NOAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

Noakhali-3814, Bangladesh.

SDG PROGRESS REPORT 2024

PREPARED BY

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Noakhali - 3814, Bangladesh.

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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 1 - No Poverty

Noakhali Science and Technology University

December 2024

Introduction

Noakhali Science and Technology University (NSTU), as a public university under the Government of Bangladesh, is deeply committed to addressing Sustainable Development Goal 1: End poverty in all its forms. Recognizing that Bangladesh is a recently graduated lower-middle-income country with a significant portion of its population facing economic hardship, NSTU has implemented a holistic, multi-faceted strategy.

Our approach is built on two key pillars:

1. **Research and Innovation:** Dedicating our research efforts to identifying and evaluating practical, scalable solutions that empower vulnerable households, enhance food security, and build sustainable livelihoods.
2. **Operations and Community Engagement:** Applying direct action through institutional policies and community outreach. This includes ensuring accessible education for all, providing robust support systems for low-income students, and actively engaging with our local community to foster sustainable economic development.

This report details our progress across both of these critical areas.

Pillar 1: Research on Sustainable Livelihoods

Our 2024 research, "The contribution of homestead pond fish culture..." (Belal Hossain, M.B. et al.), provides an evidence-based model for tackling household poverty. The study highlights how small-scale aquaculture directly addresses key dimensions of poverty:

Pillar 1: Progress through Research and Innovation

Our institution is dedicated to research that advances SDG 1, recognizing that poverty is a complex, multidimensional challenge where food security, nutrition, and economic resilience are inextricably

linked. Our 2024 research in this area focuses on identifying and evaluating practical solutions for vulnerable households.

Section 1.1: Enhancing Food Security and Resilience (Targets 1.2, 1.4, 1.5)

Our key 2024 research contribution to SDG 1, "The contribution of homestead pond fish culture to household food security and dietary diversity..." by Belal Hossain, M.B. et al., provides a direct, evidence-based model for tackling poverty at the household level.

This study investigates how localized, small-scale aquaculture—a common practice in many developing nations—serves as a powerful tool for poverty alleviation. By analyzing homestead pond culture, the research highlights a tangible solution that directly addresses several key dimensions of poverty:

- **Improving Food Security (Target 1.2):** The study provides clear evidence that this practice significantly boosts household food security. This ensures families have reliable and consistent access to sufficient, safe, and nutritious food, a foundational step in breaking the poverty cycle.
- **Enhancing Dietary Diversity (Target 1.2):** By providing a steady, low-cost source of high-quality protein (fish), the intervention directly combats malnutrition and improves dietary diversity. This is a critical component of escaping multidimensional poverty, which includes nutritional deprivation.
- **Building Resilient Livelihoods (Target 1.4 & 1.5):** The research demonstrates how households can leverage existing, often underutilized, local resources (homestead ponds) to create a sustainable livelihood. This practice enhances economic resilience (Target 1.4) and reduces household vulnerability to food price shocks and other economic disruptions (Target 1.5).

This work provides a clear pathway for policymakers, development agencies, and local governments seeking to promote self-sufficiency and enhance the economic and nutritional well-being of the poor.

Pillar 2: Progress through University Operations and Community Engagement

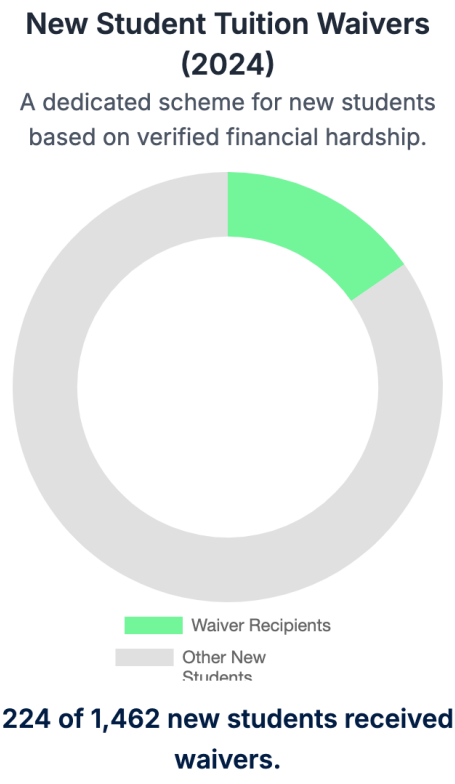
Beyond our research, NSTU implements direct strategies to fight poverty at its roots, focusing on student support and local community empowerment.

Section 2.1: University-Led Initiatives for Student Support

Section 2.1.1: Accessible Education for Low-Income Families

NSTU serves as a primary destination for higher education for students from low- and lower-income families across Bangladesh. Our commitment to accessibility is threefold:

1. **Affordability:** The total tuition cost for a four-year undergraduate program at NSTU is maintained at an extremely low level, typically remaining below USD 400. This fee structure, which includes transportation and semester fees, makes a university education attainable for students from even the bottom 20% income group.



2. **Equitable Admission:** While admission is strictly merit-based through competitive national examinations, NSTU ensures pathways for the most disadvantaged. We maintain special admission quotas for students from marginalized and underprivileged communities, including ethnic minorities, tribal groups, and the Dalit and Harijan communities, who traditionally belong to the lowest household income groups. In recent years, we have successfully admitted **12** students under this quota in 2023, **22** in 2024, and **14** in 2025.
3. **Targeted Financial Aid:** Direct financial support is a cornerstone of our anti-poverty strategy. Currently, **1,227** students out of a total of **9,897** receive financial aid specifically because of poverty or low-income status. To further this, NSTU operates a **Full Semester Tuition Fee Waiver Scheme**. Under this program, financially challenged students can apply for a full tuition exemption each semester based on verified family income and faculty recommendation. In 2024, this scheme supported **224** new bachelor's students out of 1,462, ensuring that financial hardship does not become a barrier to continuing their education.

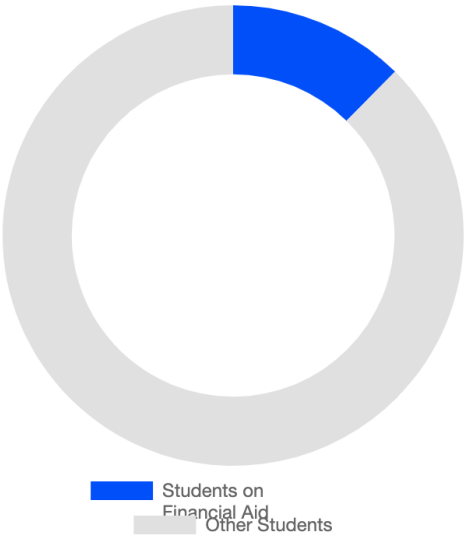
Section 2.1.2: Ensuring Success and Completion

NSTU is committed to a 100% degree completion target for all enrolled students, including those from economically disadvantaged backgrounds. A strong academic monitoring system, coupled with dedicated departmental advisors and mentors, provides continuous academic and personal support. This supportive learning environment, combined with our low tuition structure and comprehensive financial aid, minimizes dropout rates.

Furthermore, we provide heavily subsidized and affordable accommodation, transportation services, and access to student welfare funds to ensure that all students, regardless of their socio-economic status, can successfully pursue and complete their studies.

University-Wide Financial Aid

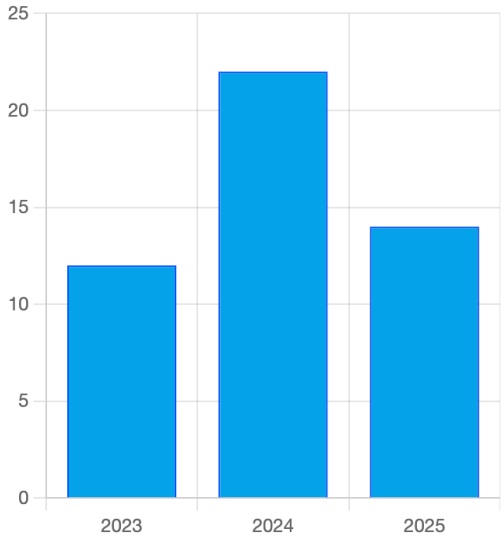
A significant portion of our student body receives financial aid due to poverty.



1,227 of 9,897 students receive aid.

Special Quota Admissions Trend

Targeted admission quotas for students from marginalized and underprivileged communities.



Ensuring pathways for the most disadvantaged.

Section 2.2: Community Engagement and Local Empowerment

Section 2.2.1: Supporting Sustainable Livelihoods

The university actively leverages its resources and research to create financially and socially sustainable business opportunities for the local community.

- **Knowledge Transfer:** We provide free training and mentorship. For example, the Department of Fisheries and Marine Science (FIMS) developed a new, highly effective method for crab farming in hatcheries. To share this innovation, a day-long field day was organized in Cox's Bazar, where researchers directly demonstrated the method's procedures and profitability to local farmers and entrepreneurs, translating scientific research into real-world, sustainable income.
- **Financial & Resource Support:** NSTU provides tangible assets to local entrepreneurs. We offer land leasing and cultivation opportunities at subsidized rates or nominal prices, enabling start-ups in agriculture and horticulture. Additionally, the university provides shop spaces within campus premises at minimal rent, helping local businesses sell essentials directly to the campus community. This not only promotes local entrepreneurship but also contributes to food security (SDG 2) and employment.

Section 2.2.2: Improving Access to Basic Services and Policy

Our commitment to community well-being includes direct action to improve basic services and contributing to poverty-reduction policies.

- **Direct Training:** NSTU organizes programs to improve access to basic services for all. A recent example is the two-day training program on fire safety and first aid that began on

December 5, 2024, under the theme "Ensuring a safe and secure working environment for all." This initiative enhances campus safety and extends to equipping residential halls and administrative buildings with first aid boxes and essential medicines.

- **Policy Contribution:** The university participates in policy-making at local and national levels. Our faculty serve as expert contributors in government-led conservation and livelihood programmes. A key example is our involvement in the Department of Fisheries' gravid hilsa conservation activities in Noakhali. Through this, NSTU supports community awareness and sustainable resource management, directly protecting the livelihoods of vulnerable fishing communities whose incomes depend on these threatened fish stocks.

Pillar 2: Operations – Community Empowerment

Our strategy extends beyond the campus, uplifting the local community through knowledge, resources, and policy engagement.

Conclusion

Noakhali Science and Technology University's commitment to SDG 1 is comprehensive, integrating high-impact research with tangible, community-focused operations. Through accessible education, direct student support, and strategic empowerment of local communities, NSTU is actively working to break the cycle of poverty. Our two-pillar strategy ensures that we are not only developing the knowledge to solve poverty but are also a primary actor in its alleviation, fulfilling our public mission to foster a more equitable and sustainable future for Bangladesh.

Appendix: SDG 1 Targeting Publication Referenced

- Hossain MB, Pingki FH, Sultana M, Salim NM, Islam MM, Rahman AA, Paray BA, Arai T. The contribution of homestead pond fish culture to household food security and dietary diversity in central coast of a developing country. Heliyon. 2024 Apr 15;10(7).

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 2 - Zero Hunger

Noakhali Science and Technology University

December 2024

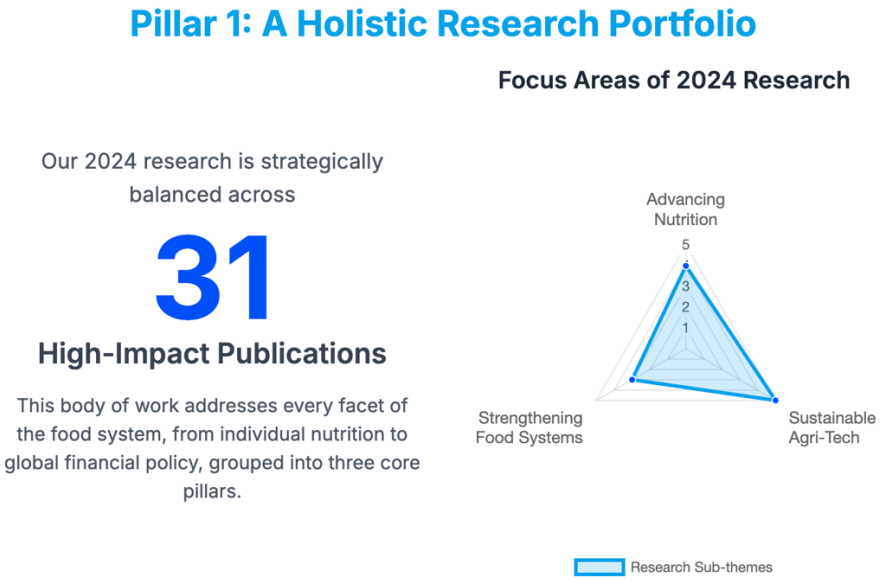
Introduction

Noakhali Science and Technology University (NSTU) is unequivocally committed to Sustainable Development Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.

Our strategy for this goal is comprehensive, built upon two interconnected pillars:

1. **Research and Innovation:** A high-impact 2024 research portfolio (31 publications) dedicated to creating and evaluating the solutions needed to achieve Zero Hunger.
2. **Operations and Community Engagement:** Institutional policies and direct-action programs that ensure food security on our campus and transfer knowledge to our local community.

This report details our progress across both of these critical areas.



Pillar 1: Progress through Research and Innovation

Our institution is dedicated to research that advances SDG 2. Our 2024 research portfolio, consisting of 31 high-impact publications, demonstrates an exceptionally broad and deep commitment. Our work is strategically organized across three core pillars.

Section 1.1: Advancing Nutrition and Household Food Security (Targets 2.1, 2.2)

Our research first addresses the most immediate targets of SDG 2: ending hunger and all forms of malnutrition. We have produced a cluster of critical studies focused on identifying at-risk populations and promoting nutrient-rich, accessible food sources.

- **Identifying Vulnerability:** To target interventions effectively, our researchers identified the key predictors of malnutrition. Studies by Halima, O. et al. and Mondal, S. et al. provided a

multivariate analysis of the individual, household, and socioeconomic factors driving child undernutrition in Bangladesh. Concurrently, the work of Begum, N. et al. harnessed machine learning to predict the nutritional status of pregnant women, a vital tool for early public health intervention.

- **Leveraging Local Solutions for "Hidden Hunger":** We have a strong focus on utilizing local, sustainable food sources. The research by Mamun, A.A. et al. on dried marine fish, along with studies by Khan, M.A. et al. and Belal Hossain, M.B. et al. on small indigenous fish, provides a comprehensive nutrient, mineral, and fatty acid profile. This work champions these accessible foods as a powerful, cost-effective tool to combat micronutrient deficiencies.
- **Linking Livelihoods to Nutrition:** The study by Belal Hossain, M.B. et al. on homestead pond fish culture provides a direct link between a sustainable livelihood (SDG 1) and improved household food security and dietary diversity (SDG 2).
- **Ensuring Food Safety at Home:** Recognizing that food security is incomplete without food safety, the study by Al Mamun, M.A.A. et al. assessed the knowledge, attitudes, and practices of mothers regarding food cleanliness, identifying key educational gaps.

Section 1.2: Innovating for Sustainable & Resilient Agriculture (Targets 2.3, 2.4)

Our institution is at the forefront of developing and evaluating the technologies and strategies needed to create a sustainable, productive, and climate-resilient agricultural future.

- **The Agri-Tech Revolution:** Our researchers are harnessing the power of AI, IoT, and machine learning to revolutionize food production. This includes frameworks for "Digital Twins" in livestock farming (Arulmozhi, E. et al.), IoT-enabled sustainable irrigation (Rana, M.Z. et al.), and using machine learning for soil classification and crop prediction (Rahman, F. et al.).
- **Precision Agriculture:** We are developing advanced deep learning and CNN models to detect diseases in mangoes (Porna, S.B. et al.), potatoes (Khan, M.A. et al.), and rice (Shakib, M.S. et al.), as well as to classify rice varieties (Rahat, I.S. et al.).
- **Climate-Smart Adaptation:** We are producing vital data for climate resilience. The work of Al Mamun, M.A. et al. provides stakeholder-driven insights into climate-adaptive strategies for coastal farmers, while the analysis by Dia, R.B. et al. on evapotranspiration trends is critical for future water resource management.
- **Sustainable Inputs & Crop Science:** We are exploring eco-friendly solutions, including research on carrageenans as plant biostimulants (Hossain, M.M. et al.) and identifying genetic traits for resilient soybean crops (Islam, M.S. et al.). We are also tackling the negative impacts of current methods through research on fungicide and antibiotic resistance in plant pathogens (Islam, T. et al.).
- **Innovating Future Food Sources:** Looking ahead, the comprehensive review by Siddiqui, S.A. et al. on microalgae as a raw material for plant-based seafood alternatives charts a course for sustainable food innovation.

Section 1.3: Strengthening Entire Food Systems (Targets 2.a, 2.c)

Beyond the farm, our 2024 research addresses the systemic, economic, environmental, and safety issues that govern our food systems.

