: Coastal resilience   DATE: 25TH November, Time 11:30-1:00

P1.3. Establishment of Livelihood Vulnerability Index Based On Cyclone Amphan: A Case Study On Shatkhira District, Bangladesh

*Tasnim Zarin Meem

1Department of Water Resource Development, Bangladesh University of Engineering and Technology

Abstract: Tropical cyclones are destructive phenomena that can seriously harm a land and its inhabitants. Shyamnagar upazila was selected for the study area as cyclones are highly hazardous and frequent for its location near the Bay of Bengal. This study aims to create a Livelihood Vulnerability Index (LVI) based on cyclone Amphan. The research has been conducted by carrying out an in-depth study on six major domains: social condition, livelihood strategies, awareness level, preparedness level, during a disaster, and after a disaster. The required data is obtained from a structured questionnaire survey, focused group discussion (FGD), and key informant interviews. To analyze the data in the study, the average base livelihood vulnerability index and factor analysis are used to determine the LVI score, wherein '0' is considered a very low-risk score and '1' is considered a very high-risk score. The social domain and livelihood strategies with LVI scores

.60 and .64, respectively, show a poor livelihood pattern in the study area. But the LVI score '0' represents the excellent level of knowledge about disasters of the people of the area. The preparedness level with an LVI score of .50 being a moderate level, impacts the situation during disaster also to be moderate (LVI .42). But the study asserts the scenario to be poor after a disaster with an LVI of .70. The overall LVI for average base analysis and factor base analysis evaluates the moderate vulnerability situation of the area with LVI score .48 and .49 respectively. The LVI calculated in the study will provide essential insights into the overall vulnerability of livelihoods within a nation, which will help pinpoint the most vulnerable livelihoods and point out the places that need the most significant assistance.

Keywords: Climate change, LVI, climate indiced migration, Coastal Communities, livelihood vulnerabilities,Bangladesh

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Plenary 1: Coastal resilience   DATE: 25TH November, Time 11:30-1:00

P1.4. Exploring Tropical Cyclone Vulnerability in Bangladesh: A Climate Change Perspective

Ummul Momanin Coalee[1], Md Tamjid Al Noor Pobon[1], Raju Ahmed[2], Khandakar Hasan Mahmud[1]

1Department of Geography and Environment, Jahangirnagar University, Dhaka, Bangladesh

2Department of Geography, University of British Columbia, Vancouver, BC, Canada

Abstract: Purpose: Bangladesh is particularly vulnerable to tropical cyclones due to its geographical position, climatic variability, the occurrence of tropical cyclone re-curvature in the funnel-shaped bay, and the shallow continental shelf. As a densely populated and low-lying deltaic country, Bangladesh is highly exposed to the impacts of tropical cyclones, which have caused substantial damage to human lives and socioeconomic stability in the past. Due to the changing climate, these regions become more susceptible to the adverse impacts of storm surges, saline water intrusion, and other dangers associated with cyclones. This study provides a perspective on the intricate relationship between tropical cyclone vulnerability and the role of evolving climatic conditions in these events in Bangladesh.

Objectives: To explore the climatic variability associated with tropical cyclogenesis in the Bay of Bengal, to investigate Bangladesh's vulnerability to tropical cyclones under this climatic variability, and to review the initiatives and adaptation policies implemented by Bangladesh in response to this vulnerability.

Materials and Methods: The Bay of Bengal tropical cyclone data was collected from secondary sources like JTWC, EM-DAT, Zoom Earth, etc. The Bay of Bengal's Sea Surface Temperature (SST) data was collected from NASA Ocean Color and NOAA National Centers for Environmental Information (NCEI). The temporal climatic variability data (i.e., temperature) was collected from the Bangladesh

Meteorological Department (BMD) and World Bank and compiled by four distinct climatic years (1901-1930, 1931-1960, 1961-1990, and 1991-2020). The average monthly mean temperature was analyzed by these climatic years. The tropical cyclone frequency that hit Bangladesh has been investigated from 1901 to 2023. ArcGIS tools were used to extract and analyze the SST from NetCDF data between 2002 and 2022.

Findings and Discussion: The annual mean temperature of the four climatic years exhibits an ascending trend with an R^2 value of 0.8443, suggesting a significant 84.43% association between the temperature and climatic years. Several detailed maps of sea surface temperature were produced from 2002 to 2020, illustrating variations in surface temperature across the Bay of Bengal. The investigation of tropical cyclone frequency shows cyclones hit Bangladesh 36 times from 1901 to 1930, 35 times from 1931 to 1960, 54 times from 1961 to 1990, and 44 times from 1991 to 2023. The trend of the cyclonic events of these four climatic years shows an R^2 value of 0.3972, indicating a 39.72% relationship between the tropical cyclone frequency and climatic years. This study found that Bangladesh has exhibited a proactive and skillful approach to adaptation to climate change.

Keywords: Climate change, cyclone , disaster , Coastal Communities, cyclone frequency, Bangladesh

Plenary 1: Coastal resilience DATE: 25TH November, Time 11:30-1:00

P1.5. Ecosystem-Based Solutions for Coastal Resilience: An Investigation in Coastal Regions of Bangladesh

Anamul Kabir1, Bayezid Khan1*, Israt Jahan Juie1, Mortuja Mahamud Tohan1, Md. Tanvir Hossain2[1]

* 1. Development Studies Discipline, Social Science School, Khulna University, Khulna-9208, Bangladesh

2. Sociology Discipline, Social Science School, Khulna University, Khulna-9208, Bangladesh

Abstract:

Background: Coastal communities in the Southwestern region of Bangladesh face increasing vulnerability due to global and regional climate change impacts that have detrimental impacts on the economy, environment, and society, leading to the vulnerability of communities. Ecosystem-based solutions that utilize natural ecosystems and ecosystem services to adapt to climate change and increase resilience could be a productive way to reduce vulnerability and enhance resilience.

Objective: This study aimed to explore the effectiveness of ecosystem-based solutions in reducing vulnerability and building resilience among coastal communities in the southwestern region of Bangladesh.

Methods: The study utilized a qualitative approach to comprehensively explore the effectiveness of ecosystem-based solutions in enhancing coastal resilience among communities in the Southwestern region of Bangladesh. A purposive sampling technique was employed to select respondents with specific knowledge and experiences relevant to the research topic. The principle of data saturation guided the selection process, resulting in 8 participants. Data were collected through key informant interviews (KII) and in-depth interviews (IDI) with ecosystem experts and community members. Thematic analysis was used to analyze the collected data.

Results: The findings revealed that ecosystem-based solutions significantly reduced vulnerability and built resilience among coastal communities. However, there are still many challenges, such as the need for comprehensive approaches that address climate change impacts, salinity intrusion, and community engagement to be more effective. However, the conservation of mangrove forests, rainwater harvesting, and adopting sustainable agricultural practices were identified as effective strategies. Optimum production through integrated farming practices such as crops, aquaculture, and tree planting were prevalent in the study area. Using vegetation as a protective layer on embankments or stream banks has enhanced stability, increased stream flows, and improved natural beauty.

Conclusion: The study concludes that ecosystem-based solutions have proven effective in reducing vulnerability and building resilience among coastal communities in the southwestern region of Bangladesh.

Keywords: Ecosystem-based solutions (EbS), Vulnerability, Resilience, Coastal Communities, Bangladesh

Plenary 1: Coastal resilience

P1.6. Gender-based Vulnerabilities at the Cyclone Shelters in Coastal Belt of Bangladesh; a study in Hatiya Upazila

Mahbubur Rashid Ories1, Dr. Md. Mostafizur Rahman2

ABSTRACT

Bangladesh's coastline region is particularly susceptible to natural disasters, and the country frequently experiences natural disasters, including cyclones, which result in severe property loss and forced migration. The purpose of this study is to investigate the gender-based vulnerabilities of women at cyclone shelters in coastal Bangladesh, with a focus on Hatiya Upazila in the Noakhali District of Bangladesh, by taking the perfect ratio of sample size, which is the vulnerable group, the Participatory Rural Appraisal tools have been considered for collecting data. The study examines sociocultural elements that support GBV in cyclone shelters, including poverty, patriarchy, tradition, and stigma. Bangladesh is especially susceptible to monsoons, glaciers melting, tropical cyclones, contaminated water, and ecosystem degradation brought on by rising sea levels. By investigating the actual experiences of women in cyclone shelters in Bangladesh and offering a complete and nuanced analysis of their gender-based risks, the study intends to fill the research gap. The study will add to the body of knowledge on GBV and disasters by identifying the sociocultural factors that affect women's experiences and requests in catastrophe situations and assess the current gender-based risks and vulnerabilities in Bangladesh's cyclone shelters using a qualitative approach and primary and secondary data with the help of Gender Dynamics of Disaster Risk and Resilience (GDDRR) Framework. The results will aid in educating the public, organizations, and policymakers on how vulnerable women and girls are in coastal Bangladesh during storms. The study also uses a conceptual framework to show how various factors are intended to relate to one another, focusing on the socio-demographic makeup of the community. Disaster risk management committees and practitioners will have a clear point of

view to concentrate on reducing disaster impacts and boosting resilience to address the gender gap in disaster management results through this research. The paper amplifies that, before, during, and after catastrophes, equal access to information, resources, services, opportunities, and decision-making is crucial for addressing gender disparity. Gender-responsive disaster response and recovery efforts, equal access to early warning systems, risk information, education, training, awareness-raising, capacity-building, supporting livelihoods and assets, and strengthening coordination and collaboration are just a few of the recommendations for addressing gender inequality, which are being reflected through this research. Finally, the research can positively impact the changemakers of disaster management and gender-based vulnerability-related practitioners and help develop the nation.

