NOAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

Noakhali - 3814, Bangladesh.

SDG PROGRESS REPORT 2024

PREPARED BY

Dr. Fahad Hussain

Associate Professor, Department of Pharmacy, NSTU

Additional Director, Ranking and Strategic Development Cell

Email: global@nstu.edu.bd

Website: www.nstu.edu.bd

RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

NOAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY
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Institution: Noakhali Science and Technology University (NSTU)

DATA CURATION & PREPARED BY

Dr. Fahad Hussain
Associate Professor, Department of Pharmacy
Additional Director, Ranking and Strategic Development Cell
Noakhali Science and Technology University
Email: fahad@nstu.edu.bd

PATRONS

Prof. Dr. Mohammad Razuanul Hoque
Pro-Vice-Chancellor
NSTU

Prof. Dr. Mohammad Ismail
Vice-Chancellor
Noakhali Science and Technology University

Prof. Dr. Muhammad Hanif
Treasurer
NSTU

PROOFREAD AND REVIEWED BY

Dr. Md. Monirul Islam
Assistant Director
Ranking and Strategic Development Cell

Dr. Khaled Mehedi Hasan
Deputy Registrar
Ranking and Strategic Development Cell

DATA COLLECTION

Ranking and Strategic Development Cell
and Recruited Student Interns:

Fatima Jannat Rinty, Umme Kulsum, Tanber Ahamed Farden, Min Hajul Islam Nahid,
and others.

Comprehensive Report: SDG 11 - Sustainable Cities and Communities

Noakhali Science and Technology University

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Introduction

Noakhali Science and Technology University (NSTU) is fully dedicated to Sustainable Development Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable. We recognize that the future of humanity is overwhelmingly urban, and creating sustainable cities is essential for public health, environmental integrity, and economic stability.

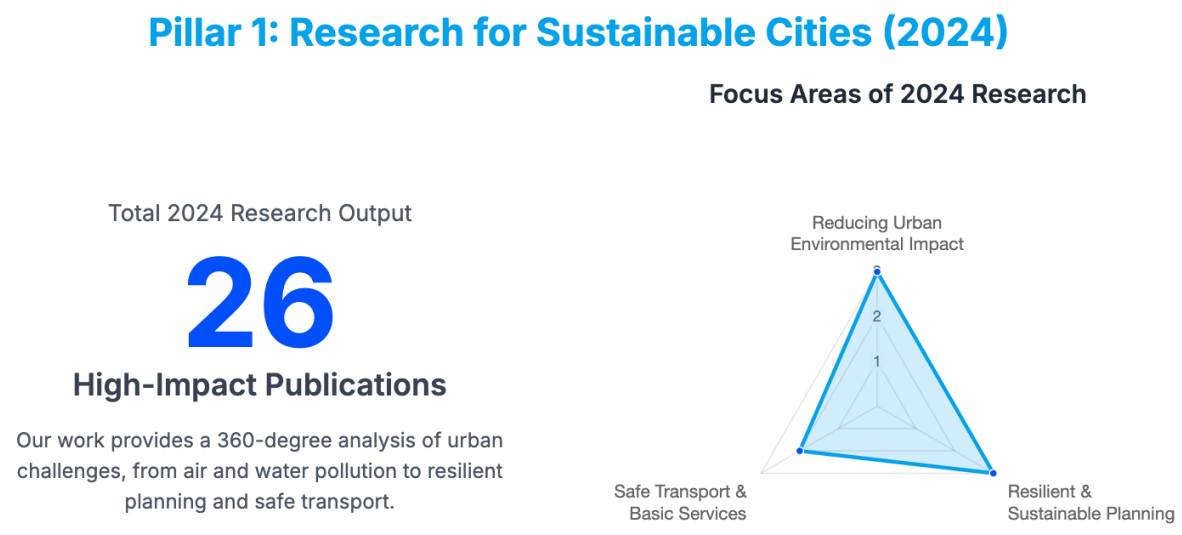
Our extensive 2024 research portfolio, featuring 26 high-impact publications, demonstrates a comprehensive, multi-disciplinary approach to this goal. Our work is organized around two key pillars:

1. **Research and Innovation:** A high-impact 2024 research portfolio (26 publications) tackling the most pressing urban challenges, from pollution and waste to resilient planning and safe transport.
2. **Operations and Community Engagement:** Acting as a steward of arts and heritage, promoting sustainable infrastructure and transport, and ensuring affordable housing.

This report details our 2024 accomplishments across these critical pillars.

Pillar 1: Progress through Research and Innovation

Our 2024 research is strategically focused on three core areas that directly align with the targets of SDG 11.