- **Ensuring Food Safety & Monitoring Contamination:** We are actively monitoring threats to the food chain. Key studies identified the emergence of multidrug-resistant Bacillus spp. in animal feed and human food (Haque, M.A. et al.) and provided the first record of microplastic ingestion by estuarine copepods in Bangladesh, highlighting a critical vector for food web contamination (Khan, N.S. et al.).
- **Economic, Social, & Policy Frameworks:** Our research provides high-level guidance for policymakers. This includes an assessment of agricultural trade openness on food security (Fan, L. et al.), an analysis of macroeconomic factors affecting women's employment in agriculture (Rahman, M.H. et al.), and an editorial emphasizing the critical role of occupational health and safety for workers in the agri-food sector (Bhowmik, S. et al.).
- **The Agriculture-Environment-Finance Nexus:** We are analyzing the complex interplay between food production and planetary health. This includes research on the impact of agriculture on CO2 emissions (Akther, T. et al.; Raihan, A. et al.) and the effect of land-use changes on ecosystem services (Roy, S.K. et al.). Critically, our research extends to the financial mechanisms needed to support this transition, as evidenced by the work of Kumar, B. et al. on Green Bonds, which explores the risk-return dynamics of the very financial instruments needed to fund a global shift to sustainable agriculture (Target 2.4) and invest in rural infrastructure (Target 2.a).

Pillar 2: Progress through University Operations and Community Engagement

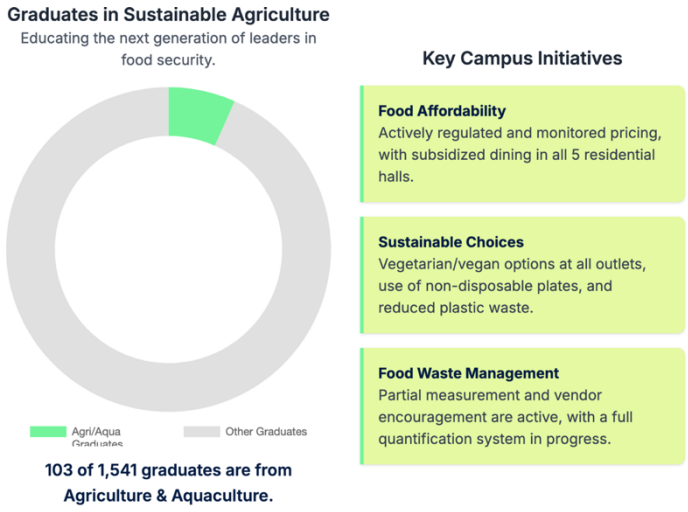
NSTU's operational strategy translates our research commitment into direct action, ensuring food security and promoting sustainable agriculture on our campus and in the surrounding community.

Section 2.1: Student Food Security and Affordability

NSTU is committed to alleviating student food insecurity. The university administration actively regulates and monitors food prices across all campus outlets to ensure affordability, as demonstrated by the officially approved and enforced price lists. We provide subsidized dining facilities in all five residential halls, complemented by numerous on-campus restaurants, shops, and vending machines. This ensures continuous access to healthy, low-cost, and nutritious food choices for all students. Cooking facilities are also available for students who wish to prepare their own meals.

Section 2.2: Sustainable Food Choices

We actively promote sustainable food choices. All food outlets on campus provide vegetarian and vegan options. Sustainability is further embedded by the use of non-disposable plates and glasses and the provision of safe drinking water, which significantly reduces plastic waste. Our vendors are encouraged to use local ingredients and minimize food waste, aligning with our eco-friendly goals.



Section 2.3: Staff Food Access

This support extends to our staff and faculty. An improved lounge provides affordable, on-demand meal services for teachers and officers. Staff can also place meal orders in dormitories and access all general on-campus cafeterias, grocery shops, and vending machines, ensuring convenient and low-cost access to daily meals and snacks.

Section 2.4: Food Waste Management

NSTU is actively addressing food waste. We conduct partial measurements through periodic monitoring in campus cafeterias and canteens and encourage our outsourced vendors to track and report waste. A systematic, university-wide system for full quantification and reduction is currently in progress.

Section 2.5: Education for Sustainable Agriculture

We are educating the next generation of leaders in this field. In 2024, **103 graduates**, out of a total of **1,541**, were from our agriculture and aquaculture programs. These courses are embedded with critical sustainability aspects, preparing our students to tackle future food security challenges.

Section 2.6: Community Knowledge and Technology Transfer

Our commitment to Zero Hunger extends directly to the local community. We provide free access to knowledge, skills, and technology for local farmers and food producers.

- **Direct Training:** Examples include a training program for 60 farmers in Cox's Bazar on crab supplement feed (image on the left) and sharing mushroom tissue culture knowledge with local farmers.
- **Knowledge Transfer Events:** Our Agriculture and Fisheries departments regularly organize free field training and technology transfer events.
- **Access to Facilities:** We provide local producers with access to university facilities, such as labs and plant stocks (both free and paid), to improve sustainable farming, as demonstrated in our river cage fish farming training.

Section 2.7: Sustainable Procurement

Finally, our institutional practices reinforce our commitment. NSTU prioritizes the purchase of products from local and sustainable sources, as clearly outlined in our Sustainable Procurement Strategy. This ensures our procurement decisions contribute to sustainable development, reduce environmental impact, and strengthen the local economy.

Pillar 2: Operations – Community Knowledge Transfer

Our commitment extends directly to local farmers and food producers, providing free access to knowledge, skills, and technology.

Conclusion

Noakhali Science and Technology University's 2024 contribution to SDG 2 is exceptionally comprehensive. Our strategy is truly holistic, demonstrating a clear link between our high-impact research and our practical operations. We are not only identifying the predictors of malnutrition and the technologies for resilient agriculture; we are actively implementing solutions. From ensuring affordable meals in our residence halls to transferring sustainable aquaculture technology to local farmers, NSTU is fulfilling its role as a key driver in the mission to achieve Zero Hunger.

Appendix: SDG 2 Targeting Publications Referenced

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 3 - Good Health and Well-being

Noakhali Science and Technology University

December 2024

Introduction

Noakhali Science and Technology University (NSTU) is profoundly dedicated to advancing Sustainable Development Goal 3: Ensure healthy lives and promote well-being for all at all ages. In 2024 alone, our researchers produced a remarkable portfolio of 136 high-impact publications directly supporting this goal.

Our extensive body of work demonstrates a comprehensive strategy, built on two key pillars:

1. **Research and Innovation:** A high-impact 2024 research portfolio (136 publications) tackling the world's most pressing health challenges, from environmental hazards to AI-driven diagnostics.
2. **Operations and Community Engagement:** Institutional policies and direct-action programs that promote health on campus and serve our local community.

This report details our 2024 accomplishments across these critical pillars.

Pillar 1: A 360-Degree Research Strategy

Pillar 1: Progress through Research and Innovation

Our research is organized around four core pillars, demonstrating a 360-degree approach to global health.

Section 1.1: Addressing Environmental Health Hazards (Target 3.9)

A significant portion of our 2024 research focused on Target 3.9, reducing illnesses from hazardous pollution.

- **Microplastics and Chemical Pollution:** We produced an extensive body of work identifying and assessing the risk of microplastics and heavy metals in water, food, and ecosystems (Riya, K.K. et al.; Parvez, M.S. et al.; Banik, P. et al.; Md Saad, S.A. et al.; Paray, B.A. et al.; Siddique, M.A.M. et al.; Mubin, A.N. et al.).
- **Heavy Metal Contamination:** We conducted critical risk assessments of heavy metal contamination from shipbreaking, groundwater, and food sources like vegetables, rice, meat, and fish feed (Lipi, J.A. et al.; Tajwar, M. et al.; Chowdhury, A.I. et al.; Shaheen, N. et al.; Rakib, M.R.J. et al.; Siddique, M.A.M. et al.).
- **Air and Water Quality:** Our research also tackled air pollution, with studies on PM2.5 (Sangkham, S. et al.; Hasan, K. et al.; Rahman, M. et al.) and pesticide residues in surface water (Bhuiya, A. et al.).
- **WASH (Water, Sanitation, Hygiene):** We provided direct solutions for safe drinking water, including assessments of pond sand filters (Khan, M.S. et al.) and the development of "safe water atlases" (Jakariya, M. et al.).

Section 1.2: Tackling the Burden of Disease (Targets 3.3, 3.4)

Our researchers are at the forefront of the fight against the world's biggest killers, from chronic diseases to infectious outbreaks and mental health disorders.

- **Non-Communicable Diseases (NCDs):** We have a massive research focus on Target 3.4. This includes genetic, diagnostic, and preventative studies on cancer (Momin, M.B. et al.; Aziz, M.A. et al.; Mahmud, M.T. et al.; Reza, S. et al.), cardiovascular disease & diabetes (Shuvo, T.A. et al.; Mitu, F.S. et al.; Alam, M.M. et al.; Biswas, R.K. et al.).
- **Mental Health:** We are addressing this critical area with studies on depression among trauma survivors (Siddik, M.A.B. et al.) and the mental health of adolescents (Hossain, S.M.R. et al.).
- **Communicable Diseases (CDs):** Our research on Target 3.3 includes modeling the impact of climate on dengue transmission (Miah, M.M. et al.; Islam, M.T. et al.), analyzing vaccination strategies for Ebola (Islam, M.R. et al.), and pioneering modern surveillance tools like wastewater-based monitoring for Mpox and SARS-CoV-2 (Islam, M.A. et al.).

Section 1.3: Innovating in Diagnostics, Therapeutics, and R&D (Targets 3.b, 3.d)

A cornerstone of our SDG 3 strategy is developing the next generation of health technologies and treatments.

- **AI & Machine Learning in Health:** We have an exceptionally strong portfolio in applying AI for health diagnostics. This includes novel deep learning and ML models for NCDs like myocardial infarction, chronic kidney disease, and various cancers (Sayed, M.S. et al.; Halder, R.K. et al.; Hossain, S.M.R. et al.; Mohi Uddin, K.M. et al.; Biswas, S. et al.; Imam, M.H. et al.; Roy, T. et al.).
- **In-Silico Vaccine & Drug Design:** Our computational biologists are designing next-generation vaccines and identifying therapeutic compounds for a range of diseases, including Borna Disease Virus, Nipah virus, Marburg virus, and multiple serotypes of Dengue virus

(Siddiquee, N.H. et al.; Masum, M.H.U. et al.; Saha, O. et al.; Parvin, R. et al.; Halder, S.K. et al.).

- **Pharmacology & Therapeutics:** Our research also includes developing new therapeutics, from bioengineered heparin (Sultana, R. et al.) and nanotechnology in cancer treatment (Hassan Chowdhury, M.M. et al.) to advanced drug-delivery systems and identifying potent natural compounds (Barman, A.K. et al.; Amanat, M. et al.; Ahmed, S. et al.).

Section 1.4: Strengthening Health Systems & Targeted Interventions

Finally, our research provides the specific, evidence-based guidance needed to strengthen health systems.

- **Sexual & Reproductive Health (Target 3.7):** We produced foundational meta-analyses on contraceptive use (Hossain, S.M.R. et al.) and identified environmental threats to pregnancy like salinity (Hossain, S.M.R. et al.).
- **Maternal Health (Target 3.1):** Our research identified key factors for the utilization of antenatal care services (Shill, L.C. et al.), a crucial intervention for reducing maternal mortality.
- **Antimicrobial Resistance (AMR) (Target 3.d):** We are tackling the "One Health" challenge of AMR by identifying multidrug-resistant pathogens in poultry, the food chain, and clinical settings (Munim, M.A. et al.; Haque, M.A. et al.; Tawhid, M. et al.; Adeiza, S.S. et al.).
- **Road Safety (Target 3.6):** We directly addressed this target by analyzing the factors associated with road traffic crashes among motorcyclists (Miah, M.M. et al.).
- **Health Systems & UHC (Target 3.8):** Our work also supports health systems through research on occupational health, the role of digital finance in health crises, and the integration of indigenous healing practices (Bhowmik, S. et al.; Rahman, M. et al.; Yesmin, S. et al.).

Pillar 2: Progress through University Operations and Community Engagement

NSTU's operational strategy translates our research commitment into direct, tangible actions that promote health and well-being on our campus and in the surrounding community.

Section 2.1: Education for Health Professions

We are committed to training the next generation of healthcare professionals. In 2024, 76 graduates, out of a total of 1,541, were from our health profession programs.

Section 2.2: Health Collaborations and Services

Our Department of Pharmacy maintains an active collaboration with the Noakhali 250 Bed General Hospital. This partnership allows our students to undertake a three-month internship, enhancing their practical skills and contributing directly to improved local health and well-being outcomes.

Section 2.3: Community Outreach

NSTU delivers impactful outreach programs to the local community.

- **Emergency Support:** The Department of Pharmacy's Emergency Medical Service Team provides essential healthcare support (image attached above) to flood-affected communities, with student volunteers distributing medicines, water purification tablets, sanitary napkins, and oral saline.
- **Shared Facilities:** We provide limited, supervised, and free access to our main playground and open fields for local schools and youth clubs for non-commercial community events and tournaments.

Section 2.4: Student Health and Well-being

We provide comprehensive, free-of-charge health services to our students.

- **Sexual & Reproductive Health:** The Shaheed Mugdho Medical Center offers free, confidential access to services, including consultations, counselling, and emergency care.
- **Mental Health:** The university provides free access to a dedicated psychologist and actively promotes mental well-being through workshops (image attached below, left side) on emotional intelligence and stress management.

Section 2.5: Staff Mental Health

This support is extended to our staff, who also have free access to the university's dedicated psychologist and are included in workshops (image attached above, right side) designed to promote emotional resilience and well-being.

Section 2.6: Smoke-Free and Substance Control Policy

NSTU is committed to a safe and healthy campus environment. We have a formal "Smoke-Free and Substance Control Policy" that aligns with national law. This policy:

- Prohibits smoking and vaping in all university buildings, transport, and public spaces (walkways, canteens, etc.).

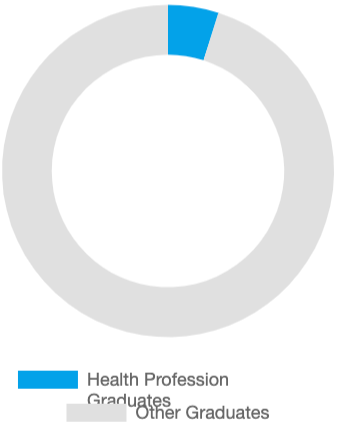
- Allows for designated smoking zones in specific outdoor locations, away from public congregation.
- Strictly forbids the sale or promotion of tobacco products on campus.
- Strictly prohibits the possession, use, or distribution of any narcotic substance.
- Is enforced by the Proctor's Office and supported by awareness campaigns.

Pillar 2: Operations – Campus & Community Health

We translate research into action through education, direct health services, and community outreach.

Graduates in Health Professions (2024)

Training the next generation.



76 of 1,541 graduates are from health professions.

Key Health Services

Clinical Collaboration
Internship program with Noakhali 250 Bed General Hospital for pharmacy students.

Student & Staff Mental Health
Free, confidential access to a dedicated psychologist and mental health workshops.

Student Reproductive Health
Free consultations, counselling, and services at the on-campus medical center.

Community & Policy

Community Outreach
Emergency Medical Service Team provides aid (medicine, hygiene kits) to flood-affected communities.

Smoke-Free Policy
Smoking is prohibited in all buildings and public spaces, with designated outdoor zones.

Conclusion

The sheer volume and comprehensive breadth of our 136 publications in 2024, combined with our direct operational support, underscore an institutional-level commitment to SDG 3. We are not only identifying environmental and NCD/CD health crises but are actively building the AI-powered diagnostic tools and evidence-based policies needed to solve them. From computationally-designed vaccines to providing free mental health support on campus, NSTU provides a 360-degree approach to ensuring healthy lives and promoting well-being for all.

Appendix: SDG 3 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. Lipi, J.A., Belal Hossain, M.B., Jolly, Y.N., Arai, T., Yu, J.J. (2024). Response of benthic assemblages to heavy metal contamination from shipbreaking operations in a tropical coastal area. *Regional Studies in Marine Science*.
3. Howlader, M., Shuvo, S.N.A., Selim, A., Fahad, A.A., Rahman, M.M. (2024). Abundance and distribution of anthropogenic marine litter on the beaches of Sonadia Island: An Ecologically Critical Area. *Regional Studies in Marine Science*.
4. Tajwar, M., Rahman, M., Shreya, S.S., Alam, M.M.T., Zahid, A. (2024). Pollution evaluation and health risks assessment of naturally occurring toxic metals in shallow groundwater: A study in southwestern tidal delta of Bangladesh. *Journal of Trace Elements and Minerals*.
5. Siddiquee, N.H., Hossain, M.I., Priya, F.M., Tuly, F.I., Hossain, A. (2024). Nature's defense against emerging neurodegenerative threats: Dynamic simulation, PCA, DCCM identified potential plant-based antiviral lead targeting borna disease virus nucleoprotein. *Plos One*.
6. 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*.
7. Sangkham, S., Phairuang, W., Sherchan, S.P., Islam, M.A., Sakunkoo, P. (2024). An update on adverse health effects from exposure to PM2.5. *Environmental Advances*.
8. 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*.
9. Rakib, M.R.J., Sarker, A., Nahida, Z.T., Kumar, R., Malafaia, G. (2024). A critical review on heavy metal contamination in aquatic food webs by edible fish species: a special case concerning Bangladesh. *Environmental Monitoring and Assessment*.
10. Masum, M.H.U., Mahdeen, A.A., Barua, L., Heema, H.P., Ferdous, J. (2024). Developing a chimeric multiepitope vaccine against Nipah virus (NiV) through immunoinformatics, molecular docking and dynamic simulation approaches. *Microbial Pathogenesis*.
11. Sultana, R., Kamihira, M. (2024). Bioengineered heparin: Advances in production technology. *Biotechnology Advances*.
12. Shuvo, T.A., Hosna, A.U., Hossain, K., Hossain, S.M.R. (2024). Prevalence of stroke in Bangladesh: A systematic review and meta-analysis. *Journal of Stroke and Cerebrovascular Diseases*.
13. Rahman, M., Yee, H.P., Masud, M.A.K., Uzir, M.U.H. (2024). Examining the dynamics of mobile banking app. Adoption during the COVID-19 pandemic: A digital shift in the crisis. *Digital Business*.