Keywords: Gender, Vulnerability, Cyclone Shelter, Disaster Management, GDDRR Framework.

Plenary 2

Plenary 2: Local-lead Adaptation (LLA)   **DATE: 25TH November, Time 2:15-3:30**

P2.1. Adaptation of Smart Farming Techniques and Effects of Crop Management A Descriptive Study of Farmers Perspective

*Katherasala Srinivas1 ,Thanduru Surender2

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ABSTRACT

Innovation is expected. From agricultural to ultramodern times, society has experienced technology. Agriculture is the source of the economy, health, and environment. As technology advanced, agricultural practices were adopted. Most developed nations employ smart farming technology (SFT) to decrease labor costs and understand crop management in real-time. Smart farming technology improves agricultural output and quality using cutting-edge methods. India uses or develops IoT, drones, AI, machine learning, remote sensing, GPS, cloud computing, and big data analytics. These innovations can help farmers face population growth, climate change, water constraints, and market instability. Additionally, they improve crop quality, profitability, sustainability, and productivity. Farmers need smart farming technologies to compete and survive globally. Smart farming reduces water, greenhouse gas, and chemical consumption, helping the environment.

Objective for study: To delve into and examine the effects of smart farming technologies on smallholder farmers' crop yield, quality, profitability, and overall crop management practices.

Methodology:

In Jangoan Mandal, Telangana State, 100 farmers were interviewed using a planned, semi-structured interview schedule to investigate this issue. The interview schedule asked farmers on what kind of SFT they use or know, its benefits and drawbacks, where they acquire SFT information and training, and how SFT affects their livelihoods. Later, the collected data was examined through SPSS software for statistical analysis. The descriptive method of research was adopted to understand the issue. The investigation can reveal Jangoan mandal farmers' SFT adoption, knowledge status, and possibilities.

Findings:

The findings showed that while 67% and 31% of farmers said SFT had improved their farming practices, 63% had observed a change. Farmers reported lower effort in 73% of cases and greater yield in 76%. Intriguingly, 72% of farmers were happy with their increased economy, and 51% reported less pollution. This study examined farming's usage of synthetic pesticides and SFT uptake. The results showed that 61% of farmers manage soil fertility and use chemicals only when necessary, 73% control crop disease, and 49% and 19% control weeds naturally. Eventually, this article used Chi-Square to examine a variable's association, and there is a significant positive association between farmers' practice of SFT and crop management. The SFT is necessary to decrease the massive mechanical, chemical, and labour input. Population growth that exceeds resources could affect the environment and food supplies. In this unpredictable circumstance, advanced SFT adoption is needed to sustain soil fertility and agricultural productivity.

Conclusion:

A potential and creative approach to improving India's agriculture economy is smart farming technology. It can assist farmers in boosting their output, income, sustainability, and crop quality while preserving the environment and soil fertility. The high adoption costs, the lack of knowledge and training, the technological difficulties, and the social and cultural hurdles are some of the difficulties that SFT must overcome. Therefore, more research, development, extension, and policy assistance are required to encourage and enable the adoption of SFT among Indian farmers. SFT has the potential to revolutionize both Indian and global agriculture.

Keywords: Local led adaptation, agriculture, economy, crop management

P2.2. Assessing The Impact of Changing Rainfall Patterns on Flood Risks and Agriculture Production Resilience in the North-Central Region of Bangladesh: A Historical Analysis

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ABSTRACT

The study examines the relationship between rainfall patterns, flood risks, and agricultural production resilience. It finds significant rainfall distribution and intensity changes over time, impacting flooding frequency and severity. The findings highlight the need for adaptive strategies to enhance agricultural resilience in flood-prone areas like Bangladesh's North-Central Region, emphasizing the need for adaptive policies.

Research Objectives

The primary objectives of this research are as follows:

1. To analyze historical rainfall patterns in the North-Central region of Bangladesh and identify trends and changes over the past three decades.

2. To assess the historical flood risks and their relationship with changing rainfall patterns in the region.

3. To investigate the impact of these changing rainfall patterns and associated floods on regional agriculture production.

Methodology

Data Collection: This research relies on various secondary data sources, including historical rainfall records from the meteorological department, flood event archives, and agriculture production statistics from government reports. The dataset spans the past few decades, allowing for an in-depth analysis.

Statistical Analysis: Mann Kendall Trend analysis was used to identify changing rainfall patterns. We assess the impact of changing rainfall on flood risks through correlation analysis. Agriculture production data is analyzed to understand losses and adaptability.

GIS Analysis: Integrate remote sensing data into a Geographic Information System (GIS) to create spatially explicit maps and perform spatial analysis. This will help visualize and interpret the relationships between rainfall, floods, and agriculture.

Findings

1. Changing Rainfall Patterns: Analysis of historical data reveals a significant shift in rainfall patterns, with increased variability and unpredictability. The region has witnessed more intense rainfall events and prolonged dry spells over the last 30 years. The 2020 flood was more severe due to the increased rainfall in the Brahmaputra River basin. This basin area received 19.28% more rainfall than expected, which caused 40% of the area to be flooded.

2. Increased Flood Risks: The changing rainfall patterns have led to a notable rise in the frequency and severity of floods in the North-Central region. There is a strong positive correlation between changing rainfall patterns and flood events.

3. Agriculture Production Challenges: Agriculture production in the region has been impacted, with increased crop losses due to flooding. In the financial year 2000-21, Aman rice production in Tangail district was 207,672 metric tons in 249,183 acres, which was 318,362 acres to 259,119 metric tons and 295,970 acres to 151,690 metric tons in 2014-15 and 1997-98, respectively.

Conclusion

This historical analysis underscores the critical impact of changing rainfall patterns on flood risks and agriculture production in the North-Central region. The findings emphasize the need for proactive adaptation and mitigation strategies.

Implications

The implications of this study are twofold. First, it provides essential insights for policymakers and local authorities to develop climate-resilient strategies. Second, it underscores the importance of continued research and monitoring to adapt to the ever-changing climate conditions. This historical analysis serves as a crucial step in charting new frontiers in climate action, not only for the North-Central region but also for regions worldwide facing similar challenges.

Keywords: Climate change, climate action, agriculture, adaptation, rainfall.

Plenary 2: Local-lead Adaptation (LLA)　　　**DATE: 25TH November, Time 2:15-3:30**

P2.3. Floating Grief: A Study on the Impact of transboundary River Water Pollution on the Adjacent Community

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ABSTRACT

Bangladesh, a nation intertwined with a labyrinth of rivers, is at risk because of transboundary river water pollution. Pollution that starts in one nation but can transcend borders through water or the air and harm the ecosystem of another is known as transboundary pollution. This kind of pollution of river water causes significant adverse effects on the environment and human activity. There are 230 transboundary rivers with several tributaries across Bangladesh (DoF, 2013). In this complex web of rivers, the Korotoya River, which came from India, stands out as one of Bangladesh's six most significant transboundary rivers. Historically, Korotoya was a substantial river, but today, it faces the gradual encroachment of water pollution from the upstream rivers. The consequences of these water issues ripple through ecosystems and human activities, influencing regional, social, and economic development. However, the once-abundant resources of the Karatoya River, vital for the livelihoods of riverbank residents, are now under severe threat. This study centers its focus on the Korotoya River in Panchagarh, Bangladesh. It aims to investigate the transboundary impacts and community perspective on river water pollution and shed light on the gravity of the problem and its potential implications. For

a theoretical lens, the study employed both Anthropocene and Ecofeminism theory to highlight the interconnected challenges faced by the community. Using qualitative methodology, respondents were chosen purposively. Data were collected through in-depth interviews in the form of testimonials by recording the participants' lived experiences and analyzing them thematically. Findings revealed that transboundary river water pollution is an environmental concern and a multifaceted issue affecting livelihoods and cultural traditions within affected communities. It emphasizes the economic and cultural disruptions caused by pollution, focusing on pollution-induced occupational migration. Water quality degradation and declining fish stocks force fishermen to leave their traditional livelihoods, affecting their income and food security. This economic shift leads to social disruption and increased vulnerability among fishing communities while endangering the preservation of cultural and hereditary fishing practices passed down through generations. Overall, pollution-related migration threatens the rich cultural heritage of these communities. To address this issue, the government should prioritize collaborative agreements with upstream countries to include stricter regulations on reducing river pollutant runoff and comprehensive support for affected communities. Therefore, the findings of this study will help policymakers adopt adequate policies to reduce the transboundary impacts on the river-adjacent community.

