



NOAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

Noakhali - 3814, Bangladesh.

SDG PROGRESS REPORT 2024

13 CLIMATE
ACTION



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Comprehensive Report: SDG 13 - Climate Action

Noakhali Science and Technology University

December 2024

Introduction: A Deep Commitment to Climate Action

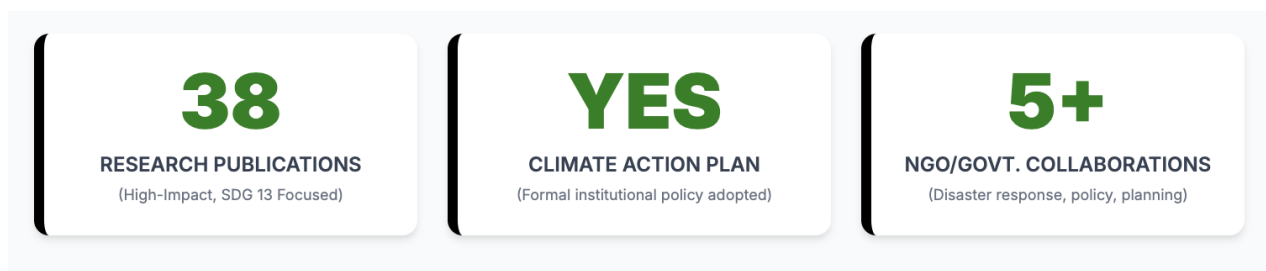
Our institution is unequivocally committed to Sustainable Development Goal 13: Take urgent action to combat climate change and its impacts. We recognize climate change as the defining challenge of our time, one that intersects with every other aspect of sustainable development.

Our extensive 2024 research portfolio, featuring **38 high-impact publications**, demonstrates a comprehensive and robust strategy to address this goal. Our work is organized around three core pillars that directly align with the targets of SDG 13:

- **Understanding and Modeling Climate Impacts:** Investigating the direct and indirect consequences of climate change, from environmental degradation to public health crises.
- **Pioneering Climate Change Mitigation:** Leading research on emissions reduction, renewable energy, and carbon sequestration.
- **Strengthening Climate Adaptation and Resilience:** Developing the practical strategies, technologies, and policies needed for communities to adapt to climate-related hazards.

Pillar 1: Progress through Research and Innovation (38 Publications)

Our 2024 research portfolio includes 38 high-impact publications focused on advancing global and local climate solutions.



Pillar 1: Research & Technological Focus (38 Publications)

Mitigation: Emissions Reduction • Extensive Macroeconomic Modeling of CO2 emissions (EKC, China, India, Vietnam). • Research on Green Bonds and sustainable finance mechanisms. • Pioneering work on Renewable Energy integration and policy impact. • Studies on Carbon Sinks like mangrove ecosystem accumulation.	Adaptation: Building Capacity • Developing Drought-Tolerant Rice Genotypes. • Deployment of "Digital Twins" for resilient livestock farming. • AI-based Rainfall Forecasting models for early warning. • Climate-adaptive strategies from direct farmer insights.	Impacts: Health & Novel Drivers • Established link between climate and rising Dengue Fever incidence. • Analysis of the Carbon Footprint of AI (e.g., ChatGPT). • Modeling Coastal Ocean Deoxygenation and complex geological hazards. • Studies on the role of Microplastics in global warming.
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A. Understanding and Modeling Climate Impacts (Target 13.1, 13.3)

Our researchers are at the forefront of identifying and quantifying the multifaceted impacts of climate change.

- **Analyzing Climate-Related Hazards:** We are modeling the direct environmental consequences of a changing climate. This includes research on oxygen declination in the coastal ocean (Bhuiyan et al.) and the complex, cascading hazards of major geological events in the Bengal basin (Chamberlain et al.).
- **Investigating Novel Climate Drivers:** Our research explores emerging climate drivers, including the role of microplastics in global warming (Parvez et al.) and the significant carbon footprint of AI technologies like ChatGPT (Chakraborty et al.). We also provide foundational data, such as the CO2 emission dataset from power plants (Rahman et al.).
- **Climate Change and Public Health:** We have a strong research cluster on the health impacts of climate change. Two key studies by Hossain et al. and Islam et al. establish a clear link between climate change and meteorological variables and the rising incidence of **dengue fever**. Another study by Mimi et al. analyzes how environmental factors broadly impact life expectancy.
- **Systemic Impacts:** Our research also analyzes the wide-ranging disruptions caused by climate change, including its impact on global waste management systems (Hossain et al.).