14. Momin, M.B., Hossain, M.A., Ferdoush, J., Rahman, T., das Gupta, S. (2024). Unveiling key genes in esophageal and lung adenocarcinoma progression: A combined high-throughput analysis and molecular docking approach for targeted therapies. *Human Gene*.

15. Islam, M.A., Hossain, M.A., Hasnat, S., Hossain, M.A., Hoque, M.N. (2024). In-silico study unveils potential phytocompounds in Andrographis paniculata against E6 protein of the high-risk HPV-16 subtype for cervical cancer therapy. *Scientific Reports*.

16. Chowdhury, A.I., Shill, L.C., Raihan, M.M., Reza, S.M.S., Alam, M.R. (2024). Human health risk assessment of heavy metals in vegetables of Bangladesh. *Scientific Reports*.

17. Roy, A.S., Feroz, T., Islam, M.K., Alam, M.R., Hossain, M.S. (2024). A computational approach for structural and functional analyses of disease-associated mutations in the human CYLD gene. *Genomics and Informatics*.

18. Aziz, M.A., Chowdhury, S., Jafrin, S., Millat, M.S., Islam, M.S. (2024). Genetic association of Interleukin-17A polymorphism in Bangladeshi patients with breast and cervical cancer: a case-control study with functional analysis. *BMC Cancer*.

19. Sayed, M.S., Rony, M.A.T., Islam, M.S., Migdady, H., Abualigah, L.M.Q. (2024). A Novel Deep Learning Approach for Forecasting Myocardial Infarction Occurrences with Time Series Patient Data. *Journal of Medical Systems*.

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24. Hossain, M.M., Sultana, F., Khan, S., Tran, L.S.P., Mostofa, M.G. (2024). Carrageenans as biostimulants and bio-elicitors: plant growth and defense responses. *Stress Biology*.

25. Alam, M.M., Nureen, N.E.N., Bhowmik, S., Hawlader, M.D.H., Shahjalal, M. (2024). Association between Mediterranean diet adherence and dyslipidemia among type-2 diabetes mellitus patients in Dhaka, Bangladesh: a hospital-based study. *Discover Public Health*.

26. Shill, L.C., Tithi, S.H., Jahan, I., Saha, P., Alam, S.S. (2024). Factors Associated with Utilization of Antenatal Care Services among Women in Noakhali District, Bangladesh. *International Journal of Child Health and Nutrition*.

27. Hassan Chowdhury, M.M., Kubra, K., Islam, A. (2024). Fundamentals behind the success of nanotechnology in cancer treatment and diagnosis. *Opennano*.

28. Munim, M.A., Tanni, A.A., Hossain, M.M., Gogoi-Tiwari, J.K., das Gupta, S. (2024). Whole genome sequencing of multidrug-resistant Klebsiella pneumoniae from poultry in Noakhali, Bangladesh: Assessing risk of transmission to humans in a pilot study. *Comparative Immunology Microbiology and Infectious Diseases*.

29. Akther, A., Millat, M.S., Islam, M.A., Ahmed, F., Islam, M.S. (2024). Association of HOTAIR rs7958904 Polymorphism with Cervical Cancer Risk. *Reproductive Sciences*.

30. Khudri, M.M., Chowdhury, P.B., Hossain, S.M.R., Ahsan, K.Z. (2024). Explaining the role of socioeconomic, healthcare access and infrastructural shifts in nutritional transition among women in Bangladesh between 2004 and 2018. *Public Health*.

31. Rahman, M.S., Hossain, M.S. (2024). Eicosanoids Signals in SARS-CoV-2 Infection: A Foe or Friend. *Molecular Biotechnology*.

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NOAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 4 - Quality Education

Noakhali Science and Technology University

December 2024

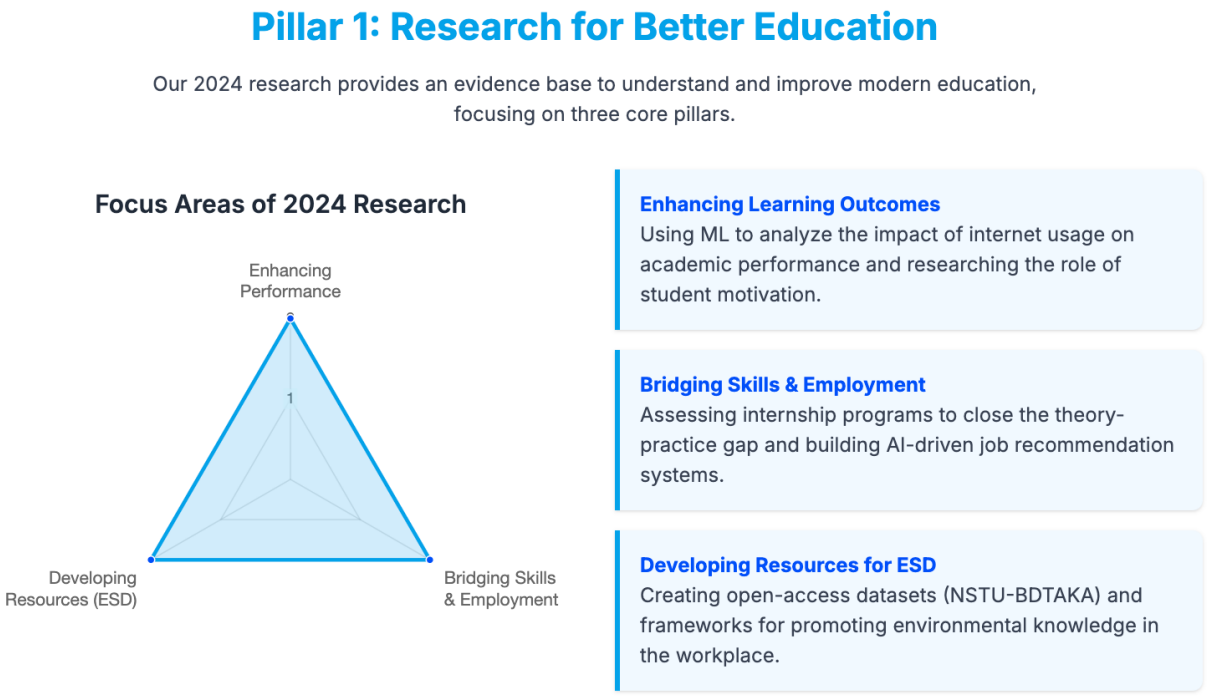
Introduction

Noakhali Science and Technology University (NSTU) is firmly committed to Sustainable Development Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. We believe that research is the key to understanding and improving educational outcomes, developing modern skills, and creating the knowledge-based tools for a sustainable future.

Our 2024 research contributions demonstrate this commitment by focusing on two key pillars:

1. **Research and Innovation:** Focusing on enhancing educational performance, bridging education with relevant technical skills, and developing innovative resources for sustainable development.
2. **Operations and Community Engagement:** Ensuring our graduates are prepared to teach, providing extensive lifelong learning opportunities, and supporting first-generation students.

This report outlines our key 2024 accomplishments in support of the targets of SDG 4.



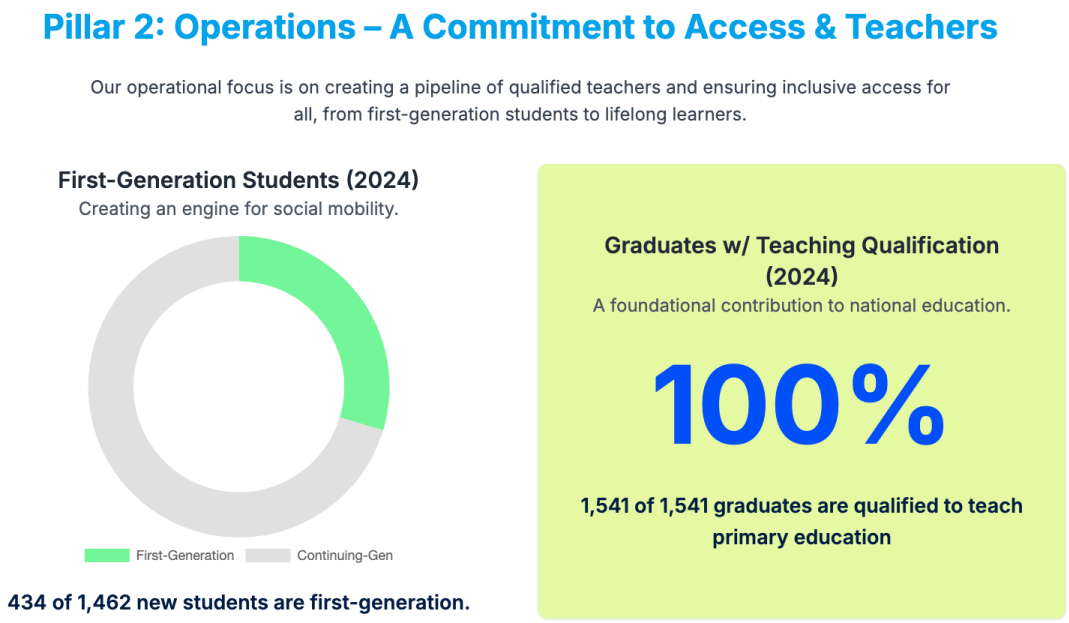
Pillar 1: Progress through Research and Innovation

Our research provides the evidence base to understand and improve modern education.

Section 1.1: Enhancing Educational Performance & Learning Outcomes (Target 4.1)

A core focus of our research is understanding the factors that drive student success.

- **Understanding Modern Learning:** The study by Hemal, S.H. et al. ("Predicting the impact of internet usage on students' academic performance...") uses machine learning to analyze one of the most significant factors in modern education. This research provides critical data for educators on how to harness digital tools effectively.
- **Analyzing Student Motivation:** The work by Siddiky, M.R. & Haque, I.E. ("Factors Affecting Students' Academic Performance...") investigates the fundamental drivers of student success, offering invaluable insights for building a learning environment that fosters intrinsic motivation.



Section 1.2: Bridging Education with Technical Skills & Employment (Target 4.4)

We are dedicated to ensuring that education translates into relevant skills for the modern workforce.

- **Evaluating Practical Training:** The research by Alam, S. & Yesmin, S. ("Bridging theoretical abstraction to professional practice...") directly assesses the efficacy of internship programs. This work is essential for closing the gap between academic theory and the practical skills required in the professional world.
- **Developing Skills-Based Technology:** The study by Aziz, M.T. et al. ("Machine Learning-Driven Job Recommendations...") contributes to this target by developing an advanced AI tool to help match students' skills with relevant employment opportunities.

Section 1.3: Developing Innovative Resources for Education & Sustainable Development (Targets 4.7, 4.a)

Our research extends to creating new knowledge and tools that support both educational infrastructure and sustainable development.

- **Creating Open-Access Educational Resources:** The creation of the "NSTU-BDTAKA" dataset by Rafi, M.J.A. et al. is a direct contribution to Target 4.a. By developing and openly sharing a new dataset for Bangladeshi currency, our researchers have provided a vital new tool for students and developers in computer science and AI.

- **Promoting Education for Sustainable Development (ESD):** The research by Miah, M. et al. ("Effects of green human resource management...") directly supports Target 4.7 by identifying the critical role of "employee's environmental knowledge management" and providing a framework for how organizations can educate their workforce on sustainability.

Pillar 2: Progress through University Operations and Community Engagement

NSTU's operational strategy is focused on creating a pipeline of qualified teachers, providing extensive lifelong learning opportunities, and ensuring inclusive access to education.

Section 2.1: Educating the Next Generation of Teachers

A primary mission of our university is to provide a quality education to the nation's future teachers. In 2024, **1,541 graduates**, out of a total of 1,541, gained a qualification that entitled them to teach at the primary school level (as the minimum qualification required to enter into a primary teaching job in Bangladesh). This represents a major institutional contribution to the foundations of education in Bangladesh.

Section 2.2: Supporting First-Generation Students

We are committed to being an engine of social mobility. In 2024, **434 new students**, out of 1,462, were first-generation students, meaning they are the first in their family to pursue a university degree. We actively support these students in their transition to and success in higher education.

Section 2.3: Lifelong Learning and Community Outreach

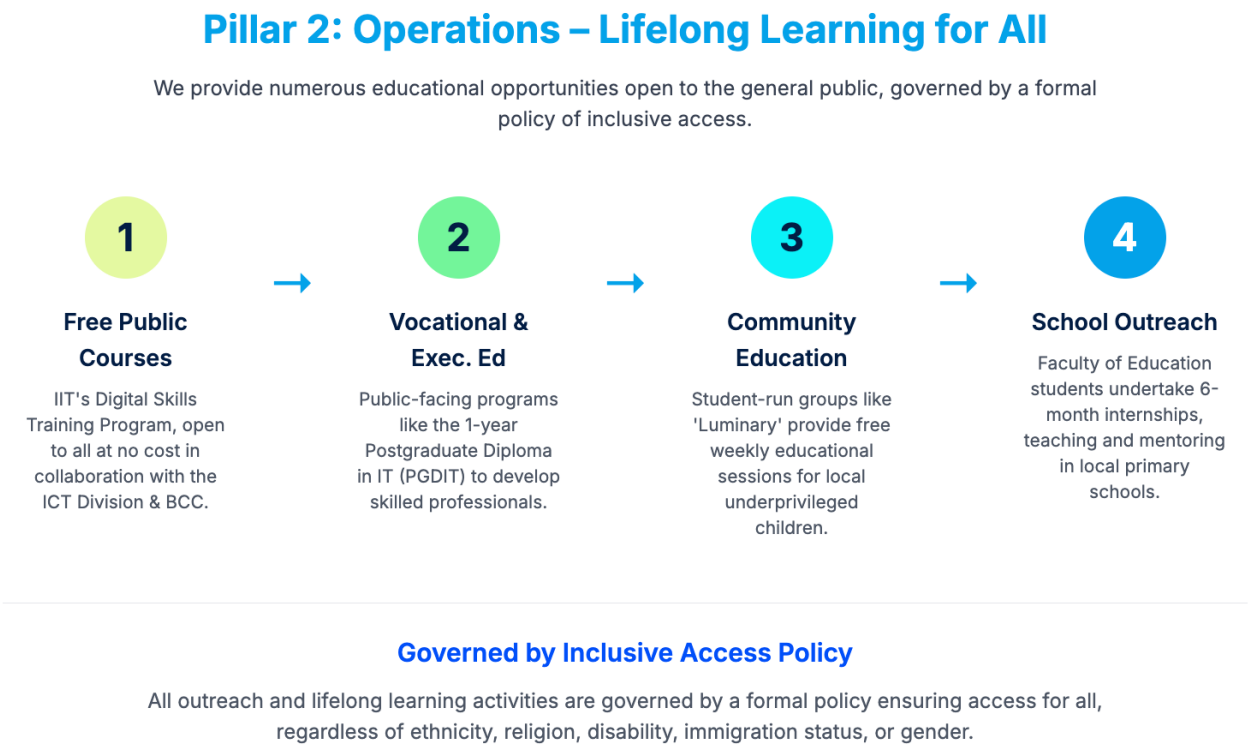
NSTU is a hub for lifelong learning, providing numerous educational opportunities open to the general public.

- **Free Public Courses:** The Institute of Information Technology (IIT) offers free programs, such as the Digital Skills Training Program, in collaboration with the ICT Division and Bangladesh Computer Council (BCC), allowing anyone to enroll at no cost.
- **Educational Outreach:** Our students actively engage in the community. For example, students from the Faculty of Education participate in a six-month internship program, where they teach and mentor in local primary schools.

- **Vocational & Executive Education:** IIT also hosts vocational programs open to the public, such as the one-year Postgraduate Diploma in Information Technology (PGDIT), designed to develop skilled professionals (image attached on the previous page, left side).
- **Community Education Events:** We host events open to the public, such as the free educational sessions run every Friday by the student-led organization 'Luminary' for underprivileged children from the local community, held on the university campus (image attached on the previous page, right side).