Keywords: Climate Displacement, migration, human security, and disability Inclusion

Plenary 2: Local-lead Adaptation (LLA)   **DATE: 25TH November, Time 2:15-3:30**

P2.4. Impact of climate change on some select components of Physical and Man-Made Environment of Sivasagar District, Assam, India A Geospatial technology based approach

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ABSTRACT

Climate change has been one of the colossal threats to the ecosystem of all kinds of the earth and human societies. Its impact is so pervasive that it has intruded into all possible spheres of both the physical and cultural environments. The availability of gridded data of Rainfall and Temperature, Landsat_8 OLI/TIR data of ground surface, Sentinel data of Land Surface Temperature (LST), Open sources GIS platforms like QGIS, Excel, and SPSS statistical software, and the statistical records of various government departments has made the study of microclimate change and its impact easier. The present paper deals with the current trend of climate change in the district with database of satellite imageries collected from USGS Earth Explorer (Landsat_8 OLI/TIR of 2011 & 2021; Landsat_7 of 2001), Copernicus Open Access Hub (Sentinel-2/5), Annual gridded data of Temperature and Rainfall collected from IMD Pune, India and the secondary data collected from Statistical handbooks of Assam government. Pre and Post-processing of imageries are done on QGIS-3.4.11 Madeira, and maps of NDVI, NDWI, and NDBI are produced and interpreted to establish the trend of climate change. Temperature and rainfall data from 1991 to 2021 are plotted to show the annual trend with MS Excel, of which the CV value shows moderate inconsistency. The impact of climate change was then validated with the data collected from the Agriculture Department of Sivasagar district. The paddy production shows considerable change in terms of micro-climatic behavior. An outbreak of the Fall Armyworm (*Spodoptera frugiperda*) in the district is also presented and evaluated. There is a direct relationship between the lesser reproductive cycle of the fall armyworm and the increasing surface temperature of the spatial units of the satellite images. Methane emission mapping shows the precarious condition of some of the paddy fields in the district. Unexpected and unseasonal inundation of paddy fields

in the district triggers the methane emission rate, contributing to the gradual warming of the local/regional atmosphere.

Keywords: Climate change, LST, QGIS, NDVI, NDWI, NDBI, CV value, Fall Armyworm.

Plenary 2: Local-lead Adaptation (LLA) DATE: 25TH November, Time 2:15-3:30

P2.5. Oxide-Based Thermoelectric Materials for Power Generation

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ABSTRACT

Nowadays, concerns about energy issues have enhanced significantly due to the excessive use of fossil fuels, the increase in energy demand, climate change, and environmental damage. As a result, energy generation devices and clean energy sources have gained substantial attention. Many countries have issued new energy development policies and strategies, such as sustainable carbon neutrality and an efficient carbon tax, to develop reliable, eco-friendly, and renewable energy. A thermoelectric generator (TEG) consisting of thermoelectric modules and heat sinks is emerging as a promising energy conversion system to convert heat energy directly into electrical energy through a temperature difference. TEG has several advantages, such as simple structure, high reliability, long lifetime, and low vibration compared to general thermodynamic cycle power generation systems. The following factors influence the performance of TEG: (i) the dimensionless figure-of-merit of thermoelectric materials, (ii) the thermoelectric leg configuration, i.e., cross-sectional area, length, and shape, and (iii) the temperature difference between two junctions. Thermoelectric materials have attracted significant attention for the generation of electricity from heat. In the present study, we prepared $Bi_2Sr_2Co_2O_y$-based thermoelectric materials with various compositions by a solid-state reaction method. Their structural and thermoelectric properties were systematically investigated. All the prepared materials showed a metallic behavior with increasing temperature. The Seebeck coefficient was optimistic over the measured temperature range, indicating a p-type semiconducting behavior. Both the

Seebeck coefficient and power factor increased with increasing temperature. We believe that environment-friendly TEG systems can be utilized for climate change mitigation.

Keywords: Climate change, power, thermos conductivity, environment, eco friendly.

Plenary 2: Local-lead Adaptation (LLA)   DATE: 25TH November, Time 2:15-3:30

P2.6. Contrasting responses of Fluorescence Dissolved Organic Matter (FDOM) to the salinity gradient due to upcoming global warming.

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Abstract:

One of the most emerging environmental concerns of the twenty-first century is the salinization of the soil due to climate change. Rising sea levels due to climate change can contribute to soil salinization in coastal areas, as saltwater intrusion can occur in freshwater aquifers and soil. The current research investigated a useful arena where we generated insights about the fluorescence properties of soil. Dissolved organic matter (DOM) is the most mobile and active soil component serving as an easily available source of nutrients and energy for microbes and other living organisms. It participates in the soil forming processes, transports nutrients and pollutants into deeper soil horizons and actively supports processes of soil structure formation. The aim of this work was to assess and quantify the changes of DOM of soil in different salinity gradient as a function of extraction time. In this work soil samples were examined to assess the soil DOM components based on their florescence properties (by using EEMs). Three fluorescence components i.e. humic acid-like (HA-like), fulvic acid- like (FA-like) and protein like fluorophores (PLF), were identified by parallel factor (PARAFAC) analysis of EEM spectra in various percentage of artificial saline water (ASW) i.e. 0%, 25%, 50% and 100%, respectively. For HAlike, FA-like, PLF-like components fluorescence intensity was high at 100% ASW. Increasing florescence intensity indicates that salinity enhance the solubility of soil organic matter. Considering fluorescence intensity with the extraction time it was found that florescence intensity increased from 1 hour to 3 hours but from 3 hours to 6 hours it was observed that FDOM intensity decreased or remain unchanged for the three

components. By this analysis it can be said that 6 hours' extraction time is a waste of time and it did not bring any significant changes. This outcome brings a potential hope for the research community and put a significant footstep for the researchers which help in further different types of studies like groundwater contamination due to more solubility of DOM components and also contaminate surface waterbodies and aquatic wetlands through surface water runoff.

Keywords: Climate change, climate action, agriculture, salinity.

Plenary 2: Local-lead Adaptation (LLA)   DATE: 25TH November, Time 2:15-3:30

P2.7. Unseen Scars of Disaster: A Comprehensive Analysis of Gender Inequities in Disaster Management Policies of Bangladesh.

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Abstract:

Bangladesh is a disaster-prone country and is extremely vulnerable to natural disasters due to its location, the nature of the land, the number of rivers, and the monsoon season. Bangladesh's coastal topography affects how much natural disasters affect the region. In Bangladesh, climate change has enhanced the incidence of natural disasters nowadays. Therefore, the country has made various policies including the National Policy of Disaster Management (NPDM). NPDM 2021-2025 has core goals for actions to save lives, and reduce economic losses in every disaster cycle stage which includes Disaster Risk Reduction (DRR), Humanitarian Response, and Emergency Recovery Management. In this Policy, they mentioned that Women, children, the elderly, the disabled, and other socially marginalized groups will be primary beneficiaries of all disaster management efforts. Besides, all the people in disaster-prone areas suffer a lot during disaster and it is evident that women are more vulnerable due to their physical condition.bLack of sanitation and safe water in shelters also cause women to suffer from various diseases such as diarrhoea and urinary tract infections. Sendai framework for disaster risk reduction advocates

for context-specific knowledge for disaster preparedness and recovery. Intersectional feminist theory and eco-feminist theory have been used as theoretical lenses. A systematic review was conducted by examining 21 journal articles, 13 journal websites, 19 newspapers, and 8 government portals. To address a clearly stated subject, a systematic literature review (SLR) finds, chooses, and evaluates research (Dewey, A. & Drahota, A. 2016). The methodology or plan for the systematic review was well-defined, with the criteria being detailed before the review's execution. It is a thorough, transparent search that is repeatable by other scholars across some databases and grey literature sources. It entails organizing a carefully considered search strategy with a clear emphasis or solution to a predetermined question. This systematic review carried out to identify the National Policy of disaster management has not paid enough attention to the gender-based problem faced during its formulation though they are considered as the most vulnerable group during disaster. Furthermore, women are also sexually harassed in shelters. Pregnant women suffer the most due to insufficient ambulances or other modes of transportation to take pregnant women to hospitals and ensure immediate and proper treatment during natural disasters. Existing literature reveals that women suffer the most from soil salinity as managing food and livelihood is their major concern. The post-disaster phase also presents significant obstacles for women, ranging from limited access to nutritious food to menstrual hygiene issues due to inadequate sanitation facilities. This research underscores the urgency of incorporating a gender-sensitive approach into disaster management policies and strategies. By doing so, it is possible to ensure that all individuals, regardless of their gender, receive the necessary support and protection during natural disasters, thus contributing to more effective disaster preparedness and recovery efforts in Bangladesh

Keywords: Climate change, disaster management, lla, DRR.

Plenary 3

Plenary 3: Nature Based Solution   DATE: 25TH November, Time 3:30-5:00

P3.1.Green technologies intervention in sugarcane in the context of Nepal

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ABSTRACT

The production of sugarcane in Nepal is very low compared to other advanced countries. Similarly, there is a huge gap between attainable and actual yield. This is mainly because of severe weather conditions during its growth and maturity, poor resource availability with the farmers, small and fragmented holdings, and inadequate supply and marketing infrastructure. However, there is still scope to increase productivity. The climatic and resource constraints (water, planting material, fertilizer, improved technology, drought management, waterlogging, insect, and disease management) need to be tackled, suitable varieties must be identified, and labor and input costs should be minimized to sustain sugarcane productivity in Nepal. So, the intervention of green technologies in sugarcane, from seed selection to harvesting, is crucial to improve productivity and sustainability. Several approaches and steps have been experimented with by NSRP in identifying the high yielding, resistance to diseases and insect-pest, and other agronomic, soil, and insect-pest management. Co 0118, Jitpur-5, Jitpur-6, Jitpur-7, CoS 08272, CoS 08276, CoS 8452, CoS 13231, CoS 07250 varieties with high sugar recovery and yield with resistance to biotic and abiotic stress. Intercropping potatoes with wider spacing of 120 cm and paired spacing 120 cm *70 cm have higher production, and bio-fertilizer is beneficial.

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Mechanical use reduces the cost of cultivation, and herbicides reduce the labor cost by up to 120 days. In conclusion, integrated approaches for increasing the sugarcane yield and recovery with eco and farmer-friendly technologies should be adopted for the sustainable development of sugarcane.