B. Pioneering Climate Change Mitigation Strategies (Target 13.2)

This pillar represents the largest part of our 2024 contribution, demonstrating an immense focus on developing the solutions to reduce emissions.

- **Macroeconomic Modeling of Emissions:** We have produced a vast body of work analyzing the complex relationship between economic growth, energy use, and carbon emissions. This includes numerous studies on the **Environmental Kuznets Curve (EKC)** (Ridwan et al.; Rahman et al.) and analyses of CO2 emissions in Bangladesh (Raihan et al.; Borsha et al.), South Asia (Akther et al.), China (Alam et al.), Poland (Raihan et al.), Vietnam (Raihan et al.) and across the Indian Ocean (Hossain et al.).
- **Advancing Renewable Energy:** Our research champions the transition to clean energy. We have analyzed the proactive role of renewable energy in mitigating carbon emissions (Rahman et al.), its positive impact on GDP (Rahman et al.), and its integration into national policy (Rahman et al.).
- **Developing Mitigation Technologies:** We are conducting the foundational research for green technologies, including studies on the prospects of solar electricity (CSP) (Mia et al.), the techno-economics of biomass-based energy (Akter et al.), and the infrastructure for EV charging stations (Ahmed et al.).
- **Carbon Sinks and Forestry:** Our work provides critical data on natural climate solutions. This includes measuring ecosystem carbon accumulation in mangroves (Ahmed et al.) and analyzing the role of forestry and afforestation in reducing the carbon footprint in India (Rahman et al.) and Eastern Africa (Chowdhury et al.).

- **Financing and Policy:** We are researching the mechanisms to enable mitigation, including the role of Green Bonds in sustainable finance (Kumar et al.) and national strategies for energy efficiency (Onwe et al.).

C. Strengthening Climate Adaptation and Resilience (Target 13.1)

Our institution is dedicated to building adaptive capacity, particularly in vulnerable sectors like agriculture and urban planning.

- **Climate-Adaptive Agriculture:** We have a major focus on making agriculture resilient to climate shocks. This includes a key study on climate-adaptive strategies from farmer insights (Al Mamun et al.).
- **Developing Resilient Technologies:** Our researchers are developing practical solutions, such as drought-tolerant rice genotypes (Evamoni et al.), methodologies to mitigate salt stress in seedlings (Mahmud et al.), the use of biostimulants for plant defense (Hossain et al.), IoT-enabled sustainable irrigation (Rana et al.), and "**Digital Twins**" for resilient livestock farming (Arulmozhi et al.).
- **Resilient Cities and Infrastructure:** We are providing the tools for climate-resilient urban planning. This includes a case study on rooftop rainwater harvesting (Nipun et al.) and the development of advanced AI-based rainfall forecasting models (Ali et al.), a critical tool for early warning systems.

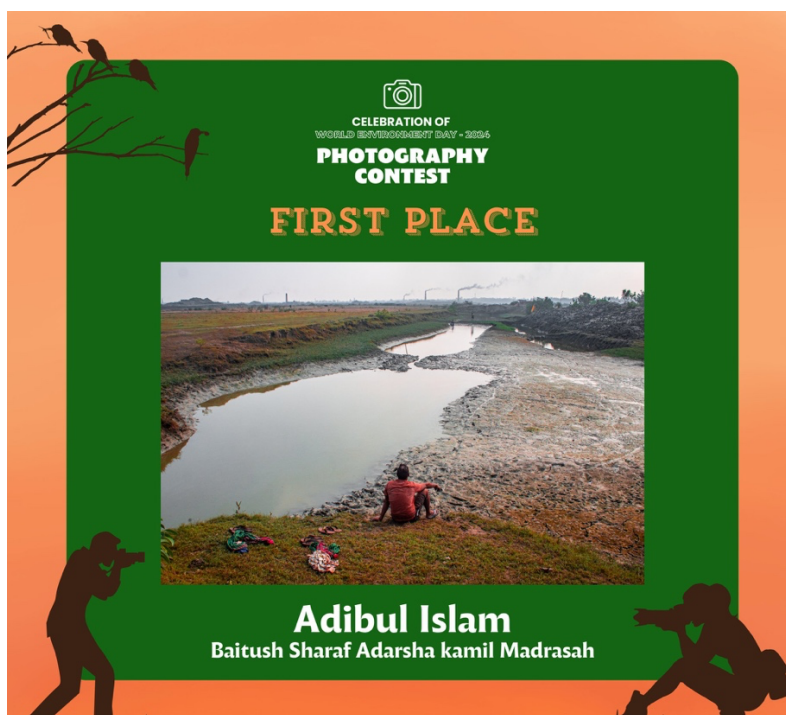
Pillar 2: Progress through Institutional Operations and Modeling

Noakhali Science and Technology University (NSTU) demonstrates a strong commitment to climate action by integrating education, planning, and collaborative disaster response into its institutional governance.