Section 2.4: Policy on Inclusive Access

To govern all these activities, NSTU has a formal "Inclusive Access to Educational Resources and Outreach Activities Policy." This policy ensures that participation in all university-hosted programs (free courses, public lectures, community outreach) is provided without any discrimination based on ethnicity, religion, disability, immigration status, or gender, upholding our commitment to equity and inclusivity.



Conclusion

Noakhali Science and Technology University's 2024 contribution to SDG 4 is comprehensive. Our research is creating an evidence base to improve academic performance, link education with employment, and promote sustainability. Operationally, we are a cornerstone of the national education system, with 100% of our 2024 graduates earning a teaching qualification. This, combined with our robust lifelong learning programs and strong support for first-generation students, demonstrates a holistic and impactful commitment to quality education for all.

Appendix: SDG 4 Targeting 2024 Publications Referenced

1. Hemal, S.H., Khan, M.A., Ahammad, I., Khan, M.A.S., Ejaz, S. (2024). Predicting the impact of internet usage on students' academic performance using machine learning techniques in Bangladesh perspective. *Social Network Analysis and Mining*.
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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 5 - Gender Equality

Noakhali Science and Technology University

December 2024

Introduction

Noakhali Science and Technology University (NSTU) is fundamentally committed to advancing Sustainable Development Goal 5: Achieve gender equality and empower all women and girls. We believe that rigorous, evidence-based research is crucial for identifying systemic barriers, informing effective policy, and driving meaningful change.

Our 2024 contribution demonstrates this commitment through a two-pillar strategy:

1. **Research and Innovation:** Focusing on advancing reproductive health, enhancing economic empowerment, and addressing systemic vulnerabilities.
2. **Operations and Community Engagement:** Ensuring equitable access and support for women on campus through policies, dedicated services, and measurable progress.

This report outlines our key 2024 accomplishments in support of the targets of SDG 5.

Pillar 1: Research for Gender Equality

Our 2024 research provides actionable insights on health, economics, and systemic barriers.

❤️ **Advancing Reproductive Health**
Published a meta-analysis on contraceptive use and linked coastal salinity to miscarriage and unintended pregnancy.

💼 **Enhancing Economic Empowerment**
Analyzing macroeconomic factors, like tourism, to identify and foster sectors with high potential for female job creation.

🌍 **Addressing Systemic Barriers**
Informing gender-responsive environmental policy by showing women's greater willingness to mitigate microplastic pollution.

Pillar 1: Progress through Research and Innovation

Our 2024 research portfolio provides actionable insights to advance gender equality in Bangladesh and beyond, focusing on three core pillars.

Section 1.1: Advancing Sexual and Reproductive Health and Rights (Target 5.6)

A cornerstone of gender equality is ensuring women's autonomy and access to healthcare. Our 2024 studies provide critical data for policymakers on this front.

- **Informing National Health Policy:** The systematic review and meta-analysis by Hossain, S.M.R. et al. ("Contraceptive uses among married women in Bangladesh") provides a comprehensive overview of family planning practices. This research is vital for identifying gaps in access and empowering women to make informed reproductive choices.
- **Linking Climate Vulnerability to Women's Health:** The study by Hossain, S.M.R. et al. ("Association between the salinity level with miscarriage...") establishes a data-driven link between environmental degradation and women's reproductive health. This research

provides irrefutable evidence that climate action (SDG 13) is also a gender equality imperative (SDG 5).

Section 1.2: Enhancing Women's Economic Empowerment (Target 5.5)

We are actively researching the macroeconomic factors that influence women's ability to participate fully and equally in economic life.

- **Identifying Pathways for Women's Employment:** The research by Rahman, M.H. et al. ("Effects of tourism and other macroeconomic variables on women's employment...") analyzes the impact of key economic sectors on female employment. This work helps governments identify and foster sectors with high potential for female job creation, contributing directly to Target 5.5.

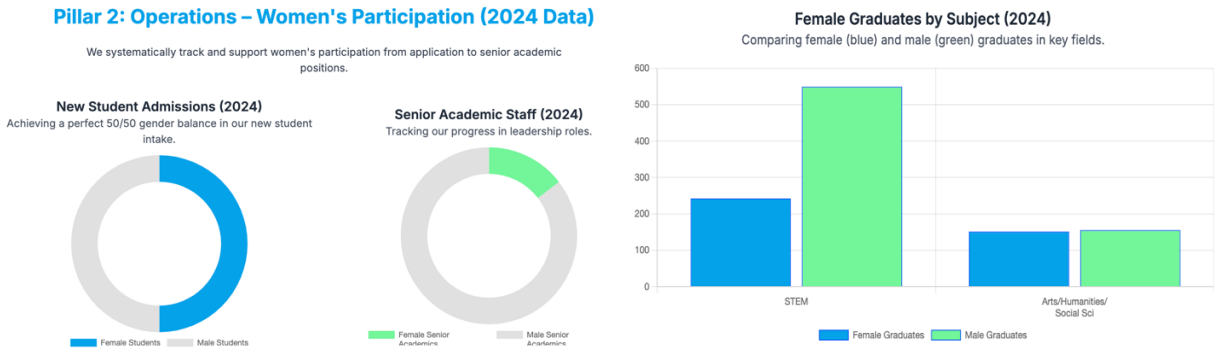
Section 1.3: Addressing Systemic Barriers and Intersectional Vulnerabilities

Our 2024 research has also tackled complex, systemic barriers, including harmful norms and gender-blind policymaking.

- **Challenging Harmful Gender Norms (Target 5.2):** The study on "Suicide attempts and depression... among the male child sexual abuse survivors..." (Siddik, M.A.B. et al.) contributes to a more holistic understanding of gender-based violence (GBV) and the patriarchal norms that perpetuate it.
- **Informing Gender-Responsive Environmental Policy (Target 5.c):** The work by Al-Masud, A. et al. ("A new approach from public behavioral attitudes... towards microplastics") provides the evidence base for creating inclusive environmental policy. The study reveals that women exhibit greater willingness to mitigate microplastic emissions, a key insight for designing gender-responsive campaigns that empower women as agents of change.

Pillar 2: Progress through University Operations and Community Engagement

NSTU's operational strategy translates our research commitment into measurable outcomes and a supportive campus environment for all.



Section 2.1: Women's Participation and Graduation (2024 Data)

We systematically track women's participation from application to graduation.

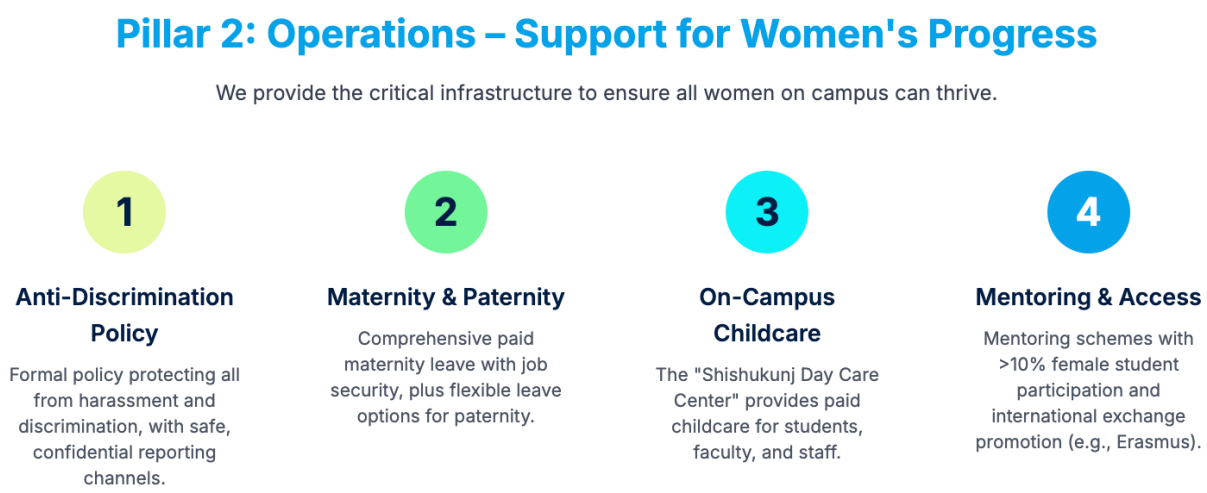
- **Student Admission:** In 2024, **731 new female students** enrolled, comprising exactly **50%** of the total 1,462 new students.

- **Graduation Rates:** In 2024, **393 female students graduated** from STEM and Arts/Humanities/Social Sciences programs.
    - **STEM:** 242 female graduates (out of 791).
    - **Arts & Humanities / Social Sciences:** 151 female graduates (out of 306).
- **Senior Academic Staff: 7 out of 48** senior academic staff (14.6%) are female, a key metric we are working to improve.

Section 2.2: Policy on Anti-Discrimination and Harassment

NSTU enforces a comprehensive "Anti-Discrimination & Anti-Harassment Policy" that forms the foundation of our commitment to equality. This policy:

- **Prohibits Discrimination:** Bans any unequal treatment based on protected characteristics, including gender, religion, ethnicity, or disability.
- **Prohibits Harassment:** Strictly forbids sexual harassment, bullying, and any conduct that creates a hostile environment.
- **Guarantees Protection:** Includes a specific clause (Section 10) to protect whistleblowers and complainants from any form of retaliation, ensuring people can report violations safely.
- **Provides Clear Channels:** Offers multiple reporting channels, including the Proctor's Office and anonymous complaint boxes, to ensure all reports are handled confidentially and impartially.



Section 2.3: Supporting Women's Progress and Well-being

We have implemented a range of specific measures to support women's participation and success.

- **Maternity and Paternity Leave:** We have a comprehensive paid maternity leave policy (Leave Regulations, Section 5) ensuring job security. We also support shared parental responsibilities by allowing flexible use of existing leave for paternity.
- **On-Campus Childcare:** NSTU provides paid childcare for students, faculty, and staff through the **Shishukunj Day Care Center**, enabling parents to continue their academic and professional activities.

- **Mentoring and Access Schemes:** We provide structured mentoring, scholarships, and guidance, with over 10% of female students participating in these schemes. We also recognize and award women's contributions on International Women's Day.
- **Encouraging Applications:** NSTU actively encourages women to apply in underrepresented fields and promotes female participation in international opportunities, such as the Erasmus Mobility Program.

Conclusion

Noakhali Science and Technology University's 2024 contribution to SDG 5 demonstrates a holistic approach. Our research is identifying systemic barriers and informing policy on women's health, economic empowerment, and environmental rights. Operationally, we have achieved a 50% female intake for new students and provide the critical infrastructure—such as anti-discrimination policies, childcare, and maternity leave—that empowers women. This combined strategy of evidence-based research and practical support underscores our deep commitment to achieving gender equality.

Appendix: SDG 5 Targeting 2024 Publications Referenced

1. Hossain, S.M.R., Akter, T., Mohsin, M., Chowdhury, P.B., Khudri, M.M. (2024). Contraceptive uses among married women in Bangladesh: a systematic review and meta-analyses. *Journal of Health Population and Nutrition*.
2. Al-Masud, A., ISLAM, A.R.M.T., Mamun, A.A., Idris, A.M., Malafaia, G. (2024). A new approach from public behavioral attitudes and perceptions towards microplastics: Influencing factors, and policy proposals. *Ocean and Coastal Management*.
3. Siddik, M.A.B., Manjur, M., Pervin, I., Khan, M.B.U., Sikder, C. (2024). Suicide attempts and depression associated factors among the male child sexual abuse survivors in Bangladesh. *Journal of Affective Disorders Reports*.
4. Hossain, S.M.R., Hasan, M.A., Faruk, M.O., Salam, M.A. (2024). Association between the salinity level with miscarriage and unintended pregnancy in Bangladesh: Impact of salinity level on miscarriage and unintended pregnancy in Bangladesh. *Heliyon*.
5. Rahman, M.H., Voumik, L.C., Nafi, S.M., Zimon, G. (2024). Effects of tourism and other macroeconomic variables on women's employment in agricultural, industry and service sectors: evidence from African countries. *Current Issues in Tourism*.

NOAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 6 - Clean Water and Sanitation

Noakhali Science and Technology University

December 2024

Introduction

Noakhali Science and Technology University (NSTU) recognizes that clean water and sanitation are the bedrock of public health, environmental stability, and sustainable development. We are profoundly committed to Sustainable Development Goal 6: Ensure availability and sustainable management of water and sanitation for all.

Our 2024 contribution demonstrates this commitment through a two-pillar strategy:

1. **Research and Innovation:** A high-impact 2024 research portfolio (38 publications) tackling water challenges from the molecular level to the ecosystem-wide.
2. **Operations and Community Engagement:** A responsible approach to on-campus water management and active knowledge-sharing with the local community.

This report details our 2024 accomplishments across these critical pillars.

Pillar 1: Progress through Research and Innovation

Our 2024 research portfolio, featuring 38 distinct publications, demonstrates a large-scale engagement with this goal, organized around four key pillars.

Section 1.1: Assessing and Protecting Water Quality (Targets 6.3, 6.6)

A primary focus of our research is to identify and understand the threats to our water bodies.

- **Microplastic Contamination:** We are at the forefront of tracking this emergent threat, with studies identifying microplastic contamination in urban tap water (Belal Hossain, M.B. et al.), groundwater-sourced drinking water (Paray, B.A. et al.), and surface water (Riya, K.K. et al.).

- **Heavy Metal and Chemical Pollution:** Our researchers conducted extensive risk assessments of toxic metals and arsenic in shallow and urban groundwater (Tajwar, M. et al.) and surface water (Rahman, M. et al.). We also reviewed the systemic threat of heavy metal contamination in aquatic food webs (Rakib, M.R.J. et al.).
- **Arsenic Monitoring:** We produced globally significant research on chronic arsenic exposure in children (Hu, K.Y. et al.) and its mobility in riverbanks (Kwak, K. et al.).
- **Biological & Ecosystem Threats:** Our work also identified biological threats, such as pathogenic bacteria in aquaculture (Tawhid, M. et al.).

Section 1.2: Innovating in Water Treatment and Technology (Targets 6.1, 6.3)

Our institution is actively developing the novel technologies required to treat polluted water.

- **Nanotechnology for Purification:** We have a strong focus on using nanomaterials to remove pollutants, including the green synthesis of nano-ZnO for photocatalytic degradation (Tamanna, N.J. et al.), using nanocellulose from waste to adsorb dyes (Tuntun, S.M. et al.), and developing reusable nanoadsorbents from e-waste to remove pharmaceuticals (Mojumder, F. et al.).
- **Advanced Membrane-Based Treatment:** Our researchers are innovating in membrane science, including nanomaterial-embedded polymer membranes (Nath, M.R. et al.), polysulfone microfiltration membranes (Nur-E-Alam, M. et al.), and advanced membranes for desalination and electrodialysis (Das, A. et al.; Kabir, M.M. et al.).

Section 1.3: Ensuring Safe Water, Sanitation, and Hygiene (WASH) (Targets 6.1, 6.2)

We conduct critical, on-the-ground research to assess WASH needs and their direct link to human health.

- **Linking WASH to Health:** Our studies provide clear evidence linking sanitation access to childhood malnutrition (Mondal, S. et al.) and analyzing the impact of WASH factors on diarrhea prevalence (Abera, M.G. et al.).
- **Safe Water Access & Solutions:** We are assessing practical solutions, including pond sand filters (Khan, M.S. et al.), developing "safe water atlases" (Jakariya, M. et al.), and promoting rainwater harvesting (Nipun, M.W.H. et al.).
- **Sanitation Systems:** Our research provides blueprints for systemic improvements, such as the case study on holistic, citywide sanitation for Noakhali Pourashava (Karim, F.S. et al.).
- **Wastewater Surveillance:** We are innovating in the use of wastewater as a public health tool, pioneering surveillance methods for early detection of viral outbreaks like Mpox (Islam, M.A. et al.).

Section 1.4: Integrated Water Resource & Ecosystem Management (Targets 6.4, 6.5, 6.6)

Our research provides the high-level data and models needed for sustainable, long-term water management.

- **Resource Monitoring and Forecasting:** We provide essential data for national planning, including groundwater vulnerability mapping (Iqbal, M.A. et al.), trend analysis of

evapotranspiration (Dia, R.B. et al.), and advanced AI models for rainfall forecasting (Ali, M.E. et al.).

- **Ecosystem Protection:** Our research assesses the impact of human interventions and land use on water-related ecosystems (Jannah, M.R. et al.; Haque, M.R. et al.; Roy, S.K. et al.).
- **Water-Use Efficiency:** We are developing tools for more efficient water use in agriculture through IoT-enabled sustainable irrigation (Rana, M.Z. et al.) and by identifying climate-adaptive strategies for farmers (Al Mamun, M.A. et al.).

Pillar 2: Progress through University Operations and Community Engagement

NSTU's operational strategy focuses on responsible water stewardship on campus and active engagement with the wider community on water security.