Keywords: Sugarcane, green technologies, varieties, NSRP, sugar, approaches

Plenary 3: Nature Based Solution   **DATE: 25TH November, Time 3:30-5:00**

P3.2 Multi-Hazard Vulnerability Assessment and its Impacts on Kishoreganj District.

Asma Akther Popy 1*, *Zereen Saba, Mizanur Rahman, Khaled Md. Mehzabin Alam, Umme Hani Asha, and Musrat Jahan Momo*

[1*]Research Assistant, Center for People & Environ (CPE)

ABSTRACT

This multi-hazard vulnerability assessment aims to comprehensively evaluate the susceptibility and potential impacts of various hazards on the Kishoreganj district, Bangladesh. The evaluation considered a range of hazards including as heavy rainfall, floods, flash floods, erosion of riverbanks, heat waves, cold waves, thunderstorms and examines how they interact and composite to affect the district's social, economic and livelihoods aspects. This evaluation, which takes a multidisciplinary approach, uses geospatial analysis, sustainable livelihoods assessment qualitative or quantitative data collection and community viewpoints to comprehend the vulnerabilities in the district. The findings show that the most of the upazila of Itna and Mithamoin area are vulnerable to a variety of dangers due to its geographical location, topography, and socioeconomic variables and these disaster frequency is increasing day by day. Floods and flash flood inundate extensive agricultural lands on a regular basis, disrupting livelihoods and increase food security. Riverbank erosion, hailstorm, increasing trend heat wave and cold wave endangers settlements, resulting in displacement of population. Furthermore, these hazard not only effect the livelihoods but also effects increase disease and drinking water scarcity. Moreover the evaluation draws attention to how risks disproportionately affect vulnerable groups of people, such as women, children, and members of marginalized communities. In order to address their unique vulnerabilities and improve resilience, it highlights the necessity of inclusive and focused interventions.

Keywords: Climate change, climate action, agriculture, hazard, rainfall, disaster, climatic events.

P3.3. The Nexus of NDVI and UHI: A Comprehensive Analysis from Bangladesh

* Abdulla Al Imran, Naimur Rahman, Md Sujon Sheikh and Afsana Mimi.

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ABSTRACT

Rapid population growth usually drives the expansion of urban infrastructure, which can reduce vegetation cover for housing, roads, and other urban amenities. Land Use and Land Cover (LULC) changes led to changes in the types of land use, primarily concrete woods, which have made cities hotter because they are housing more people. Urban Heat Island (UHI) is one of the human-induced environmental phenomena within a city where temperatures are significantly higher than in surrounding areas due to human activities, urbanization, and heat-absorbing surfaces. Surface temperature monitoring can be achieved using temporal satellite imagery. In contrast, vegetation indices can be employed to evaluate the extent to which the region is covered by vegetation and non-vegetation. The study area employs the Normalized difference vegetation index (NDVI) to investigate the influence of land surface temperature in addition to NDVI in the region. Therefore, LULC and its dynamic variations and other environmental phenomena like surface temperature can be mapped using remotely sensed data over time. Geospatial technology was employed to estimate temporal UHI to incorporate it into an assessment of environmental impact on the surrounding environment. The current study centers on the temporal NDVI and surface temperature as the entire methodology

employed to evaluate the dynamic resolution change in UHI on the environmental condition in Uttara, Dhaka, Bangladesh for different years (2001, 2011, and 2022). Changes in environmental conditions are observed based on different times, geographical locations, and demography. In 2001, there were a lot of vegetation-covered areas when the temperature level was not so high, and we can see the increase in temperature level over time with infrastructural and economic growth. The research findings illustrate the relationship between the Normalized Difference Vegetation Index (NDVI) and Urban Heat Island (UHI), as evidenced by a case study across many temporal, geographical, and economic contexts. According to the study, it is essential to keep the climate in mind when moving forward with urbanization.

Keywords: Normalized difference vegetation Index, Urban Heat Island, Urbanization, Climate Change.

Plenary 3: Nature Based Solution   **DATE: 25ᵀᴴ November, Time 3:30-5:00**

P3.4.Variation in drought resilience and climate sensitivity of Zanthoxylum Rhetsa at three sites along environmental and disturbance gradient

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ABSTRACT

Changes in tropical tree growth could affect the global carbon balance since trees store 85% of biomass carbon. Frequent and extreme droughts may cause growth decline and influence the global carbon cycle. The main objective of this study was to evaluate the growth response of *Zanthoxylum rhetsa* to the drought events in 1999 and 2006 and the annual climate anomalies at three sites (Rema-Kalenga Wildlife Sanctuary, RKWS, Lawachara National Park, LNP, and Kaptai National Park, KNP).

Ring-with-index chronologies of *Z. rhetsa* were developed for three sites. Average radial growth was higher in the high rainfall site (KNP) than in the dryer sites (LNP and RKWS). At all sites, radial growth of *Z. rhetsa* was negatively related to temperatures. However, precipitation had minimal impact on tree growth of *Z. rhetsa* at RKWS and KNP but no impact at LNP. Regional climate affected tree growth, as shown by the spatial correlation between radial growth and regional climate data. Drought significantly reduced tree growth at all sites, ranging from 25% to 46%. Drought resistance, recovery, resilience, and relative resilience varied among sites depending on the variability of rainfall, drought severity, and disturbance history of the study sites. Drier sites have higher resistance but lower recovery and resilience than wetter sites during low-severe drought (1999). During the severe drought (2006), sites with high disturbance history and low stand

density became more drought resilient. Our results suggest that rainfall variability disturbance history and drought severity determine the growth resilience of *Z. rhetsa* to drought in moist tropical forests.

Keywords: Climate change, resilience, agriculture, drought, rainfall.

Plenary 3: Nature Based Solution   **DATE: 25TH November, Time 3:30-5:00**

P3.5. Enhancing River Ecosystem through Nature-based Solutions: A Case Study on Sucker Fish in the Buriganga River

Khaled Md. Mehzabin Alam Prottoy1*, Zereen Saba, Mizanur Rahman, , Umme Hani Asha, and Musrat Jahan Momo, Asma Akther Popy

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ABSTRACT

Sustaining biodiversity, ecological equilibrium, and community welfare necessitates sustainable management of river ecosystems. The nature-based solution (NBS) approach of fish habitat enhancement is highlighted in this abstract as a crucial step in the preservation and restoration of river ecosystems. The strategy attempts to address the problems that fish populations confront, which are frequently a good indicator of the general wellbeing of aquatic habitats. This abstract examines the various approaches used to improve fish habitats in river ecosystems. evaluate the potential threats posed by sucker fish to fish diversity. Developing fish-friendly infrastructure, safeguarding important spawning grounds, and encouraging sustainable river flow management are important elements. Key considerations include the competitive interactions for resources, alteration of spawning and feeding habitats, and the potential for introducing diseases or parasites. The abstract discusses how these factors may contribute to shifts in fish community structure, potentially leading to declines in native species.

Achieving successful fish habitat enhancement has a favorable effect on the larger river ecology in addition to improving fish populations. In order to maintain the long-term health of river ecosystems,

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this abstract highlight the necessity of an integrated approach that takes hydrological, geomorphological, and biological aspects into account. This abstract seeks to advance knowledge of the significance of fish habitat enhancement in the context of nature-based solutions for river ecosystems by analyzing case studies, research findings, and best practices.

Keywords: Fish Diversity, River, River Ecosystem, Nature Based solution

Plenary 3: Nature Based Solution **DATE: 25TH November, Time 3:30-5:00**

P3.6.Assessment of Noise Pollution and its Impact on Human Health of Jatiya Kabi Kazi Nazrul Islam Univerisity Area- a GIS base Overview."

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ABSTRACT

The condition of noise pollution in Bangladesh is getting dire day by day and impacts the local people's daily lives. Noise pollution means unwanted or excessive noise that can harm human health and environmental quality. Noise pollution, also known as environmental noise, is typically generated indoors in many industrial facilities and some other workplaces, but also comes from highway, railroad, and airplane traffic and outdoor construction activities. Noise National Poet Kazi Nazrul Islam University Campus, Trishal, Mymensingh primarily originates from crowds, vehicles, loudspeakers, public address systems, festivals, etc. The study was conducted at 16 important sites with different areas to analyze the different noise levels. GIS (ArcGIS 10.8) with IDW technique was used for detailed noise pollution mapping of the university campus. The final results show that the ambient noise level (dB) in the campus area of Jatiya Kabi Kazi Nazrul Islam University is much higher than the standard noise. The maximum sound level from Nazrul Murti in the afternoon is about 95.8 dB and the lowest average sound level is about 42.2 dB in the evening at the residence area of Jatiya Kavi Kazi Nazrul Islam University Vice-Chancellor. We can reduce noise pollution by turning off appliances when not in use, using earplugs, turning down the volume, planting more trees, and maintaining vehicles and machines.