Section 1.1: Reducing the Adverse Environmental Impact of Cities (Target 11.6)

A major focus of our 2024 research was on Target 11.6, addressing air quality and waste management.

- **Air Quality Monitoring:** We have produced critical research on urban air pollution, including a data-driven model for forecasting particulate matter in the Dhaka megacity (Hasan et al.) and a classification of aerosols over major urban locations in Asia (Tariq et al.).
- **Urban Water Pollution:** Our researchers are leading the investigation into urban water contamination. This includes a cluster of studies identifying microplastic contamination in urban rivers (Riya et al.), tap water (Belal Hossain et al.), and groundwater (Paray et al.).
- **Chemical & Metal Pollution:** We conducted extensive risk assessments of heavy metals in urban surface water (Kubra et al.), the highly polluted Buriganga River (Rakib et al.), and Dhaka city's groundwater (Tajwar et al.).
- **Waste and Industrial Pollution:** Our research addresses pollution from urban industrial activity, including risk assessment of the lead-acid battery industry (Lima et al.) and frameworks for waste reduction as a model for "greening" urban centers (Onwe et al.).

Section 1.2: Building Resilient and Sustainable Urban Planning (Targets 11.3, 11.5, 11.b)

Our institution is at the forefront of developing the knowledge needed for Target 11.3 (sustainable urbanization) and Target 11.5 (disaster resilience).

- **Sustainable Land Use & Planning:** Our research provides tools for sustainable urban planning, including assessments of how land use alterations impact ecosystem services (Roy et al.) and affect surface runoff (Haque et al.).
- **Climate and Disaster Resilience:** We produced vital research to make cities more resilient, including modeling cascading earthquake hazards (Chamberlain et al.), assessing rooftop rainwater harvesting for climate resilience (Nipun et al.), and developing AI-driven rainfall forecasting models (Ali et al.).
- **Public Health Resilience:** The study by Hossain et al. analyzes the meteorological drivers of dengue incidence, a critical public health challenge for cities in Bangladesh.

Section 1.3: Ensuring Safe Transport and Access to Basic Services (Targets 11.1, 11.2)

Our research addresses the foundational needs of urban populations, including access to safe transport and basic services like sanitation.

- **Safe and Sustainable Transport (Target 11.2):** We have a strong focus on improving urban mobility, including an analysis of factors associated with Road Traffic Crashes (Miah et al.) and reviews of machine learning for Intelligent Transportation Systems (Azad et al.).
- **Access to Basic Services (Target 11.1):** Our research provides blueprints for essential urban services. The work by Karim et al. presents a holistic case study for citywide sanitation in the Noakhali Pourashava. The study by Abera et al. addresses the critical WASH factors for vulnerable, internally displaced populations in urban settings.

Pillar 2: Progress through University Operations and Community Engagement

NSTU's operational strategy is to be a model sustainable community, acting as a steward of arts and heritage, promoting sustainable infrastructure, and ensuring access to affordable housing.

Section 2.1: Support of Arts and Heritage

NSTU is a vital cultural hub for the region, preserving heritage and providing public access to arts.

- **Public Access to Heritage:** The NSTU campus, listed as a tourist spot by the local government, provides free public access to its buildings (supervised), monuments, and natural heritage landscapes (limited).
- **Access to Green Spaces:** Local residents and tourists are free to visit the 101-acre campus to enjoy the natural beauty, open lawns, and seasonal flora.
- **Access to Libraries and Exhibitions:** We offer limited public access to our Central Library for researchers and school groups, as well as free public access to exhibitions, such as our International Mother Language Day photography exhibit (images attached below).
- **Cultural Preservation:** We actively preserve intangible cultural heritage by organizing annual public performances (>15) and commemorative events, such as the observance of Shaheed Day (International Mother Language Day), to celebrate local linguistic and cultural traditions.

Section 2.2: Sustainable Commuting and Transport

We are actively promoting sustainable commuting for our students and staff.

- **Sustainable Transport Systems:** NSTU provides a shared transport system with several dozen buses and designated bicycle parking to encourage low-impact commuting.
- **Introducing Clean Transport:** The university has announced the introduction of electric cars to its campus transport system, demonstrating a clear commitment to reducing carbon emissions and promoting cleaner mobility.

Section 2.3: Affordable Housing

NSTU is committed to ensuring access to affordable housing for both students and employees.

- **Student Housing:** We provide affordable on-campus housing for students in five residential halls at a highly subsidized rate of **$10 per year**, which includes utilities. This currently accommodates ~25% of our students.
- **Employee Housing:** We support our employees by providing a house rent allowance (35% of basic salary) and maintaining on-campus residential quarters at subsidized rental rates.