Section 2.1: On-Campus Water Management and Infrastructure

NSTU actively measures the total volume of water used for our campus population of 11,800.

- **Sustainable Extraction:** We utilize sustainable water extraction technologies, drawing from on-campus lakes and groundwater. Rainwater is also captured in the large campus lake to reduce reliance on groundwater.
- **Free Drinking Water:** In accordance with the NSTU Citizen Charter, we provide free and safe drinking water to all students, staff, and visitors in every campus building.
- **Water-Saving Infrastructure:** All new university buildings are designed and constructed in compliance with the Bangladesh National Building Code (BNBC) 2020 to minimize water use.
- **Ecological Landscaping:** Our campus landscaping, which includes species like *Mangifera indica* and *Cocos nucifera*, is designed primarily to enhance ecological diversity and support local wildlife.

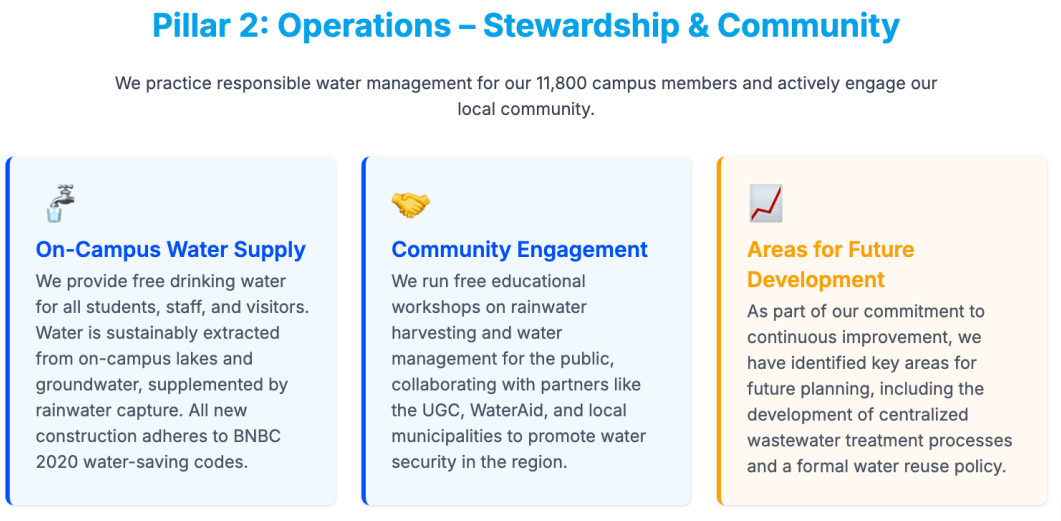
Section 2.2: Wastewater and Water Reuse

As part of our commitment to continuous improvement, we have identified key areas for future development. The university does not currently have a centralized wastewater treatment process, processes to prevent accidental water pollution, or a formal policy to maximize water reuse. These areas are a focus for future planning.

Section 2.3: Community Engagement and Water Conservation

NSTU actively promotes conscious water use and conservation both on campus and in the wider community.

- **Public Education:** We provide educational opportunities for local communities, such as the "special model exhibition on water management" organized by the Department of Environmental Science and Disaster Management (ESDM) (images attached on the previous page).
- **Community Workshops:** We support water conservation off-campus by organizing public workshops on topics like rainwater harvesting.
- **Multi-Level Collaboration:** Our community-facing water security initiatives are conducted in cooperation with local, regional, and national partners, including the Bangladesh University Grants Commission (UGC), WaterAid Bangladesh, Coastal Environment Network (COEN), Choumuhani Municipality, and Noakhali Municipality.



Conclusion

Noakhali Science and Technology University's 2024 contribution to SDG 6 is both extensive and holistic. Our 38 publications cover the full life cycle of water, from identifying molecular pollutants to innovating purification technologies and providing integrated management models. Operationally, we practice responsible water stewardship by providing free drinking water, utilizing sustainable extraction methods, and actively promoting water conservation in our community through education and multi-stakeholder collaboration.

Appendix: SDG 6 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. Jannah, M.R., Saha, D., Bappy, M.M.M., Arai, T., Belal Hossain, M.B. (2024). Macrobenthos community responses to tidal barrier in a sub-tropical river estuary: Insights for coastal management. *Regional Studies in Marine Science*.

3. Tajwar, M., Rahman, M., Shreya, S.S., Alam, M.M.T., Zahid, A. (2024). Pollution evaluation and health risks assessment of naturally occurring toxic metals in shallow groundwater: A study in southwestern tidal delta of Bangladesh. *Journal of Trace Elements and Minerals*.
4. Rakib, M.R.J., Sarker, A., Nahida, Z.T., Kumar, R., Malafaia, G. (2024). A critical review on heavy metal contamination in aquatic food webs by edible fish species: a special case concerning Bangladesh. *Environmental Monitoring and Assessment*.
5. Mondal, S., Wangdi, K., Gray, D.J., Kelly, M.J., Sarma, H. (2024). Associations between childhood malnutrition, socioeconomic inequalities and sanitation in the coastal regions of Bangladesh. *Discover Public Health*.
6. Iqbal, M.A., Salam, M.A., Nur-E-Alam, M., Rahaman, H., Uddin, M.F. (2024). Monitoring groundwater vulnerability for sustainable water resource management: A DRASTIC-based comparative assessment in a newly township area of Bangladesh. *Groundwater for Sustainable Development*.
7. Khudri, M.M., Chowdhury, P.B., Hossain, S.M.R., Ahsan, K.Z. (2024). Explaining the role of socioeconomic, healthcare access and infrastructural shifts in nutritional transition among women in Bangladesh between 2004 and 2018. *Public Health*.
8. Tamanna, N.J., Sahadat Hossain, M., Tabassum, S., Bahadur, N.M., Ahmed, S. (2024). Easy and green synthesis of nano-ZnO and nano-TiO2 for efficient photocatalytic degradation of organic pollutants. *Heliyon*.
9. Kwak, K., Varner, T.S., Saha, S., Datta, S., Knappett, P.S.K. (2024). Impact of surficial lithology on arsenic mobility in riverbanks of tidally fluctuating rivers: The Hooghly River, West Bengal, India. *Journal of Hydrology*.
10. Khan, M.S., Paul, S.K. (2024). Quality and efficiency assessment, health issues and management practices of pond sand filter water in coastal Bangladesh. *International Journal of Energy and Water Resources*.
11. Tuntun, S.M., Sahadat Hossain, M., Akter, S., Alam, M.S., Ahmed, S. (2024). Synthesis of nano crystallite cellulose and chitosan from waste natural source for the adsorption of cationic and anionic dyes in aqueous medium. *Hybrid Advances*.
12. 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*.
13. 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*.
14. Dia, R.B., Mallick, J., Aziz, T., Chu, R., ISLAM, A.R.M.T. (2024). Comparative Trend Variability Analysis of Reference Evapotranspiration in Bangladesh Using Multiple Trend Detection Approaches. *Theoretical and Applied Climatology*.
15. Das, A., Im, K., Kabir, M.M., Shon, H., Nam, S.Y. (2024). Polybenzimidazole (PBI)-based membranes for fuel cell, water electrolysis and desalination. *Desalination*.

16. Rahman, M., Chaity, I.J., Hossain, M.I.S., Siddique, M.A.M. (2024). Surface water pollution by some heavy metals in a remote island, Hatiya, northern Bay of Bengal. *Journal of Trace Elements and Minerals*.

17. Nath, M.R., Pal, K., Imran, A.B., Chowdhury, A.N. (2024). Innovations in nanomaterial-embedded polymer membranes for water and wastewater treatment: a comprehensive review. *Nano Express*.

18. Al Mamun, M.A., Li, J., Cui, A., Chowdhury, R., Hossain, M.L. (2024). Climate-adaptive strategies for enhancing agricultural resilience in southeastern coastal Bangladesh: Insights from farmers and stakeholders. *Plos One*.

19. Hu, K.Y., Islam, M.A., Parvez, F., Bhattacharya, P., Khan, K.M. (2024). Chronic exposure of arsenic among children in Asia: A current opinion based on epidemiological evidence. *Current Opinion in Environmental Science and Health*.

20. Islam, M.A., Kumar, R., Sharma, P., Bhattacharya, P., Tiwari, A. (2024). Wastewater-Based Surveillance of Mpox (Monkeypox): An Early Surveillance Tool for Detecting Hotspots. *Current Pollution Reports*.

21. Mojumder, F., Yasmin, S., Ali Shaikh, M.A., Chowdhury, P., Kabir, M.H. (2024). Synthesis of reusable graphene oxide based nickel-iron superparamagnetic nanoadsorbent from electronic waste for the removal of doxycycline in aqueous media. *Journal of Hazardous Materials Advances*.

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23. Al Nahid, S.A., Rana, S., Sultana, N., Rahman, M.J., Iqbal, M.M. (2024). Larval Fish Assemblages in Coastal Waters of Bangladesh: Spatial and Seasonal Dynamics. *Conservation*.

24. Souza, S.S.D., Gomes, A.R., Guimarães, A.T.B., ISLAM, A.R.M.T., Malafaia, G. (2024). Exposure to microcrystallized cellulose affects the health of tadpoles and sheds light on the threat these materials pose to amphibians. *Environmental Pollution*.

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26. 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.

27. Im, K., Kabir, M.M., Shon, H., Nam, S.Y. (2024). Polybenzimidazole (PBI)-based membranes for fuel cell, water electrolysis and desalination. Desalination.

28. 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*.

29. Haque, M.R., Tusar, M.K., Mou, M.A., Rahaman, M.S. (2024). Assessment of LULC change and its impact on Surface Runoff using SCS-CN method for Noakhali Region, Bangladesh. *Present Environment and Sustainable Development*.

30. Belal Hossain, M.B., Yu, J.J., Sarker, P.K., Paray, B.A., Arai, T. (2024). Microplastic accumulation, morpho-polymer characterization, and dietary exposure in urban tap water of a developing nation. *Frontiers in Sustainable Food Systems*.

31. Paray, B.A., Yu, J.J., Sultana, S., Li, Y., Belal Hossain, M.B. (2024). Contamination, morphological and chemical characterization, and hazard risk analyses of microplastics in drinking water sourced from groundwater in a developing nation. *Frontiers in Environmental Science*.

32. Tawhid, M., Islam, M.M., Amanat, M., Tandon, S. (2024). Biochemical assay for detection of pathogenic and probiotic bacteria at shrimp and prawn from wild and different culture conditions in bangladesh. *Suranaree Journal of Science and Technology*.

33. Varner, T.S., Saha, S., Kwak, K., Knappett, P.S.K., Datta, S. (2024). Distribution of Arsenic and Iron in Hyporheic Zone Sediments Along the Hooghly River. *Lecture Notes in Civil Engineering*.

34. Rana, M.Z., Rahaman, A.S.M.M., Ali, M.O., Parvez Mahmud, M.A. (2024). IoT-Enabled Water Management: A Low-Cost Framework for Sustainable Irrigation in Agricultural Farms and Home Gardens. *2024 International Conference on Advances in Computing Communication Electrical and Smart Systems Innovation for Sustainability Icaccess 2024*.

35. Nur-E-Alam, M., Deowan, S.A., Hossain, E., Miah, M.Y., Nurnabi, M. (2024). Fabrication of Polysulfone-Based Microfiltration Membranes and Their Performance Analysis. *Water Air and Soil Pollution*.

36. Rakib, M.R.J., Sarker, A., Mejjad, N., Sharma, P., Idris, A.M. (2024). Spatiotemporal distribution, trophic transfer, and research uncertainty of heavy metals in a subtropical highly polluted Buriganga River: A critical review. *Regional Studies in Marine Science*.

37. Kabir, M.M., Sabur, G.M., Akter, M.M., Tijing, L.D., Shon, H. (2024). Electrodialysis desalination, resource and energy recovery from water industries for a circular economy. *Desalination*.

38. Ali, M.E., Shil, P., Shakib, M.S., Baten, M.A., Mayoa, F. (2D.S., Baten, M.A., Mayoa, F. (2024). A Comparative Analysis of Rainfall Forecasting in Cox's Bazar using SARIMA, LSTM and GRU. *2024 27th International Conference on Computer and Information Technology ICCIT 2024 Proceedings*.

NOAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

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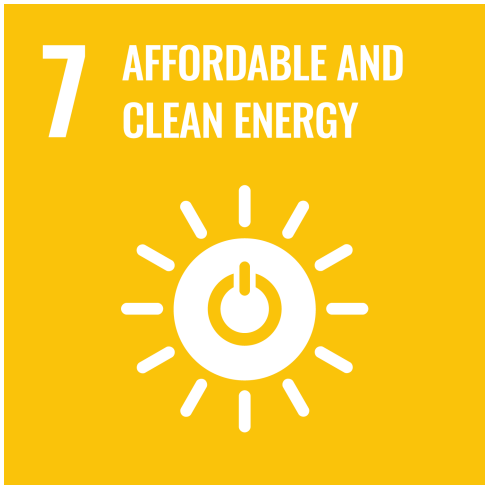
SDG PROGRESS REPORT 2024



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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 7 - Affordable and Clean Energy

Noakhali Science and Technology University

December 2024

Introduction

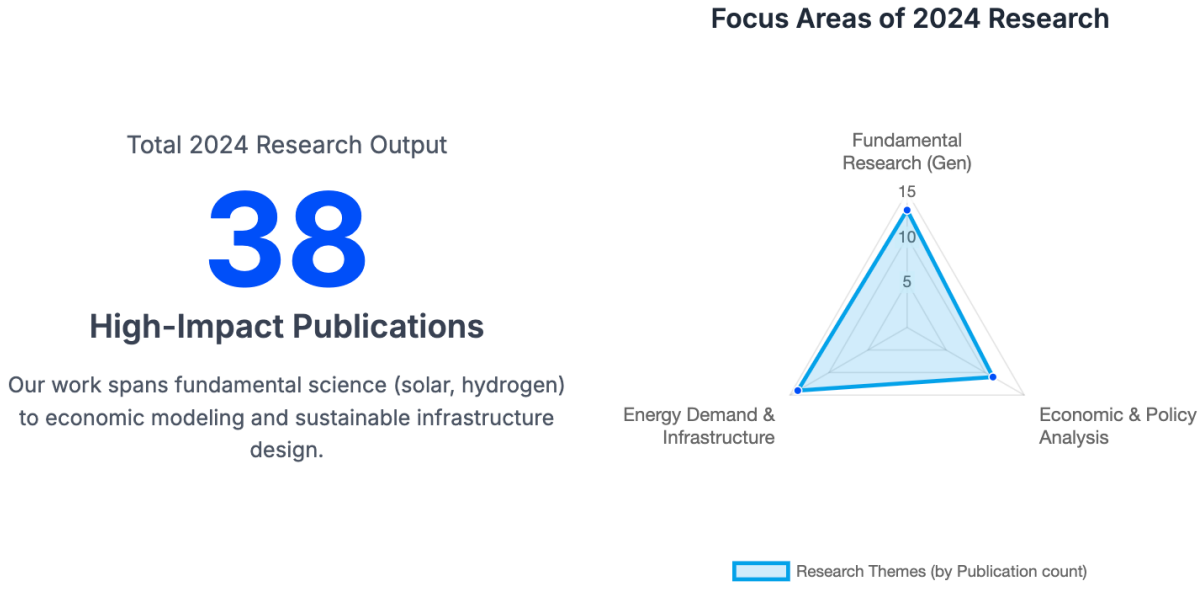
Noakhali Science and Technology University (NSTU) is fully dedicated to advancing Sustainable Development Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all. We recognize that energy is the golden thread connecting economic growth, social equity, and environmental sustainability.

Our 2024 contribution demonstrates this commitment through a two-pillar strategy:

1. **Research and Innovation:** A high-impact 2024 research portfolio (38 publications) pioneering new energy technologies and analyzing the economic, environmental, and policy frameworks for their global implementation.
2. **Operations and Community Engagement:** A responsible approach to on-campus energy efficiency, divestment from carbon-intensive industries, and active knowledge-sharing with the local community.

This report details our 2024 accomplishments across these critical pillars.

Pillar 1: Research for a Clean Energy Future (2024)



Pillar 1: Progress through Research and Innovation

Our 2024 research portfolio, comprising 38 diverse publications, demonstrates a comprehensive, multi-layered strategy for this goal. Our researchers are not only pioneering the fundamental science of new energy technologies but also analyzing the frameworks necessary for their global implementation.

Section 1.1: Fundamental Research in Clean Energy Generation (Targets 7.2, 7.a)

A significant portion of our 2024 research involves foundational R&D to increase the share of renewable energy.

- **Advanced Solar Power:** We have a major research cluster focused on improving solar technology, including prospecting for Concentrating Solar Power (CSP) in Bangladesh (Mia, M.S. et al.) and designing high-efficiency triple-junction, perovskite, and organic solar cells (Sifat, M.I. et al.; Acharjee, K. et al.; Kundu, C.S. et al.).
- **Green Hydrogen and Fuel Cells:** Our institution is a leader in the hydrogen economy, with research on platinum-free electrocatalysts (Islam, F. et al.), advanced membranes for fuel cells (Das, A. et al.), and a proof-of-concept for producing green hydrogen from human urine electrolysis (Im, K. et al.).
- **Bioenergy and Energy Harvesting:** We are exploring diverse energy sources, including the techno-economics of agricultural biomass-based energy (Akter, M.M. et al.) and wearable piezoelectric energy harvesters (Islam, A.J. et al.).