Keywords: Noise Pollution; GIS, Noise Level, IDW technique, JKKNIU

Plenary 4: Climate Migration   DATE: 26TH November, Time 9:00-10:30

P4.1. Disability Inclusion in Climate Resilient Infrastructure: A Cross Sectional Study in Four Coastal Sub-Districts of Bangladesh

__Zereen Saba[1*]__, *Masur Abdul Quader[2], Mizanur Rahman[3], Md Nahid Ferdous[3], Asma Akther Popy[4]*

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ABSTRACT

Bangladesh's coastal region is highly vulnerable to natural, hydrological, and climatological disasters. A disaster disproportionately affects a different population group. In a disaster situation, "people with disabilities" (PWDs), regardless of gender, encounter significant obstacles. In a calamity context, the response mechanisms of disabled individuals are also distinct. This paper aimed to investigate the climate-resilient infrastructure of PWDs in Bangladesh's coastal zone during a natural disaster. The study was conducted in three subdistricts of Khulna District and one subdistrict of Bagerhat District (Khulna: Dacope, Koyra, Paikgacha, and Bagherhat: Mongla) using a quantitative method. The study also reviewed relevant scientific articles. The quantitative data were collected through a household survey. The sample size is 520, and a random sampling technique was used for the household survey. The study found that only 6.7% of homes are made of concrete and resistant to strong winds, cyclones, floods, and storm surges, while only 6.9% are disaster resilient. Only 5% of respondents indicated that their residences were accessible to PWDs, and there were no accessible WASH facilities. With disaster-resistant infrastructure, the study suggests that accessibility for PWDs should also be addressed.

Keywords: Climate change, disability, agriculture, coastal resilience, PWD.

P4.2. Escalating Climate Change Risks and the Plight of South Asian Climate Refugees

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ABSTRACT

With each passing day, the Earth's climate script unfolds, revealing dramatic shifts in temperature, weather patterns, and ecosystems. It is a global phenomenon that disregards political boundaries and affects every corner of the Earth. The effects of climate change, which range from rising sea levels and extreme weather to changes in temperature and precipitation patterns, are geographically and racially neutral. South Asia, comprising countries such as India, Pakistan, Bangladesh, and Sri Lanka, faces unique challenges, including more frequent and severe extreme weather events, rising sea levels, and shifting rainfall patterns due to climate change. These changes pose a significant threat to agriculture, the backbone of many South Asian economies, leading to crop failures and food insecurity. The changing climate has also disrupted ecosystems and biodiversity, endangering numerous species and ecosystems vital for ecological balance. Glacial melt in the Himalayas, the region's "water tower," impacts the major river systems, affecting the water supply for millions and increasing the risk of conflicts over shared water resources.

Moreover, as climate change intensifies, the region experiences a surge in environmental displacement, particularly in low-lying coastal areas and drought-prone regions, who are forced to abandon their ancestral lands and seek shelter elsewhere. These displaced individuals often find themselves in overcrowded and under-resourced camps, lacking necessities, and healthcare. Climate-induced migration frequently crosses over with pre-existing socioeconomic vulnerabilities, inadequate

infrastructure, and insufficient resources, which only exacerbate the situation and make it an environmental problem and a critical human rights concern. However, people who were displaced from their homes due to climate change and do not meet the criteria for refugee status cannot use the human rights safeguards provided by the law, which could shield them from dangers like deportation. This legal ambiguity also leads to potential jurisdictional disputes among countries and the absence of a cohesive legal response, aggravating the vulnerability of the displaced populations. This paper employs a doctrinal research methodology to examine the escalating climate change risks in South Asia and their profound implications for the region's growing population of climate refugees. It aims to investigate the socioeconomic and environmental vulnerabilities faced by South Asian climate refugees, considering factors such as gender, age, income, and geographical location. It analyses existing legal frameworks and international agreements on climate-induced displacement in South Asia. The findings of the paper reveal a critical gap in the legal protection and recognition of climate refugees in South Asia and highlight the urgent need for international cooperation to establish a legal framework that recognizes the rights and protection of South Asian climate refugees, fosters regional collaboration, and addresses the environmental and humanitarian dimensions of this critical issue.

Keywords: Climate change, climate action, climate refugee, adaptation.

Plenary 4: Climate Migration　　　　　　　　　**DATE: 26TH November, Time 9:00-10:30**

P4.3. From Crisis to Crisis: The Dual Burden of Legal Injustice and Humanitarian challenges on Climate Migrants in Bangladesh

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ABSTRACT

In the face of intensifying climate change, Bangladesh stands increasingly vulnerable to natural disasters and rising sea levels, resulting in significant population displacement. Climate migrants encounter a myriad of obstacles, including restricted access to resources, heightened risks of violence and exploitation, social exclusion, and inadequate legal protection. Their struggles extend to accessing justice, education, healthcare, and fundamental necessities. This comprehensive analysis delves into the escalating humanitarian challenges faced by climate migrants in Bangladesh, driven by the confluence of rising sea levels and a pervasive legal void. The primary objectives of this research are to assess these challenges, delineate the core needs of climate migrants, and propose policies and programs to ease their vulnerabilities. Employing a comprehensive methodology, this study integrates a literature review, case studies, and a thorough analysis of domestic, regional, and international legal and policy documents. It scrutinizes climate migrants' experiences, highlighting access to resources, protection from violence, social integration, and legal support. Furthermore, it investigates their difficulties accessing essential services, including justice, education, and healthcare. Findings from this research underscore the urgency of inclusive policies and programs designed to address the fundamental needs of climate migrants, encompassing secure housing, livelihood opportunities, and healthcare provision. The study accentuates the unique vulnerabilities of women and children within this context. It emphasizes the importance of international frameworks as guiding principles. It underscores the necessity of developing a regional framework within South Asia to collectively confront the multifaceted challenges experienced by climate migrants in Bangladesh. In conclusion, this study

highlights the imperative need for immediate action in developing and implementing comprehensive policies and programs to address the multifaceted humanitarian challenges faced by climate migrants in Bangladesh. The implications are twofold: firstly, it provides critical insights for policymakers, humanitarian organizations, and governments to design initiatives that alleviate the hardships faced by climate migrants. This can significantly improve the resilience and well-being of this vulnerable population. Secondly, this research contributes to the global discourse on climate-induced displacement, emphasizing the importance of international and regional cooperation in addressing the complex issues associated with climate migration. It underscores the necessity of a collective response to safeguard the rights and welfare of those affected by climate change, highlighting the importance of protecting the most vulnerable members of this population. This research is a foundation for comprehensive policies and a coordinated global approach to mitigate the humanitarian challenges confronting climate migrants in Bangladesh and beyond.

Keywords: Climate migration, Bangladesh, South Asia, Humanitarian challenges, Climate change, Displacement

Plenary 4: Climate Migration

P4.4. The wage dynamics in the climate vulnerable areas of Bangladesh From the perspective of gender, age, and seasonality

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ABSTRACT

Bangladesh is one of the most climate-vulnerable zones in the world. On the other hand, agricultural wages are the sole source of income for most of the population. Traditional agriculture is becoming obsolete as conventional agriculture cannot be continued due to climate change-induced hazardous situations like salinity. In this scenario, this paper examines the wage dynamics from the climate-vulnerable areas of Bangladesh. This inquiry is based on gender, age, and seasonality over forty areas, and this study considers ten types of agriculture-related tasks. These tasks include manual land preparation, land preparation by persons using tractors, land preparation: persons' bullock/cow for plowing/laddering, planting, irrigation work, seed broadcasting, transplanting, applying fertilizer/pesticides, weeding, and harvesting. The regression analysis shows that gender and being a child in the workforce strongly predict wage differentiation across task types and seasonality. Eventually, very few tasks can provide them enough to live above extreme poverty. This study suggests that resilience measures should address two issues. The first is to include gender components so women might not face gender-induced wage discrimination. The agriculture workers are already living below the poverty line, and the interventions should make alternative income-generating activities with the motive of their poverty graduation, too.

Keywords: Climate change, climate action, gender, poverty, agriculture.

Plenary 4: Climate Migration　　　　　　**DATE: 26TH November, Time 9:00-10:30**

P4.5. Vulnerability Assessment of Environmental Migrants in Urban Slums in Bangladesh: A Case Study in Kalshi Slum, Mirpur, Dhaka.

Iftehadul Islam (*), Md. Tahsinur Rahman, Md. Rasel Prodhania, Md. Nazrul Islam

ABSTRACT

Migration, particularly environmental migration, has been a historical phenomenon in Bangladesh. This study focuses on the vulnerability assessment of environmental migrants in Dhaka, the capital of Bangladesh, with a specific emphasis on the Kalshi slum, a refuge for many such migrants. Bangladesh, a disaster-prone country, experiences frequent natural hazards such as floods, cyclones, river erosions, flash floods, and droughts due to its geographical location. These calamities displace a significant number of individuals annually, forcing them to leave their homes and migrate to urban areas, particularly Dhaka. Dhaka, known for its rapid urbanization and development, has become a beacon of hope for those seeking better livelihoods and shelter. The study area, Kalshi Slum, was selected for its relevance to the issue at hand. In this densely populated urban slum, over 1,470 families reside, many of whom are environmental migrants. A comprehensive data collection approach, encompassing primary and secondary sources, was employed to understand their plight. The primary data collection involved on-site visits, general interviews with residents, and a questionnaire survey targeting environmental migrants living in the slum. These methods sought to gather firsthand information about their origin, occupation, experiences with disasters, impacts of those disasters, living conditions in the slum, and the hazards they face in their current environment. The vulnerabilities identified in this study encompass a range of challenges faced by environmental migrants in the Kalshi Slum, including unplanned and poor housing systems, inadequate sanitation facilities, water supply deficiencies, a lack of proper sewerage systems, unstructured waste disposal methods, limited knowledge about existing hazards and preparedness strategies, scarce medical services, insufficient police protection and fire services, and the presence of criminal activities within the community. These

vulnerabilities have already resulted in hazardous situations, including fire incidents and waterlogging, affecting the residents' well-being and safety. The findings emphasize the urgent need for mitigation measures to address these vulnerabilities and protect the environmental migrants, as well as the general slum population, from further risks. This study sheds light on the complex relationship between environmental migration and development in Bangladesh. While rural-urban migration is seen as a pathway to better livelihoods, it can paradoxically lead to more vulnerability when migrants find themselves in substandard living conditions. The research aims to provide insights into the severity of these problems and suggest ways to improve the quality of life for environmental migrants in Dhaka and other urban areas. In conclusion, this research underscores the urgency of addressing the vulnerabilities faced by environmental migrants as their numbers continue to rise in response to the environmental challenges that Bangladesh faces. The findings can serve as a valuable resource for policymakers, researchers, and organizations working to protect and uplift the lives of those affected by environmental migration in the country. Furthermore, it underscores the importance of a comprehensive national policy to safeguard the rights and well-being of environmental migrants, particularly vulnerable groups such as women and children.