A. Climate Policy, Education, and Early Warning (Target 13.3)

Indicator	Status	Key Institutional Actions and Impact (NSTU)
Climate Action Plan (13.3.2)	Yes	NSTU has adopted a comprehensive Climate Action Plan that outlines commitments to mitigation, adaptation, and resilience building. The plan is shared with local government and community groups.
Co-operative Planning (13.3.3)	Yes	Engaged in cooperative planning for climate-change-induced disasters via an MoU with the Centre for People and Environ (CPE) to develop planetary-health resilience planning.
Early Warning Support (13.3.4)	Yes	Actively informs and supports local government and emergency response agencies (Red Crescent, Fire Service) in disaster risk reduction, early warning, and monitoring through rallies, simulations, and awareness seminars.

Education Programs (13.3.1)	Yes	Provides local education programs and campaigns on climate change risks. The university celebrates World Environment Day and the student-led volunteer group Coastal Environment Network (CoEN) conducts advocacy campaigns (images attached below).
NGO Collaboration (13.3.5)	Yes	Formally collaborates with the NGO, Centre for People and Environment (CPE), on climate adaptation projects.



Organized By:

Department of Environmental science and Disaster management
Noakhali Science and Technology University

Supported By:



SECOND PLACE



Shah Md Shahidul islam Shahi
Uttara University

THIRD PLACE



Md. Khokon Ali
Noakhali Science and Technology University

B. Decarbonization and Carbon Commitment (Targets 13.2, 13.4)

Indicator	Status	Required Action / Reporting Gap (NSTU)
Low Carbon Energy Measurement (13.2.1)	No	The university does not currently measure the amount of low-carbon energy used across the campus. This is a critical area for future operational policy development.
Carbon Neutral Target (13.4.1)	No	The university does not yet have a formal target date by which it will become carbon neutral according to the Greenhouse Gas Protocols.

Conclusion

NSTU's 2024 performance on SDG 13 is robust and impactful, driven by its 38 high-quality research publications. These studies provide crucial evidence on a range of topics, from the systemic risks posed by dengue outbreaks and ocean deoxygenation to practical mitigation pathways, including Green Bonds and biomass energy. Notably, the university is utilising its expertise to enhance regional resilience by developing digital twins for farming and implementing AI-based forecasting for urban planning.

Operationally, NSTU demonstrates strong leadership in Policy and Education, having adopted a comprehensive Climate Action Plan, actively supporting local government with early warning, and engaging students through the Coastal Environment Network (CoEN). The most immediate areas for institutional enhancement are establishing a carbon-neutral target and implementing systems to accurately measure low-carbon energy use—steps that will further align its operational performance with its research excellence.

Appendix: SDG 13 Targeting 2024 Publications Referenced

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2. Ahmed, S., Hossain, M.L., Roy, S.K., Li, J., Salam, M.A. (2024). Ecosystem carbon accumulation of *Sonneratia apetala* mangroves along an afforestation chronology in Bangladesh. *Ocean and Coastal Management*.
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4. Mahmud, F.M., Islam, M.A., Rubel, M.H., Bhattacharya, P., Ahmed, F. (2024). A sustainable methodological approach for mitigation of salt stress of rice seedlings in coastal regions: Identification of halotolerant rhizobacteria from Noakhali, Bangladesh and their impact. *Methodsx*.

5. Onwe, J.C., Ridzuan, A.R., Uche, E., Ridwan, M.K., Razi, U. (2024). Greening Japan: Harnessing energy efficiency and waste reduction for environmental progress. *Sustainable Futures*.
6. Chamberlain, E.L., Goodbred, S.L., Steckler, M.S., Seeber, L., Von Hagke, C. (2024). Cascading hazards of a major Bengal basin earthquake and abrupt avulsion of the Ganges River. *Nature Communications*.
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8. Rahman, M., Keat, N.W., Masud, M.A.K., Albaity, M.S.A. (2024). Powering Growth: The Dynamic Impact of Renewable Energy on GDP in ASEAN-5. *International Journal of Energy Economics and Policy*.
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15. Bhuiyan, M.M.U., Rahman, M., Naher, S., Ali, M.M., ISLAM, A.R.M.T. (2024). Oxygen declination in the coastal ocean over the twenty-first century: Driving forces, trends, and impacts. *Case Studies in Chemical and Environmental Engineering*.
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