Section 1.2: Economic & Policy Analysis of the Energy Transition (Targets 7.2, 7.3)

Alongside technology, we produce high-level economic analysis to guide the transition to sustainable energy systems.

- **Modeling Renewable Energy Impact:** Our studies analyze the dynamic impact of renewable energy on GDP (Rahman, M. et al.) and its role in mitigating CO2 emissions in various countries (Rahman, A.A. et al.; Borsha, F.H. et al.; Alam, M.B. et al.).
- **Promoting Energy Efficiency:** Our work directly supports Target 7.3, including modeling drivers for energy-efficient textile manufacturing (Tushar, S.R. et al.) and estimating energy balance in agriculture (Deb, N.C. et al.).
- **Green Finance and Technology Policy:** We are researching the mechanisms to enable the transition, including the impact of geopolitical risk on green technology adoption (Voumik, L.C. et al.) and the role of Green Bonds (Kumar, B. et al.).

Section 1.3: Analyzing Energy Demand and Sustainable Infrastructure (Targets 7.1, 7.b)

Our research provides a crucial understanding of how energy is used and how to build the sustainable infrastructure of the future.

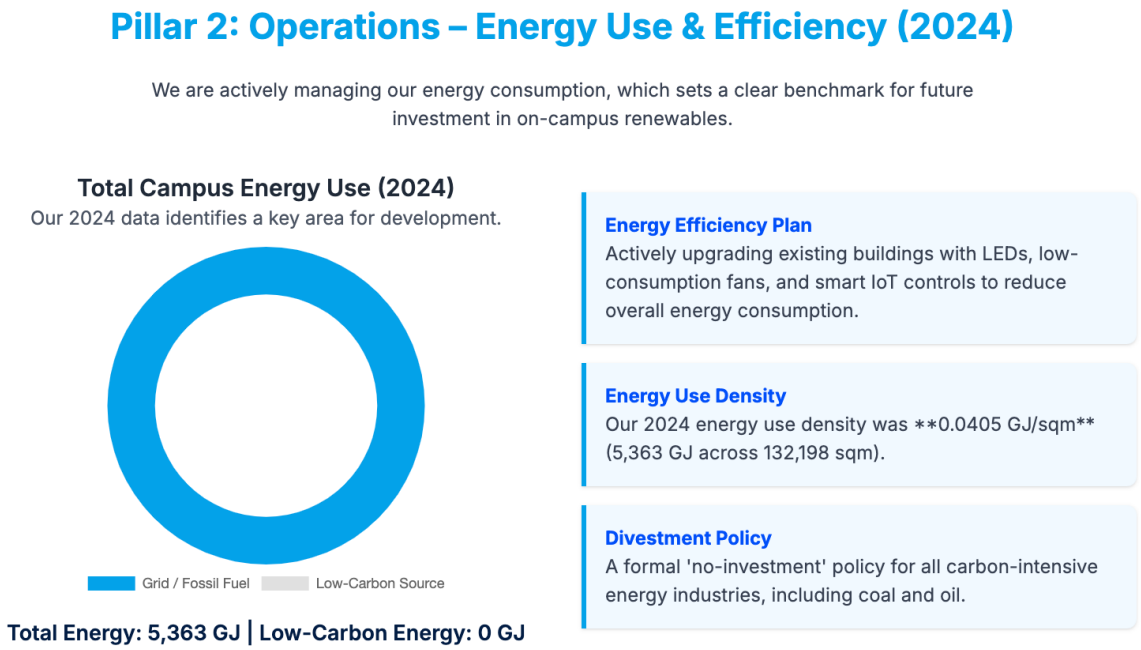
- **Analyzing Energy Demand:** We analyze the key drivers of energy consumption, including studies on the impact of tourism (Ridwan, M.K. et al.) and urbanization (Tahrim, F. et al.).
- **The Energy-Environment Nexus:** We investigate the environmental impact of energy choices, including the health impacts of energy choices (Kaya, F. et al.) and the complex relationships between energy, agriculture, tourism, and CO2 emissions (Akther, T. et al.).
- **Designing Sustainable Systems:** Our researchers are designing practical infrastructure, including models for hybrid power plants (Ahmed, S. et al.) and frameworks for transforming institutional buildings into "Green Libraries" (Tanzin, M. et al.). This is complemented by future-facing research, such as using ML to identify optimal EV charging station locations (Ahmed, M. et al.).

Pillar 2: Progress through University Operations and Community Engagement

NSTU's operational strategy translates our research commitment into direct action, focusing on campus efficiency, responsible finance, and community education.

Section 2.1: Energy Efficiency and Carbon Management

NSTU has an energy efficiency plan in place to reduce overall consumption. We are progressively upgrading existing buildings by replacing traditional lighting with energy-efficient alternatives, installing low-consumption fans, and integrating IoT-based smart control systems. The university also conducts internal energy reviews to identify areas of high wastage, such as inspections of residential halls to address the overuse of high-wattage personal appliances. While a formal carbon management process is not yet in place, these efficiency measures form the basis of our emission reduction strategy.



Section 2.2: Divestment from Carbon-Intensive Industries

NSTU has a formal policy on divesting investments from carbon-intensive energy industries. While the university does not hold investments in external industries beyond traditional bank deposits, the policy commits to:

- A formal no-investment and no-engagement stance with coal, oil, and other carbon-intensive energy sectors.
- Preferentially selecting banking or financial products that support sustainable and green financing where options exist.
- Ensuring any future investment opportunities undergo sustainability screening to ensure alignment with low-carbon practices.

Section 2.3: Energy Use Density and Low-Carbon Energy (2024)

In 2024, the total energy used on campus was **5,363 GJ** across a total floor space of **132,198 sqm**. This results in an energy use density of **0.0405 GJ/sqm**.

The total energy used from low-carbon sources (e.g., solar, geothermal) in 2024 was **0 GJ**. This has been identified as a primary area for future investment and development, aligning our operational goals with our research strengths in renewable energy.

Section 2.4: Energy and the Community

NSTU actively engages the community on energy topics through several initiatives:

- **Public Education:** The student-led NSTU EEE Association organizes multiple events annually, including seminars and demonstrations, to promote renewable energy and efficient electricity use to both students and the local community (images attached below).

- **Industry Services:** EEE faculty and students regularly visit local facilities to provide free and paid technical consultations and preliminary energy-efficiency assessments (e.g. MUH service), supporting cleaner industrial operations.
- **Policy Support:** Through expert discussions and industry engagement, the EEE department actively informs and supports local and regional government bodies in clean energy and energy-efficient technology policy development.
- **Start-up Assistance:** The university provides informal support and expertise for start-ups focused on developing and fostering low-carbon technologies.

Conclusion

Our 2024 research on SDG 7 is robust and comprehensive, spanning the entire energy landscape—from the foundational science of solar and hydrogen to the macroeconomic modeling of renewable integration and the practical design of sustainable infrastructure. Operationally, we are implementing a clear strategy for energy efficiency and divestment, while actively engaging our community to promote clean energy. Our 2024 data, which shows 0 GJ of low-carbon energy use, has provided a clear benchmark and institutional imperative to begin investing in on-campus renewable energy generation, creating a powerful synergy between our research expertise and our operational practices.

Appendix: SDG 7 Targeting 2024 Publications Referenced

1. Kaya, F., Voumik, L.C., Rashid, M., Kochański, K., Zimon, G. (2024). Energy choices to health outcomes: A multidimensional analysis of risk in BRICS via PMG-ARDL approach. *Plos One*.

2. Shakil, J.A., Saikat, S.P., Bhattacharjee, N., Uddin, J., Chowdhury, F.I. (2024). DFT/TD-DFT study of novel triphenylamine-based dyes with azo moieties and π-spacer variations for enhanced dye-sensitized solar cell performance. *Chemical Physics Impact*.

3. Ridwan, M.K., Akther, A., Al-Absy, M.S.M., Yağiş, O., Jaheer Mukthar, K.P. (2024). The Role of Tourism, Technological Innovation, and Globalization in Driving Energy Demand in Major Tourist Regions. *International Journal of Energy Economics and Policy*.

4. Islam, R., Abdur, R., Ashraful Alam, M., Islam, D., Jamal, M.S. (2024). Modulating Mn-doped NiO nanoparticles: structural, optical, and electrical property tailoring for enhanced hole transport layers. *Nanoscale Advances*.

5. Tahrim, F., Hasan, M.A., Akter, S.M.S., Das, M.K., Pattak, D.C. (2024). Impact of urbanization, economic growth, FDI, and trade openness on energy demand in Ireland: an ARDL approach. *Progress in Energy*.

6. 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*.

7. Islam, F., Ahsan, M., Islam, N., Maiyalagan, M.T., Hasnat, M.A. (2024). Recent Advancements in Ascribing Several Platinum Free Electrocatalysts Pertinent to Hydrogen Evolution from Water Reduction. *Chemistry an Asian Journal*.

8. Rahman, M., Hasan, K., Siddique, M.A.B., Tariq, S., Ibrahim, M.K. (2024). Particulate matter concentrations around natural gas-fired power plants and their associated health impact assessment. *Journal of King Saud University Science*.

9. Dia, R.B., Mallick, J., Aziz, T., Chu, R., ISLAM, A.R.M.T. (2024). Comparative Trend Variability Analysis of Reference Evapotranspiration in Bangladesh Using Multiple Trend Detection Approaches. *Theoretical and Applied Climatology*.

10. Tushar, S.R., Imtiazh, M.S.A., Noor, R.B., ISLAM, A.R.M.T., Kabir, M.M. (2024). An Intuitionistic fuzzy approach to modeling the drivers to promote Energy-Efficient textile Manufacturing: Implications for sustainable development. *Journal of King Saud University Science*.

11. Akther, T., Selim, M.M.I., Hossain, M.S., Kibria, M.G. (2024). Synergistic role of agriculture production, fertilizer use, tourism, and renewable energy on CO2 emissions in South Asia: A static and dynamic analysis. *Energy Nexus*.

12. Das, A., Im, K., Kabir, M.M., Shon, H., Nam, S.Y. (2024). Polybenzimidazole (PBI)-based membranes for fuel cell, water electrolysis and desalination. *Desalination*.

13. Deb, N.C., Basak, J.K., Paudel, B., Kang, M., Kim, H. (2024). Estimation of Energy Balance throughout the Growing–Finishing Stage of Pigs in an Experimental Pig Barn. *Agriculture Switzerland*.

14. Ahmed, T., Suzauddula, M., Akter, K., Hossen, M., Islam, M.N. (2024). Green Technology for Fungal Protein Extraction—A Review. *Separations*.

15. Raihan, A., Hasan, M.A., Voumik, L.C., Akter, S.M.S., Ridwan, M.K. (2024). Sustainability in Vietnam: Examining economic growth, energy, innovation, agriculture, and forests' impact on CO2 emissions. *World Development Sustainability*.

16. Voumik, L.C., Ghosh, S., Rashid, M., Esquivias, M.A., Rojas, O. (2024). The effect of geopolitical risk and green technology on load capacity factors in BRICS. *Utilities Policy*.

17. Rahman, M.M., Mohanty, A.K., Rahman, M.H. (2024). Renewable energy, forestry, economic growth, and demographic impact on carbon footprint in India: does forestry and renewable energy matter to reduce emission? *Journal of Environmental Studies and Sciences*.

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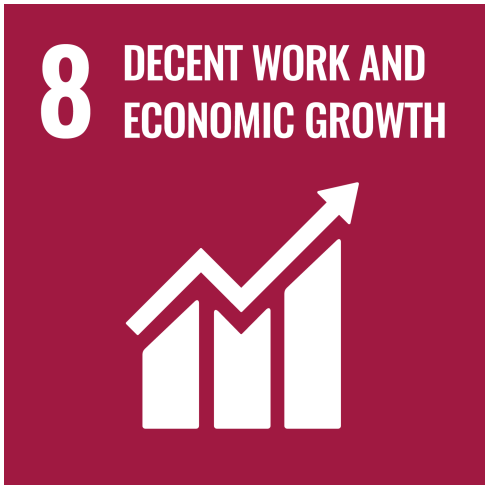
SDG PROGRESS REPORT 2024



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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 8 - Decent Work and Economic Growth

Noakhali Science and Technology University

December 2024

Introduction

Noakhali Science and Technology University (NSTU) is deeply committed to Sustainable Development Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. We believe that a truly sustainable future is built on an economy that is both robust and equitable.

Our extensive 2024 research portfolio, featuring 45 high-impact publications, demonstrates a comprehensive strategy for addressing this goal, complemented by our operational policies. Our work is organized around two key pillars:

1. **Research and Innovation:** Analyzing economic growth, decoupling it from environmental degradation, fostering innovation, and promoting decent work.
2. **Operations and Employment Practices:** Ensuring decent work, fair compensation, and secure employment for all our staff, faculty, and associated personnel.

This report details our 2024 accomplishments across these critical pillars.

Pillar 1: Research for a Sustainable Economy (2024)

Pillar 1: Progress through Research and Innovation

Our 2024 research provides a comprehensive evidence base for building a more prosperous, inclusive, and sustainable economy.

Section 1.1: Analyzing and Promoting Sustained Economic Growth (Targets 8.1, 8.10)

A major part of our research provides the evidence base for Target 8.1 (sustain economic growth) and Target 8.10 (strengthen financial institutions).

- **Modeling Macroeconomic Drivers:** Our researchers have produced extensive analyses on the drivers of GDP, including studies on the impact of renewable energy (Rahman et al.), remittances, and FDI (Jui et al.).
- **Analyzing Financial and Trade Linkages:** We have a strong focus on the financial and trade systems that underpin growth, including research on the adoption of Fintech (Raihan et al.), the role of Green Bonds (Kumar et al.), and the ICT-trade relationship (Islam et al.).

Section 1.2: Decoupling Growth from Environmental Degradation (Target 8.4)

Our institution is a leader in researching Target 8.4 (improve resource efficiency). We provide critical analysis on how to achieve a "green economy."

- **Promoting Resource Efficiency:** Our work identifies pathways for efficiency, including studies on energy-efficient textile manufacturing (Tushar et al.) and advancing circular economy principles (Kabir et al.; Narwal et al.).
- **The Growth-Environment Nexus:** We have a massive research cluster on the Environmental Kuznets Curve (EKC), analyzing the interplay of economic growth, energy use, and carbon emissions in Bangladesh (Raihan et al.; Borsha et al.) and globally.

Section 1.3: Fostering Innovation, Diversification, and Sustainable Tourism (Targets 8.2, 8.9)

We actively support Target 8.2 (economic diversification) and Target 8.9 (promote sustainable tourism).

- **Promoting Sustainable Tourism:** We have a dedicated research focus on green tourism sustainability (Tafsirun et al.) and the impact of tourism on carbon emissions (Voumik et al.; Chowdhury et al.).
- **Technological Innovation in Key Sectors:** Our researchers are developing and assessing the tools for economic diversification, especially in agriculture, by using machine learning for soil classification (Rahman et al.), IoT-enabled irrigation (Rana et al.), and AI for crop disease detection (Khan et al.).

Section 1.4: Promoting Decent Work and Inclusive Livelihoods (Targets 8.5, 8.8)

Our research addresses the human side of economic growth, focusing on full employment and safe work environments.

- **Analyzing Employment and Livelihoods:** We directly investigate Target 8.5. The work by Rahman et al. provides key evidence on macroeconomic variables affecting women's employment. The study by Tawsif et al. provides a critical analysis of the livelihood capitals of urban slum dwellers.
- **Promoting Safe and Secure Work Environments (Target 8.8):** Our research promotes worker well-being, including a study by Miah et al. on green human resource management to create environmentally sustainable and positive work environments.

Pillar 2: Progress through University Operations and Employment Practices

NSTU's operational strategy is to be an exemplary employer, ensuring decent work, fair compensation, and secure employment for our entire community.

Section 2.1: Fair Compensation and Pay Equity

NSTU is committed to providing a living wage. All 1,174 university employees are compensated according to the official National Pay Scale 2015 set by the Government of Bangladesh. This structure ensures a salary above the national poverty line, and its uniform application based on grade and seniority guarantees pay equity, free from discrimination based on gender or other protected characteristics.

Section 2.2: Comprehensive Employment and Welfare Policies

NSTU has two key policies that govern our commitment to decent work:

1. **Comprehensive Employment and Welfare Policy:** This policy outlines our zero-tolerance stance against forced labour, modern slavery, human trafficking, and child labour. It also guarantees the rights and welfare of outsourced personnel (e.g., cleaning, security) by requiring contractors to comply with the Bangladesh Labour Act.
2. **Anti-Discrimination & Anti-Harassment Policy:** This policy prohibits all forms of discrimination in the workplace. It also provides a formal grievance and appeals process for all employees and guarantees protection for whistleblowers from any retaliation.