Keywords: Climate change, climate action, migration, adaptation, Bangladesh

Plenary 4: Climate Migration   **DATE: 26TH November, Time 9:00-10:30**

P4.6. The Impact of Climate-Induced Migration on Rural Livelihoods in Bangladesh

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ABSTRACT

In the twenty-first century, climate change has presented the globe with enormous challenges and risks. Developing nations are hardly an exception, and as natural hazards become more frequent and intense, they become more vulnerable. It is already known that one of the biggest threats to developing nation's ability to advance economically is climate change, which has a negative impact on people's lives and means of livelihood globally. Bangladesh has been recognized as one of the nation's most susceptible to the effects of climate change. Several factors, such as natural disasters, alterations in the environment, scarcities, and financial strain, may make the local population more vulnerable. With societal vulnerabilities and risk exposure, there is fear that climatic extremes and even a string of less extreme occurrences might endanger people's lives and means of livelihood in rural areas. Rural communities that are losing their population often experience a breakdown in social networks, making it more challenging to access resources and support systems. Many rural inhabitants depend on agriculture and related activities, which become increasingly precarious due to erratic weather patterns, leading to food and income insecurity. Families are often separated as individuals migrate in search of better opportunities or to escape environmental crises. This separation can lead to a loss of social support networks and a sense of community. Furthermore, the departure of working-age individuals can leave rural areas with an aging population, impacting the overall economic productivity of these communities. Moreover, when rural populations migrate to urban areas or other regions, they often face challenges such as cultural differences, language barriers, and a lack of social acceptance. Health consequences are another significant aspect of climate-induced migration. The living conditions in informal settlements or urban slums to which many rural migrants move are often substandard,

lacking access to clean water, sanitation, and healthcare. This can increase the vulnerability of rural migrants to diseases and health risks, leading to higher morbidity rates. On a broader scale, climate-induced migration from rural areas to cities or other regions can strain the already limited resources and infrastructure of these destinations. Urban areas often struggle to accommodate the influx of migrants, leading to overcrowding, inadequate housing, and overburdened public services. This, in turn, can create tensions between migrants and the host communities, sometimes leading to conflicts and social unrest.

Through a comprehensive study, this paper provides an understanding of the number of migrants, their demographics, and the specific regions most affected in Bangladesh. It seeks to uncover the strategies rural communities employ to adapt to climate change and mitigate the necessity for migration. While some policies have shown promise in mitigating the impact of climate-induced migration, The findings of the paper indicate that challenges remain in terms of equitable distribution of resources and effective implementation and the need for more comprehensive and long-term solutions for this issue.

Keywords: Climate change, climate action, migration, adaptation, rural livelihoods.

Plenary 5: Resilient City   DATE: 26TH November, Time 11:00-1:00

P5.1. Assessing Urban Expansion and Land Use/Land Cover Changes for Sustainable Development in Gazipur City Corporation Area.

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ABSTRACT

Urbanization is a prevalent occurrence worldwide, particularly in emerging nations, and it has a substantial influence on the land use and land cover of specific regions, resulting in adverse consequences. Urban built-up area expansion regulation has become a key research topic due to the rapid pace of urban expansion, particularly in Bangladesh, a developing country striving to create resilient cities. The paper aims to identify the direction of urban expansion and detect the changes in the LULC of the study area. Landsat 5 (TM) and 8 (OLI/TIRS) satellite images were subjected to supervised classification with a maximum likelihood classifier to extract spatial and temporal data. The combination of remote sensing and Geographical Information System (GIS) has proven to be efficacious in monitoring land use/cover changes and offering essential data required for planning and research. This paper provides a comprehensive account of the entire urban expansion process in Gazipur City Corporation, a newly established urban center, from 2000 to 2020 by using analysis of Landsat Multi-spectral Scanner (MSS) and Operational Land Imager (OLI) photos from 2000 and 2020. In 2000, the urban built-up area was 82.65 km2, and in 2020, the area was 154.50 km2; this shows a significant expansion of the built-up area of about 71.85 km^2. The urban area has expanded in the southern and western sides of the city corporation area. During this period, approximately 11% of water bodies have been transformed into urban areas. Additionally, almost 2% of agricultural land, 7% of vegetation cover, and 6% of bare soil have also been changed into urban areas. This study enhances

our comprehension of urban expansion's spatial and temporal patterns in the city. This knowledge serves as a foundation for improved urban planning and the efficient arrangement of urban activities, ultimately contributing to Gazipur's resilient city development. Therefore, in the same way, as in many other nations, particular urban and development plans ought to be produced to protect the environment and fulfill the sustainable development goal (SDG) 11 (sustainable cities and communities).

Keywords: Climate change, climate action, SDG, adaptation, LULC

Plenary 5: Resilient City   **DATE: 26TH November, Time 11:00-1:00**

P5.2. Correlation between Land Surface Temperature (LST) and Major Air Pollutants (MAP) in Greater Dhaka Region: A Geospatial Approach

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ABSTRACT

Dhaka, a bursting city of over 10 million, has seen its population double in three decades. Rapid industrial growth has led to urban air pollution, posing a severe threat to public health. As development clusters in congested areas, air quality monitoring has become of utmost importance for making the city resilient for the future. The study examines the 30-year correlation between land surface temperature (LST) and central air pollutants (MAP) in Dhaka using Landsat imagery from 1994 to 2023 at 10-year intervals. Air quality data was gathered in post-monsoon conditions from 26 locations in Gazipur, Dhaka, and Narayanganj using a portable Aeroqual Series 500 air quality monitor. The study revealed that the land surface temperature (LST) has increased as the high value jumped from $32.05^{o}C$ in 1994 to $38.78^{o}C$ in 2023. The study found that Gulistan, Mirpur 10, Gabtoli, Darussalam, Farmgate, and Savar have the highest amounts of NO_2, which are 0.084 ppm, 0.089 ppm, 0.134 ppm, 0.090, and 0.99 ppm, respectively. Gulistan and Fuldi Bazar had the highest amounts of SO_2, 0.3 ppm, and 0.2 ppm, respectively. Gulistan, Farmgate, Gabtoli, and Joyedebpur had a rise in land surface temperature of more than $6^{o}C$. The annual mean particulate pollution level of the nation's established standard is 0.015 mg/m³. The Joydebpur rail station recorded a PM_{10} concentration of 1.13 mg/m³, exceeding the national standard level by over 80 times. Again Jirani Bazar (0.415 mg/m³) and Farmgate (0.497 mg/m³) had a high amount of PM_{10}. Conversely, Kadamtuli, Joydebpur Rail Station, and Genda had the highest levels of $PM_{2.5}$, measuring 0.108 mg/m³, 0.151 mg/m³, and 0.125 mg/m³, respectively. Lalbagh and Kadamtuli are close to the Buriganga River, and the air in these areas is heavily polluted, emitting an unpleasant odor. New Market, a hub for the middle-class population, is grappling with

congested traffic, leading to elevated pollution levels and a rapid increase in temperature; the area had CH_4 (11 ppm) and CO_2 (614 ppm), which is above the standard level. Zinda Park (55 ppm) and Jirani Bazar (54 ppm) had the highest concentrations of CH_4, while Mogbazar (938 ppm) and Fuldi Bazar (770 ppm) exhibited the highest levels of CO_2. Jirani Bazar, Fuldi Bazar, and Savar had land surface temperatures that rose by nearly 6.5^0C in the last three decades. The study reveals that high land surface temperatures align with air pollution hotspots due to human activities and regulatory gaps in greater Dhaka. This provides valuable insights for local, national, and international organizations to address air pollution challenges.

Keywords: Land Surface Temperature (LST), Major Air Pollutants (MAP), Geographic Information System (GIS), Air quality, Dhaka city.

Plenary 5: Resilient City DATE: 26TH November, Time 11:00-1:00

P5.3. Geospatial Modeling for Air Quality Mapping of Dhaka City

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ABSTRACT

The most populous city in the world is Dhaka, the capital of Bangladesh, which is the most developed metropolis in terms of urban infrastructure, transport system, and land use. The development of the transportation infrastructure, industrialization, and heavy construction generate air pollutants, and Dhaka's AQI has remained severe in recent years. Air pollution can cause serious health conditions such as respiratory infection, lung cancer, chronic obstructive pulmonary disease, stroke, heart attack, and stunted growth and development inchildren. The objective of this study is to evaluate the hot spot and cold spot zones of Dhaka City Corporation and to rank the Ward and Thana by AQI. Prioritizing primary data consistingof air pollutant values are gathered, and sites are chosen using the confusion matrix approachof Dhaka City Corporation's Road network nodes. Based on the estimated AQI used for hot spot analysis and zonal statistics, the Inverse Distance Weighting (IDW) interpolation method is used. After conducting a hot spot analysis, House Building and Gulshan-2 are the nodal points with 99% significance for hot and cold spots, respectively.Zonal statistics determine the ranking of Thana and AQI at the ward level, with Jatrabari Thana ranking highest and Ward No. 65 of Dhaka South City Corporation achieving the highest ranking. After taking some national actions to reduce air pollution in the future, these results can be implemented in Environmental Risk Management.