- **Community Collaboration:** We actively work with local authorities on housing. During the COVID-19 period, NSTU collaborated with the Noakhali District Administration and local house owners to secure a **40% rent waiver** for students living off-campus.

Section 2.4: Sustainable Planning and Building

Our campus development is guided by principles of sustainability.

- **Pedestrian Access:** The campus is designed with wide, green, pedestrian-friendly paths, prioritizing walkability.
- **Sustainable Building Standards:** All new construction follows national sustainable standards, including the **Bangladesh National Building Code (BNBC) 2020** and SREDA guidelines.
- **Brownfield Development:** NSTU prioritizes the use of brownfield sites (areas with previous development) for new construction to minimize environmental impact and preserve greenfield land.

Conclusion

Noakhali Science and Technology University's 2024 contribution to SDG 11 provides a 360-degree analysis of sustainable urban development. Our 26 research publications provide critical data to mitigate urban pollution, models for resilient planning, and strategies for safer transport. Operationally, we embody the principles of a sustainable community: we serve as a public steward for arts and heritage, provide affordable housing for 25% of our students at just $10/year, and are actively introducing electric vehicles to our transport fleet. This integration of research and practice underscores our commitment to making cities and human settlements inclusive, safe, resilient, and sustainable.

Appendix: SDG 11 Targeting 2024 Publications Referenced

1. Riya, K.K., Anisuzzaman, M., Samad Azad, M.A., Yu, J.J., Hossain, M.B. (2024). Characteristics, Contamination Levels, and Ecosystem Risk Assessment of Microplastics in Surface Water of a Highly Urbanized River from a Developing Country. *ACS Omega*.

2. Parvez, M.S., Czédli, H.M., Hoque, M.I., Magura, T., Simon, E. (2024). Accumulation of Microplastics and Potentially Toxic Elements in Plant Leaves Along an Urbanization Gradient in Bangladesh. *Toxics*.

3. Ridwan, M.K., Akther, A., Tamim, M.A., Esquivias, M.A., Wibowo, W.P. (2024). Environmental health in BIMSTEC: the roles of forestry, urbanization, and financial access using LCC theory, DKSE, and quantile regression. *Discover Sustainability*.

4. 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*.

5. 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*.

6. Hasan, K., Rahman, M., Akhter, M., Kayes, I., Rahman, S. (2024). A new dynamic approach using data-driven and machine learning models for forecasting particulate matter in Dhaka megacity. *Environmental Pollution and Management*.

7. Karim, F.S., Mohinuzzaman, M., Rafa, N., Hosen, R., Ahmed, S. (2024). Holistic citywide sanitation for an urban area in the Global South: A case study of the Noakhali Pourashava of Bangladesh. *Journal of Water Sanitation and Hygiene for Development*.

8. Abera, M.G., Werkneh, A.A., Welde, R.S., Islam, M.A., Redae, G.H. (2024). Diarrhea prevalence and water, sanitation, and hygiene (WASH) factors among internally displaced children under-five in Mekelle city, Northern Ethiopia. *Clinical Epidemiology and Global Health*.

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11. Lima, F.A., Bhattacharjee, S., Sarker, M.J., Salam, M.A. (2024). Ecological risk assessment of potentially toxic elements (PTEs) in agricultural soil, vegetables and fruits with respect to distance gradient in proximity to lead-acid battery industry. *Environmental Nanotechnology Monitoring and Management*.

12. Sultana, N., Eti, S.A., Hossain, M.L., Li, J., Salam, M.A. (2024). Tracing and source fingerprinting of metals from the southern coastal sediments in Bangladesh. *Environmental Science and Pollution Research*.

13. Tariq, S., Nisa, A., Ul-Haq, Z., Salam, M.A., Mehmood, U. (2024). Classification of aerosols using particle linear depolarization ratio (PLDR) over seven urban locations of Asia. *Chemosphere*.

14. Roy, S.K., Alam, M.T., Mojumder, P., Al Mamun, M.A., Mahtab, S.B. (2024). Dynamic assessment and prediction of land use alterations influence on ecosystem service value: A pathway to environmental sustainability. *Environmental and Sustainability Indicators*.

15. Nipun, M.W.H., Ashik Ur Rahman, M., Rikta, S.Y., Parven, A., Pal, I. (2024). Rooftop rainwater harvesting for sustainable water usage in residential buildings for climate resilient city building: case study of Rajshahi, Bangladesh. *International Journal of Disaster Resilience in the Built Environment*.

16. Tajwar, M., Rahman, M., Shreya, S.S., Samm-A, A., Zahid, A. (2024). Is the groundwater of Dhaka city, Bangladesh contaminated with naturally occurring potential toxic elements? *Frontiers in Environmental Science*.

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