Section 2.3: Labour Rights and Secure Employment

NSTU fully respects the right of all employees to form and join unions and associations, in compliance with national law.

- **Secure Contracts (2024): 100%** of our 1,174 employees are on contracts of over 24 months, demonstrating our commitment to secure employment.
- **Employee Data (2024):** Total employees: 1,174; Academic staff: 395.

Section 2.4: Preparing Students for Decent Work

We bridge the gap between education and employment by providing students with practical experience. In 2024, 551 students (out of 9,897) participated in work placements lasting more than one month, including our pharmacy students' internships at the 250-bed Noakhali General Hospital and education students' internships in local primary schools.

Pillar 2: Operations – Our Commitment to All Workers

Our policies guarantee a fair, safe, and equitable environment for all staff, faculty, and associated personnel.

1

Living Wage & Pay Equity

All staff paid a living wage via the National Pay Scale 2015, ensuring no gender pay gap.

2

Zero-Tolerance Policy

A formal policy with a zero-tolerance stance on forced labour, modern slavery, and child labour.

3

Anti-Discrimination

Comprehensive policy prohibiting discrimination, with safe, confidential reporting and anti-retaliation protection.

4

Labour Rights

Full recognition of unions and guaranteed rights for outsourced workers via binding contracts.

Conclusion

Noakhali Science and Technology University's 2024 contribution to SDG 8 is comprehensive. Our research (45 publications) provides the evidence base for a sustainable economy—modelling growth, promoting green finance, and analysing decent work. Operationally, we lead by example: 100% of our 1,174 employees are on secure contracts, are paid a living wage in accordance with the national pay scale, and are protected by comprehensive anti-discrimination and anti-forced labour policies. This combination of research and responsible practice demonstrates our holistic commitment to promoting decent work and sustainable economic growth.

Appendix: SDG 8 Targeting 2024 Publications Referenced

1. Kaya, F., Voumik, L.C., Rashid, M., Kochański, K., Zimon, G. (2024). Energy choices to health outcomes: A multidimensional analysis of risk in BRICS via PMG-ARDL approach. *Plos One*.
2. Aspy, N.N., Voumik, L.C., Esquivias, M.A., Das, M.K., Pattak, D.C. (2024). Impact of tourism, globalization, and technological patents on ecological footprint in ASEAN countries: static and dynamic panel regression approaches. *Discover Sustainability*.
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. Raihan, A., Guneysu Atasoy, F., Coskun, M.B., Atasoy, M., Yer, H. (2024). Fintech adoption and sustainable deployment of natural resources: Evidence from mineral management in Brazil. *Resources Policy*.

5. Raihan, A., Rahman, J., Tanchangya, T., Ridwan, M.K., Bari, A.B. (2024). Influences of economy, energy, finance, and natural resources on carbon emissions in Bangladesh. *Carbon Research*.
6. 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*.
7. Hossain, M.M., Sultana, F., Khan, S., Tran, L.S.P., Mostofa, M.G. (2024). Carrageenans as biostimulants and bio-elicitors: plant growth and defense responses. *Stress Biology*.
8. Ridwan, M.K., Akther, A., Al-Absy, M.S.M., Yağiş, O., Jaheer Mukthar, K.P. (2024). The Role of Tourism, Technological Innovation, and Globalization in Driving Energy Demand in Major Tourist Regions. *International Journal of Energy Economics and Policy*.
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12. Tafsirun, U., Farhana, A., Alam, M.F.E., Castanho, R.A. (2024). Green tourism sustainability and its impact on green environment achievement. *Cultural Gastronomy and Adventure Tourism Development*.
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15. Jui, F.N., Hossain, M.J., Das, A., Sultana, N., Islam, M.K. (2024). Analyzing the impact of remittance, FDI and inflation rate on GDP: A comparative study of Bangladesh, Pakistan and Sri-Lanka using VAR and BEKK-GARCH approach. *Heliyon*.
16. Al Mamun, M.A., Li, J., Cui, A., Chowdhury, R., Hossain, M.L. (2024). Climate-adaptive strategies for enhancing agricultural resilience in southeastern coastal Bangladesh: Insights from farmers and stakeholders. *Plos One*.
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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 9 - Industry, Innovation, and Infrastructure

Noakhali Science and Technology University

December 2024

Introduction

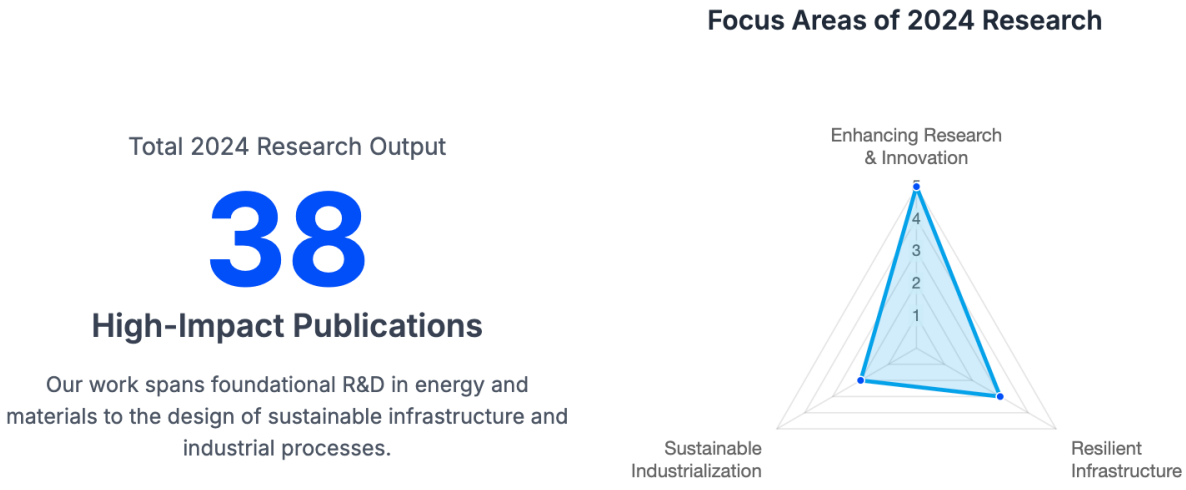
Noakhali Science and Technology University (NSTU) is fundamentally dedicated to advancing Sustainable Development Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. We believe that scientific research, technological development, and sustainable engineering are the primary engines for economic growth and societal resilience.

Our extensive 2024 research portfolio, featuring 38 high-impact publications, demonstrates a deep and multifaceted commitment to this goal. Our work is organized around two key pillars:

1. **Research and Innovation:** A high-impact 2024 research portfolio (38 publications) driving the foundational R&D for next-generation industries and sustainable infrastructure.
2. **Operations and Industry Linkages:** Translating our research into tangible economic impact through industry funding and fostering a nascent innovation ecosystem.

This report details our 2024 accomplishments across these critical pillars.

Pillar 1: Research for Innovation (2024)



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 9.

Section 1.1: Enhancing Scientific Research & Fostering Innovation (Targets 9.5, 9.b)

Our most significant contribution in 2024 has been to Target 9.5 (Enhance scientific research). Our researchers are pioneering the materials and technologies that will define future industries.

- **Advanced R&D in Energy Technology:** We have produced a wealth of foundational research in clean energy generation, including innovation in solar (Shakil, J.A. et al.; Sifat,

M.I. et al.; Wasi, N.F. et al.), green hydrogen and fuel cells (Islam, F. et al.; Im, K. et al.), and novel energy harvesting materials (Rana, S.S. et al.; Islam, A.J. et al.).

- **Driving Green Technology & Innovation:** Our research provides blueprints for "green technology" in industrial processes (Ahmed, T. et al.) and analyzes the macroeconomic frameworks for green technology adoption (Voumik, L.C. et al.; Alam, M.B. et al.).

Section 1.2: Building Resilient & Sustainable Infrastructure (Targets 9.1, 9.a)

Our research directly supports the development of Target 9.1 (Quality, reliable, sustainable and resilient infrastructure).

- **Designing Future-Proof Infrastructure:** We are developing the blueprints for next-generation sustainable infrastructure, including using machine learning to identify optimal locations for EV charging stations (Ahmed, M. et al.) and frameworks for "Green Libraries" (Tanzin, M. et al.).
- **Enabling Resilient Infrastructure (Target 9.a):** We are producing the critical data and financial frameworks for infrastructure development. This includes resource prospecting for Concentrating Solar Power (Mia, M.S. et al.), climate data for resilient planning (Dia, R.B. et al.), and financial analysis of Green Bonds (Kumar, B. et al.).

Section 1.3: Promoting Sustainable & Efficient Industrialization (Targets 9.2, 9.4)

Our work promotes Target 9.4 (Upgrade industries to make them sustainable).

- **Greening Industrial Processes:** We are developing strategies to improve resource-use efficiency, including models for energy-efficient textile manufacturing (Tushar, S.R. et al.) and energy balance in agriculture (Deb, N.C. et al.).
- **Macroeconomic Analysis of Industrialization:** Our researchers are analyzing the complex interplay between industrialization, energy, economic growth, and environmental impact (Borsha, F.H. et al.; Raihan, A. et al.).

Pillar 2: Progress through University Operations and Industry Linkages

NSTU's operational strategy is focused on translating our deep research capabilities into tangible economic innovation and industrial partnerships.

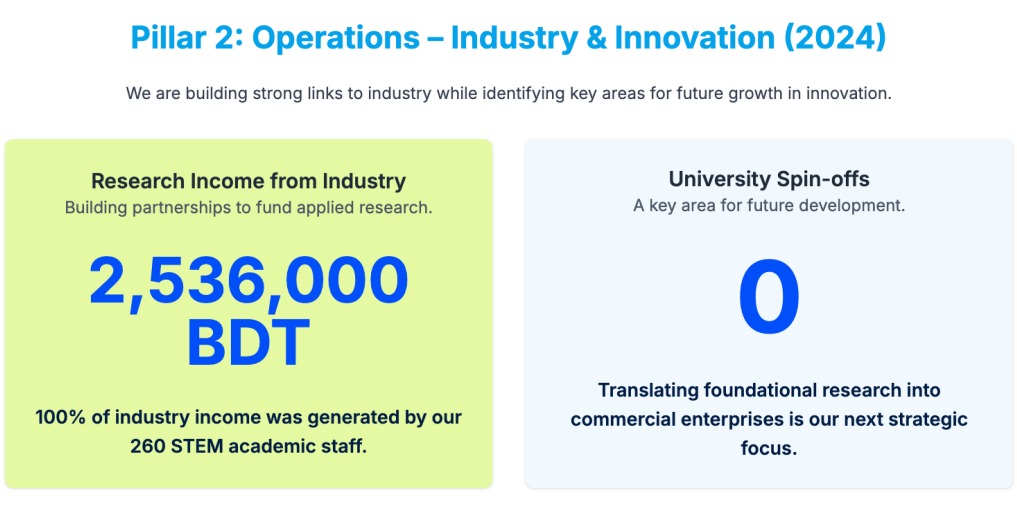
Section 2.1: Research Income from Industry (2024)

We are actively building partnerships with industry to fund applied research. In 2024, our university generated **2,536,000 BDT** in research income from industry and commerce.

- **100%** of this income (**2,536,000 BDT**) was generated by our **260 STEM academic staff** (out of a total 395 academic staff). This highlights our strength in applied science and engineering and demonstrates a strong, targeted link between our STEM research and industrial needs.

Section 2.2: University Spin-offs (2024)

In 2024, the number of active university spin-offs was **0**. While our research in innovation is strong, we recognize that translating this foundational research into new commercial enterprises is a key area for future development and strategic focus.



Conclusion

Noakhali Science and Technology University's 2024 contribution to SDG 9 is powerful. Our 38 publications demonstrate a comprehensive strategy, fostering innovation through foundational R&D in materials and energy, designing sustainable infrastructure, and providing frameworks for efficient industrialization. Operationally, our **2,536,000 BDT** in industry-funded research demonstrates a strong and growing link between our STEM faculty and the private sector. While we have laid the groundwork for innovation, our 2024 data (0 spin-offs) provides a clear benchmark to focus future efforts on commercializing our research and fostering a vibrant start-up ecosystem.

Appendix: SDG 9 Targeting 2024 Publications Referenced

1. Kaya, F., Voumik, L.C., Rashid, M., Kochański, K., Zimon, G. (2024). Energy choices to health outcomes: A multidimensional analysis of risk in BRICS via PMG-ARDL approach. *Plos One*.
2. Shakil, J.A., Saikat, S.P., Bhattacharjee, N., Uddin, J., Chowdhury, F.I. (2024). DFT/TD-DFT study of novel triphenylamine-based dyes with azo moieties and π-spacer variations for enhanced dye-sensitized solar cell performance. *Chemical Physics Impact*.
3. Ridwan, M.K., Akther, A., Al-Absy, M.S.M., Yağiş, O., Jaheer Mukthar, K.P. (2024). The Role of Tourism, Technological Innovation, and Globalization in Driving Energy Demand in Major Tourist Regions. *International Journal of Energy Economics and Policy*.
4. Islam, R., Abdur, R., Ashraful Alam, M., Islam, D., Jamal, M.S. (2024). Modulating Mn-doped NiO nanoparticles: structural, optical, and electrical property tailoring for enhanced hole transport layers. *Nanoscale Advances*.
5. Tahrim, F., Hasan, M.A., Akter, S.M.S., Das, M.K., Pattak, D.C. (2024). Impact of urbanization, economic growth, FDI, and trade openness on energy demand in Ireland: an ARDL approach. *Progress in Energy*.
6. 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*.

7. Islam, F., Ahsan, M., Islam, N., Maiyalagan, M.T., Hasnat, M.A. (2024). Recent Advancements in Ascribing Several Platinum Free Electrocatalysts Pertinent to Hydrogen Evolution from Water Reduction. *Chemistry an Asian Journal*.
8. Rahman, M., Hasan, K., Siddique, M.A.B., Tariq, S., Ibrahim, M.K. (2024). Particulate matter concentrations around natural gas-fired power plants and their associated health impact assessment. *Journal of King Saud University Science*.
9. Dia, R.B., Mallick, J., Aziz, T., Chu, R., ISLAM, A.R.M.T. (2024). Comparative Trend Variability Analysis of Reference Evapotranspiration in Bangladesh Using Multiple Trend Detection Approaches. *Theoretical and Applied Climatology*.
10. Tushar, S.R., Imtiazh, M.S.A., Noor, R.B., ISLAM, A.R.M.T., Kabir, M.M. (2024). An Intuitionistic fuzzy approach to modeling the drivers to promote Energy-Efficient textile Manufacturing: Implications for sustainable development. *Journal of King Saud University Science*.
11. Akther, T., Selim, M.M.I., Hossain, M.S., Kibria, M.G. (2024). Synergistic role of agriculture production, fertilizer use, tourism, and renewable energy on CO2 emissions in South Asia: A static and dynamic analysis. *Energy Nexus*.
12. Das, A., Im, K., Kabir, M.M., Shon, H., Nam, S.Y. (2024). Polybenzimidazole (PBI)-based membranes for fuel cell, water electrolysis and desalination. *Desalination*.
13. Deb, N.C., Basak, J.K., Paudel, B., Kang, M., Kim, H. (2024). Estimation of Energy Balance throughout the Growing–Finishing Stage of Pigs in an Experimental Pig Barn. *Agriculture Switzerland*.
14. Ahmed, T., Suzauddula, M., Akter, K., Hossen, M., Islam, M.N. (2024). Green Technology for Fungal Protein Extraction—A Review. *Separations*.
15. Raihan, A., Hasan, M.A., Voumik, L.C., Akter, S.M.S., Ridwan, M.K. (2024). Sustainability in Vietnam: Examining economic growth, energy, innovation, agriculture, and forests' impact on CO2 emissions. *World Development Sustainability*.
16. Voumik, L.C., Ghosh, S., Rashid, M., Esquivias, M.A., Rojas, O. (2024). The effect of geopolitical risk and green technology on load capacity factors in BRICS. *Utilities Policy*.
17. Rahman, M.M., Mohanty, A.K., Rahman, M.H. (2024). Renewable energy, forestry, economic growth, and demographic impact on carbon footprint in India: does forestry and renewable energy matter to reduce emission? *Journal of Environmental Studies and Sciences*.
18. Rana, S.S., Faruk, O., Robiul Islam, M., Zaman, K., Wang, Z.L. (2024). Recent advances in metal-organic framework-based self-powered sensors: A promising energy harvesting technology. *Coordination Chemistry Reviews*.
19. Borsha, F.H., Voumik, L.C., Rashid, M., Stępnicka, N., Zimon, G. (2m, N., Zimon, G. (2024). An Empirical Investigation of GDP, Industrialization, Population, Renewable Energy and CO2 Emission in Bangladesh: Bridging EKC-STIRPAT Models. *International Journal of Energy Economics and Policy*.