Keywords: AQI, Zonal Statistics, Nodal Point, Confusion Matrix, Hot Spot Cold Spot Analysis.

Plenary 5: Resilient City　　　　　　　**DATE: 26TH November, Time 11:00-1:00**

P5.4. Plastic Recycling and Political Embodiedness

Khadiza Tul Kubra Shapu, Nafisa Islam, Shrabon Sarker and Sumaiya Akter Mim*

ABSTRACT

The fundamental purpose of this research is to explore the repercussions of the plastic recycling process for a particular class of people linked to this system. This study aims to untangle the politicization of their body and mind under the notion of a green and clean environment. Another objective of this study is to elicit the perspective of those people on synchronizing themselves with the concept of recycling and generating a pollution-free environment.

Plastic recycling factories in Islambag have been chosen as research areas for conducting preliminary field research. Qualitative research methodologies have been employed to address the vulnerable conditions of the individuals associated with these factories. In-depth interviews, focus group discussions, and geographical map analysis have been used to collect data. A literature review was drawn for secondary data compilation.

Using the embodied urban political approach, this study argues that the recycling process, which is assumed to be productive towards the aim of a pollution-free environment itself, might be detrimental to the physical and mental health of the people pertinent to it. Plastic recycling, becoming one of their primary sources of income, leaves them with no alternative but to continue working in this hazardous environment despite its adverse impact on their health. Dust and small particles from shredded plastic and the noise produced by the machines have catastrophic consequences on the mental and physical health of the workers, equally disserving the residents living in that area. But this perception is constantly concealed underneath the fancy themes of ecology and, as always, stays out of debate despite their functional body being the primary catalyst in the plastic recycling movement. Moreover, an intersectional approach supports this research endeavour in exploring the gendered and marginalized

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perspective of female workers who are driven to labour in such harsh surroundings, sometimes even with their toddlers, because of their socioeconomic situations.

In conclusion, we attempt to demonstrate that with the discourse of plastic recycling management, the body of individuals who participated in this process is being politicized. This study indicates that not only plastic recycling has to be a concern for urban ecosystems, but also human beings connected with recycling procedures and their health concerns should be incorporated as an essential element in designing a resilient city.

Embodied approaches to plastic recycling will develop a deeper understanding of the complicated interrelationship between the socioeconomic condition, working and living environment, politicization of body and mind of the workers, and the concept of recycling in developing a green city. This approach assists in unveiling those parts of the recycling process that used to be turned a blind eye to, as this process itself could be lethal to the people working for this noble cause.

Keywords: Climate change, climate action, pollution, environment, plastic waste.

Plenary 5: Resilient City

P5.5. Time Series Assessment of Air Pollution in the Dhaka North City Corporation based on Concentration of PM2.5 using Linear Regression Model

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ABSTRACT

There is substantial air pollution in Dhaka City, mainly from particulate matter. The continuous Air Quality Monitoring Station (CAMS) in Sangshad Bhaban in Dhaka, Bangladesh, collected the ambient air quality data for particle matter from April 2011 to September 2020. Delicate particulate matter is a typical air contaminant linked to several detrimental health effects. According to the most recent data, PM 2.5 concentration varies from 30.01 μg/m3 to 39.82 μg/m3 during monsoon periods, while in the non-monsoon period the concentration ranges from 156 μg/m3 to 196.75 μg/m3. High concentration has been observed on weekdays from 2011 to 2020 due to increased diesel vehicles and technological development. The objective is to predict the next 10 years' concentration and assess air pollution conditions in the northern part of Dhaka City. A trend has been followed by the particular matter concentration of the northern part of Dhaka, as the seasonal variation indicates that particulate matter pollution is mainly during the dry winter season. The prediction has been made using a linear regression model. Seasonal variation has been seen and compared with the last decade. After 2023, the concentration of air pollution is linearly increasing till 2030. Unplanned urbanization and vehicle usage are the reasons behind its devastating day-by-day environmental conditions.

Keywords: Climate change, climate action, pollution, environment, air pollution.

Plenary 5: Resilient City　　　　　**DATE: 26TH November, Time 11:00-1:00**

P5.6. Riverbank Erosion Impact Assessment of Rural Households with Morpho hydrological Analysis and Main Adaptation Barriers in Northern Part of Bangladesh

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ABSTRACT

Bangladesh is one of the most vulnerable deltas in the world due to natural hazards. Bangladesh is mainly formed by alluvial depositions. It faces river bank erosion frequently due to regular shifting of river channels. This study was conducted in the northern region Gaibandha situated on Bhramaputra river basin which is under Rangpur division. About 120 households were surveyed from villages composed of char lands and riparian areas, which are facing extreme riverbank erosion almost every year. The main objective of this study is to understand the overall trend and consequences of the riverbank erosion of that study area. All most 100% of the people on the bank line of Brahmaputra have been suffering due to erosion. Loss of homesteads, cultivable lands, garden lands & home yard lands have played vital role for the change of their livelihood pattern. Assessing loss of agricultural lands among the respondents 90% have lost their cultivable lands. Around 60% people have lost homestead land. In rehabilitation status among the displaces 60% (out of 120) settled in nearby rural areas. 15.83 % shifted to nearby land and rest of them are landless. In case of Brahmaputra riverbank erosion 79.17% respondents have admitted that their family status changed in term of financial ability being victims of erosion. This paper documents the bank line dynamics of the Brahmaputra River along the Gaibandha region during the period 1991 to 2021. GIS and RS aided data extraction, employing unsupervised classification and on-screen digitizing for change detection, enabling precise mapping of riverbank shifts and erosion/accretion areas. Satellite image-based interpretations used to detect river shifting which results slightly rightwards shifting of river during this period and total accretion is more than erosion during this period. This study also assesses the water level condition of last 30 years from

historical time series data acquire from BWDB which shows maximum water level recorded as 18.85 m in year 2017 and minimum 10.83m in year 2000. Farm level adaptation strategies are the key to reducing climate change impacts on agriculture, food production and the vulnerability of rural households. In this chapter, the determinants of and barriers to adaptation of the resource-poor households are illustrated using economic techniques. We have found some adaptation strategies (Migration, Tree plantations, Homestead gardening, Diversified income and Diversified crop). Among these variables we tested the Factor analysis to check the variable heterogenicity to fit for the binomial logit regression. We tasted them in regression model with independent variables (gender, age, education, income, small-farmer, medium-farmer). For diversified crop, gender and medium farmer shows 5% level of positive significant relation and 5% level of negative significant relation with small-farmer and in case of diversified income, it is statistically reverse. It is needed to understand the historical trends of that natural disaster to take proper steps to improve the livelihoods of that area. This information will enable policy makers to identify the factors that influence household adaptation and mitigation choices so that effective intervention policies can be formulated to enhance their resilience

Keywords: riverbank erosion, hydro, impact assessment, resilience.

Plenary 6: Environmental Conservation DATE: 26TH November, Time 2:00-3:30

P6.1. A Review on the status of Fish Diversity and Its Degradation in Cholon Beel

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ABSTRACT

Chalan Beel- a significant waterbody in Bangladesh, is the hub of one of the most important fish species in the world. It substantially contributes to the fisheries sector, which plays a vital role in the agro-ecosystem. This study assessed (i) the status of fish diversity in Chalan Beel and (ii) the causes of fish diversity degradation in Chalan Beel. A literature search was conducted using internet browsing from the Google Scholar database. The fish diversity data was collected from several published papers. An order-based distribution & seasonal availability of the fish species was also calculated and analyzed. Cypriniforms were the most dominant order (35.14%), which is quite different from the other fish species. The highest species richness was found at 3.04 at Atrai during the monsoon and the euphorbia during the post-monsoonal period. The most abundant species were found in the eastern part of the country. The main factors for the degradation of fish diversity were overexploitation and habitat degradation. The results of this study inform about 66 native fish species and provide helpful information for future management. The list of existing fish species and their conservation status needs to be updated regularly for the future management of fish diversity in Chalan Beel.

Keywords: Climate change, climate action, river pollution, environment, fish diversity, food.

Plenary 6: Environmental Conservation　　　DATE: 26TH November, Time 2:00-3:30

P6.2. Environmental Education for Nature-based Solutions

Anusree Ghosh*, *Nahid Morshed, Tapas Ranjan Chakraborty, Moniruzzaman Khan and Dr. Liakath Ali*

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ABSTRACT

Nature-based solutions are the most required form of climate action for the fragile ecosystem. The fast development and growth interfere with environmental well-being. To minimize environmental risks, holistic management and sustainable use of natural resources are necessary. BRAC initiated a mangrove plantation on the Mirsarai coast of Chattogram. Seventy-two thousand saplings have been planted on newly accredited 22 hectares of land; natural growth of mangroves is observed. To engage the youth in the process of climate action, environmental education is being initiated at the secondary level at Mirsarai and Chattogram. This non-formal environmental education includes class sessions, relevant day celebrations, and self-reading. A flip chart on Mangrove and a book on Ecosystem understanding were developed from the project. The current paper reviews the importance of environmental education to promote nature-based solutions. The effectiveness of environmental education was assessed by analyzing 10 class sessions in Mirsarai, 6 class sessions in Chattogram City, and two World Environment Day celebration events. It was found that though the textbook curriculum has covered the elements of environment, ecosystem, and climate change, the non-formal or co-curricular education on the environment will make the students more proactive towards climate action. According to the two-thirds secondary level, student plantation is the best climate action, whereas the rest assumed it is waste management. No significant variance in suggested actions was found in urban and rural contexts. Introducing environmental education as a co-curricular was not welcomed by the schools quickly but required an excellent effort to convince the authorities. The formation of nature or

ecological clubs resulted in the significant participation of students in climate action. Understanding nature-based solutions requires understanding energy flow in the ecosystem and environment. South Asian experiences with nature-based solutions by mangrove vegetation can help develop the learning materials. Since the native language in Sundarbans areas is the same, there is the scope of using a unique "Paribhsha" for the Bangla language.

Keywords: Climate change, climate action, pollution, ecosystem, education.

Plenary 6: Environmental Conservation   **DATE: 26TH November, Time 2:00-3:30**

P6.3. Soil Carbon Stock and CO2 mitigation potential and impact on environment in the Ratargul Swamp Forest of Sylhet, Bangladesh

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ABSTRACT

Due to global warming and climate change, the world's soil organic carbon (SOC) is decreasing day by day. The only freshwater swamp forest in Bangladesh is the Ratargul swamp forest, which has unique characteristics and is ecologically important. This study was carried out in Ratargul swamp forest, Sylhet, to measure the soil's physiochemical parameters, soil organic carbon (SOC) stock, and CO_2 mitigation potential of the forest land along the Gowain River.

A systematic sampling method was used to identify each sampling point through the Global Positioning System (GPS). We collected top soil (0–15 cm) and subsoil (16–30 cm) from 10 sampling locations. From each sampling station, three samples were collected from one-meter-diameter Then the top soil samples and subsoil samples were mixed together to make homogeneous soil samples. Walkley and Black's wet oxidation method was used to measure the SOC of the soil samples.

The result showed that the pH, Electrical conductivity (EC), Moisture content, Bulk density, Particle density, Soil porosity, Total organic carbon (TOC), Soil organic matter (SOM), Total nitrogen (TN), Soil carbon sequestration, and CO2 mitigation potential ranged from 5.70 to 6.02, 0.083 to 0.10 us/cm, 10.8 to 34.87%, 1.06 to 1.19 gcm-3, 1.65 to 2.21 gcm-3, 29 to 54%, 0.34 to 0.69%, 0.61 to 1.19 %, 1.35 to 2.54 t/ha, and 4.95 to 8.89 t/ha, respectively. The study showed that the soil condition is good, the current soil C stock is in good condition, and the soil CO_2 mitigation potential is excellent. The forest plays an important role in mitigating climate change and should be protected from deforestation and human activities through modification of land use and management strategies, notably conservation and restoration.

Keywords: Soil Carbon Stock, Soil Organic Carbon, Soil Organic Matter, Soil quality parameter, and CO_2 mitigation potential.

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P6.4. Nepal's Mountain Tourism: A Beacon of Climate Resilience for South Asia

Shanti Tamang*

ABSTRACT

Nepal's Himalayan landscapes represent an inspiring paradox- a synergy of breathtaking natural grandeur interwoven with profound cultural heritage. These mountains are a global asset, offering far more than postcard-perfect backdrops for tourists. They serve as an invaluable living laboratory for climate resilience and sustainable development.

As climate change intensifies, with receding glaciers and erratic weather patterns, Nepal's mountains are at the forefront of climate-related challenges, including the proliferation of glacial lakes and ensuing flash floods. Amidst these challenges, the tourism sector is a critical driver of climate resilience and sustainable development in Nepal's mountain regions. Tourism becomes a financial cornerstone when managed sustainably, generating revenue that can be invested in conservation, community development, and environmental education. This dynamic relationship between tourism and climate resilience fosters investments in vital areas like infrastructure and ecological preservation. Promoting tourism in Nepal's mountains isn't solely a national concern but a regional benefit, safeguarding water resources, agriculture, and livelihoods across South Asia.

The legal frameworks governing tourism in these regions are vital to serving as a model for climate resilience and sustainable development. In this context, the imperative of exploring the necessity for a South Asian regional policy to address collective climate challenges comes to the forefront. The primary question is, "How can the legal frameworks governing tourism in Nepal's mountain regions serve as a

model for climate resilience and sustainable development within Nepal and as a prototype for neighboring South Asian regions confronting similar climate challenges?"

The research will employ a meticulous mixed-method approach. It will encompass an exhaustive literature review, delving into existing studies pertaining to Nepal's mountain ecosystems, the tourism sector, and the multifaceted challenges posed by climate change. In addition, primary data will be meticulously gathered through interviews and surveys involving critical stakeholders, including government officials, conservation organizations, and local communities in Nepal. The study will critically examine the legal and policy frameworks governing tourism in Nepal's mountain regions.

The outcome of this study unveils the intricate dynamics where tourism promotion and climate resilience intersect in Nepal's mountains. This research anticipates robust findings that emphasize the pivotal role of sustainable tourism in Nepal's mountain regions in the context of climate resilience and sustainable development.

The research will conclude with an emphasis on the transformative power of sustainable tourism practices in Nepal's mountains, emerging as a symbol of optimism and a blueprint for climate resilience across the South Asian expanse. While legal boundaries are in place, the imperative for a comprehensive approach to sustainable tourism is undeniable. The shared climate challenges across South Asia open windows of collaboration and knowledge exchange, rendering Nepal's experience applicable to the entire region. The research contributes to the broader discourse on climate resilience and sustainable development in South Asia, emphasizing the pivotal role played by Nepal's mountain tourism. This study's legal and policy insights can steer South Asian nations in their quest to harmonize tourism promotion with climate resilience.

Keywords: Climate change, mountain, climate resilience, pollution, environment, Nepal.

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P6.5. Transition from Linear Economy to Circular Economy: A Prospect of Minimizing Economic and Environmental Cost

Ikhtiarul Arefeen *Md Bodiujjaman

ABSTRACT

Bangladesh is experiencing substantial economic growth and severe environmental challenges simultaneously, making its growth costly as it depends mostly on a linear economic model. Although the effect of a linear economy is positive in terms of gaining wealth and achieving growth, the output of carbon emissions and environmental loss put developing countries like Bangladesh at increased risk of economic loss and damage. Considering this issue, this paper intends to present mainly the prospects and importance of a circular economy rather than a linear economy in Bangladesh. Bangladesh's economy is one of the fastest growing in the world despite many man-made and natural challenges. Amidst the burgeoning economy and gigantic development activities, the country usually loses a significant amount of its national resources and income due to following the linear economic model. Climate change and its impacts put high economic pressure on all kinds of industries in a country like Bangladesh. On an understanding of this reality, this article proposes a circular economy model because it will work like a double dividend method where investments and employment generations would be ensured while protecting the environment by reducing different forms of degradation by individuals and firms. To present this theme, a qualitative study is applied, and the systematic literature review methodology is conducted to achieve better knowledge about the prospects of the circular economy by using the most relevant and recent articles. Moreover, adaptation to a circular economy requires a change aiming for a new business model based on the 3R approach (reducing, reusing, and recycling) and energy efficiency that would reduce production costs. As new businesses and industries are being established, it is high time to adopt a model of circular economy rather than a linear one. Consequently, a circular economy can also help the country introduce an innovative and sustainable development

model at less cost with a sustainable green economy and employment; thus, it could reduce the transition cost from the linear economy. Policymakers and scholars will benefit from this article to continue further study on it, mostly in three areas: sustainable public procurement, sustainable manufacturing, and corrective and progressive taxation. More studies are needed to sort out innovative adaptation mechanisms for the circular economy to achieve economic benefits.

Keywords: Climate change, economy, climate adaptation, pollution, environment, circular economy.

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P6.6. Climate Justice in Nepal: Exploring Equity and Sustainability in a Developing Nation

Prakriti Adhikari*

ABSTRACT

The paper delves into the complex landscape of climate justice in Nepal, a developing Himalayan nation facing significant climate challenges driven by its rich biodiversity, vulnerable ecosystems, and predominantly agrarian society. It centers on the disproportionate burden borne by marginalized communities and aims to identify strategies for equitable and sustainable solutions to address Nepal's climate security challenges, focusing on inclusive policy-making, gender-responsive approaches, and the integration of sustainability principles into national policies. Grounded in the principles of climate justice, equity, sustainability, and the ethical dimensions of climate change, the study underscores the need for a fair distribution of climate-related benefits and burdens, recognizing that marginalized communities lack the resources and representation to combat climate change effectively. This research gathers empirical evidence and diverse perspectives by employing qualitative interviews, document analysis, case studies, and comparative analysis, offering insights and recommendations to advance climate justice, empower communities, reduce disparities, and build a sustainable, equitable, and resilient society. The findings emphasize the integration of equity into climate strategies to promote justice and the importance of effective governance mechanisms, drawing from successful practices in other developing nations. This research contributes to a deeper understanding of climate justice, informs policy formulation, and paves the way for a fairer and environmentally sustainable future in Nepal.

Keywords: Climate Justice, Nepal, Equity, Sustainability, Vulnerability.