20. Rahman, A.A., Murad, S.M., Mohsin, A.K., Wang, X. (2024). Does renewable energy proactively contribute to mitigating carbon emissions in major fossil fuels consuming countries? *Journal of Cleaner Production*.

21. Rahman, M.H., Voumik, L.C., Rahman, M.M., Majumder, S.C. (2024). Scrutinizing the existence of the environmental Kuznets curve in the context of foreign direct investment, trade, and renewable energy in Bangladesh: impending from ARDL method. *Environment Development and Sustainability*.

22. Akter, M.M., Surovy, I.Z., Sultana, N., Nam, S.Y., Kabir, M.M. (2024). Techno-economics and environmental sustainability of agricultural biomass-based energy potential. *Applied Energy*.

23. Alam, M.B., Hossain, M.S. (2024). Investigating the connections between China's economic growth, use of renewable energy, and research and development concerning CO2 emissions: An ARDL Bound Test Approach. *Technological Forecasting and Social Change*.

24. Voumik, L.C., Islam, M.A., Nafi, S.M. (2024). Does tourism have an impact on carbon emissions in Asia? An application of fresh panel methodology. *Environment Development and Sustainability*.

25. Kundu, C.S., Adhikary, A., Ahsan, M.S., Murad, S.A., Ahmed, F. (2024). Design and analysis of performance parameters for achieving high efficient ITO/PEDOT:PSS/P3HT:PCBM/Al organic solar cell. *Journal of Optics India*.

26. Im, K., Park, M.J., Kabir, M.M., Shon, H., Nam, S.Y. (2024). Human urine electrolysis for simultaneous green hydrogen and liquid fertilizer production for a circular economy: A proof of concept. *Desalination*.

27. Ahmed, S., Rashid, M.A., Yaakob, S.B., Higa, H. (2024). MODELLING AND PERFORMANCE ANALYSIS OF HYBRID ELECTRICAL POWER GENERATION SYSTEM FOR CONDENSATE FRACTIONATION PLANT. *Engineering Review*.

28. Raihan, A., Voumik, L.C., Ridwan, M.K., Soseco, T., Ismail, N.A. (2024). Indonesia's Path to Sustainability: Exploring the Intersections of Ecological Footprint, Technology, Global Trade, Financial Development and Renewable Energy. *Studies in Systems Decision and Control*.

29. Kumar, B., Tiasha, A.M., Shah, A., Urbee, A.J. (2024). Green Bonds in Modern Portfolios: Risk-Return Dynamics. *Green Bonds and Sustainable Finance the Evolution of Portfolio Management in Conventional Markets*.

30. Raihan, A., Voumik, L.C., Zimon, G., Rashid, M., Akter, S. (2024). Prioritising sustainability: how economic growth, energy use, forest area, and globalization impact on greenhouse gas emissions and load capacity in Poland? *International Journal of Sustainable Energy*.

31. Tanzin, M., Hoq, K.M.G. (2024). Transforming the Dhaka University Library into a Green Library: Opportunities and Challenges. *Electronic Green Journal*.

32. Ahmed, M., Jaman, A., Islam, M.N., Shakib, M.S., Amin, I.K. (2024). Identifying Optimal EV Charging Station Locations: A Smart Grid and Machine Learning Approach. *13th International Conference on Electrical and Computer Engineering Icece 2024*.

33. Islam, A.J., Salehin, S., Ul Alam, S.U.I., Barua, N., Wasi, N.F. (2024). Implementation of a Wearable Piezoelectric Integrated Shoe Energy Harvester. *2024 IEEE International Conference on Biomedical Engineering Computer and Information Technology for Health Becithcon 2024*.

34. Sifat, M.I., Barua, A., Paul, S., Uddin, A., Risan, A.W. (2024). Design and Simulation of an InAlGaP/AlGaAs/Ge Triple Junction Solar Cell for Minimizing Thermalization Losses. *International Conference on Recent Progresses in Science Engineering and Technology Icrpset 2s.m.s 2024*.

35. Acharjee, K., Uddin, R., Barua, A. (2024). Performance Study of Hole Transport Layer-Free Cs2 TiBr6-Based Perovskite Solar Cell. *International Conference on Recent Progresses in Science Engineering and Technology Icrpset 2024*.

36. Mia, M.S., Hasan, M.I., Paul, S., Ul Alam, S.U.I., Dipto, A.P. (2024). Prospects of Solar Electricity from Concentrating Solar Power (CSP) in Bangladesh. *International Conference on Recent Progresses in Science Engineering and Technology Icrpset 2024*.

37. Al-Hysam, A., Eram, A.F., Ihsan, M.A., Nahar, L. (2024). Performance Enhancement of Single-Ended Primary-Inductor Converter for Low Power and Photovoltaic Applications. *2024 International Conference on Innovations in Science Engineering and Technology Innovative Technologies for Global Solutions Iciset 2024*.

38. Wasi, N.F., Kamaruzzaman, (2024). Evaluation of the Performance of Natural Dye-Sensitized Solar Cells Using Red Spinach and Henna: Combining Fabrication Insights with ML-Based Efficiency Predictions. *2024 International Conference on Innovations in Science Engineering and Technology Innovative Technologies for Global Solutions Iciset 2024*.

[Version 2.0, Updated]

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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 10 - Reduced Inequalities

Noakhali Science and Technology University

December 2024

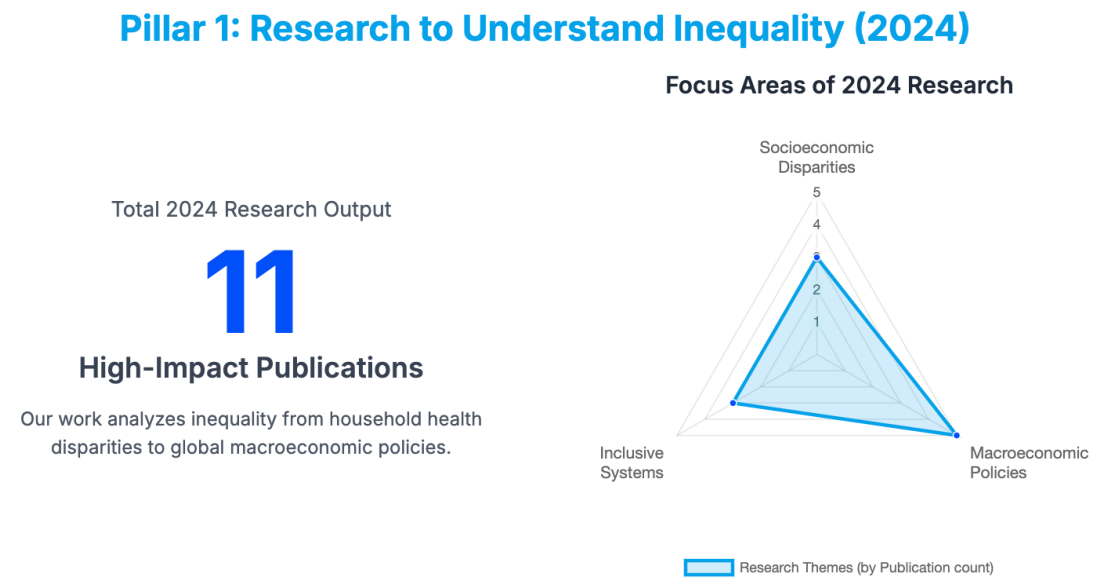
Introduction

Noakhali Science and Technology University (NSTU) is fully committed to Sustainable Development Goal 10: Reduce inequality within and among countries. We believe that sustainable development is only possible when its benefits are shared equitably. Our 2024 research agenda reflects this commitment by producing critical analysis on the drivers, outcomes, and solutions to inequality.

Our 2024 contribution demonstrates this commitment through a two-pillar strategy:

1. **Research and Innovation:** A high-impact 2024 research portfolio (11 publications) analyzing socioeconomic disparities, macroeconomic policies, and inclusive financial and educational structures.
2. **Operations and Community Engagement:** Ensuring equitable access and support for all underrepresented groups on campus through comprehensive policies, dedicated services, and measurable data.

This report details our 2024 accomplishments across these critical pillars.



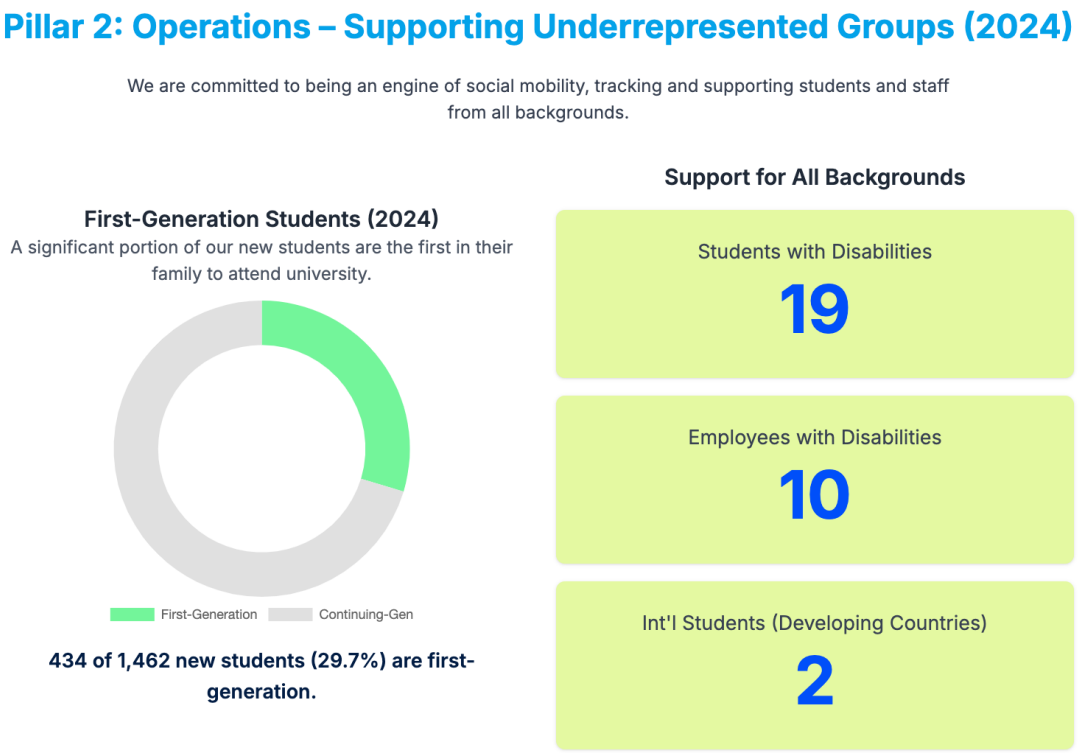
Pillar 1: Progress through Research and Innovation

Our 11 key publications in this area tackle inequality from the micro to the macro level, organized into three core areas.

Section 1.1: Analyzing Socioeconomic Disparities Within Countries (Targets 10.1, 10.2, 10.3)

Our research provides a strong evidence base on how inequality manifests at the household level, particularly in public health and food security.

- **Identifying Inequalities in Health Outcomes:** Two of our key studies directly link socioeconomic status to health crises. The work by Mondal, S. et al. establishes a clear association between socioeconomic inequalities and childhood malnutrition. Similarly, the study by Khudri, M.M. et al. explains how socioeconomic status and healthcare access are primary drivers of the "nutritional transition" among women.
- **Promoting Livelihood Solutions:** The study by Belal Hossain, M.B. et al. on homestead pond fish culture demonstrates how a low-cost intervention can improve household food security, providing a tangible pathway to enhance the economic resilience of households at the bottom of the income ladder (Target 10.1).



Section 1.2: Examining Macroeconomic Policies Among Countries (Targets 10.a, 10.b, 10.c)

A major focus of our research is on the financial flows and policies that shape inequality among nations.

- **Analyzing Financial Flows (FDI & Remittances):** The study by Jui, F.N. et al. provides a comparative analysis of the impact of remittances and FDI on GDP in South Asia, engaging with Target 10.c (remittances) and Target 10.b (FDI).
- **Investigating Trade, Globalization, and Development:** Our researchers have explored the impact of global trade and finance on emerging economies, including the role of FDI and trade in the context of the Environmental Kuznets Curve (Rahman, M.H. et al.) and the effect of exchange rate asymmetry on trade (Rahman, A.A. et al.).

Section 1.3: Promoting Inclusive Financial and Educational Structures (Targets 10.2, 10.5)

Our research also examines the domestic systems essential for building a more equitable society.

- **Strengthening Financial & Corporate Systems:** To promote Target 10.5 (improve regulation), our research provides crucial transparency. The work by Rakib, M.I. et al. analyzes financial networks in emerging markets, while Das, S.K. et al. investigates how corporate ownership affects sustainability reporting.
- **Leveraging Education for Economic Inclusion:** The research by Islam, M.S. et al. investigates the role of education human capital in the ICT-trade relationship, providing a blueprint for how nations can leverage education to participate equitably in the global digital economy.

Pillar 2: Progress through University Operations and Community Engagement

NSTU's operational strategy translates our research commitment into measurable outcomes and a campus environment dedicated to equity and inclusion for all underrepresented groups.

Section 2.1: Tracking and Supporting Underrepresented Students (2024 Data)

We systematically track and support the admission and success of students from diverse backgrounds.

- **First-Generation Students:** In 2024, **434 new students** (out of 1,462), or **29.7%**, were first-generation students.
- **Students with Disabilities:** A total of **19 students** with disabilities are **currently studying** at the university.
- **International Students (Developing Countries):** We have **2 international students** from developing countries.
- **Tracking and Recruitment:** We track admissions through the central GST system and implement planned actions to recruit from underrepresented groups via designated quotas for ethnic minorities, tribal communities, and government-certified disabled students.

Section 2.2: Comprehensive Anti-Discrimination Framework

NSTU has a formal "Anti-Discrimination & Anti-Harassment Policy" that prohibits all forms of discrimination and harassment based on gender, religion, ethnicity, disability, or socio-economic background.

- **Non-Discriminatory Admissions:** Our admissions policy is governed by the Noakhali Science and Technology University Act, 2001, which explicitly states the university is open to all persons, ensuring a non-discriminatory admissions process.
- **Safe Reporting:** The policy provides multiple confidential reporting channels (e.g., Proctor's Office, anonymous complaint boxes) and includes a robust anti-retaliation clause (Section 10) to protect all complainants and whistleblowers.

Section 2.3: Support for People with Disabilities

We provide comprehensive support to ensure an accessible and inclusive campus.

- **Accessible Facilities:** NSTU provides accessible facilities, including lifts in high-rise buildings, high-commode toilets, and priority transport services.

NSTU SOCIETY FOR DISABILITIES

NSTU SOCIETY FOR DISABILITIES

- **Support Services:** We provide dedicated support services through the student club **NSTU SHINE**, which assists students with various needs, including interpreters, note-takers, and daily necessities (during flood), as well as emotional support in times of distress (images attached above). Staff with disabilities are assigned to accessible offices.
- **Access Schemes:** We offer access schemes for students with disabilities, including targeted scholarships and tuition waivers, as highlighted at our events for the International Day of Persons with Disabilities (images attached above).

Section 2.4: Employees with Disabilities (2024 Data)

As of 2024, there are 10 employees with disabilities (out of 1,174) working at Noakhali Science and Technology University, who are provided with accessible workspaces and support.

Conclusion

Noakhali Science and Technology University's 2024 contribution to SDG 10 is comprehensive. Our research (11 publications) identifies key socioeconomic drivers of inequality in health and finance, while analyzing the macroeconomic policies that shape disparities between nations. Operationally,

we are actively fostering an inclusive campus, with **29.7% of our new students in 2024 being first-generation**. We back this with a strong anti-discrimination policy, accessible facilities, and dedicated support services like **NSTU SHINE** to ensure that all members of our community, including students and staff with disabilities, have the opportunity to thrive.

Appendix: SDG 10 Targeting 2024 Publications Referenced

1. Mondal, S., Wangdi, K., Gray, D.J., Kelly, M.J., Sarma, H. (2024). Associations between childhood malnutrition, socioeconomic inequalities and sanitation in the coastal regions of Bangladesh. *Discover Public Health*.
2. Ridwan, M.K., Akther, A., Al-Absy, M.S.M., Yağiş, O., Jaheer Mukthar, K.P. (2024). The Role of Tourism, Technological Innovation, and Globalization in Driving Energy Demand in Major Tourist Regions. *International Journal of Energy Economics and Policy*.
3. Khudri, M.M., Chowdhury, P.B., Hossain, S.M.R., Ahsan, K.Z. (2024). Explaining the role of socioeconomic, healthcare access and infrastructural shifts in nutritional transition among women in Bangladesh between 2004 and 2018. *Public Health*.
4. Jui, F.N., Hossain, M.J., Das, A., Sultana, N., Islam, M.K. (2024). Analyzing the impact of remittance, FDI and inflation rate on GDP: A comparative study of Bangladesh, Pakistan and Sri-Lanka using VAR and BEKK-GARCH approach. *Heliyon*.
5. Rakib, M.I., Alam, J., Akter, N., Tuhin, K.H., Nobi, A. (2024). Change in hierarchy of the financial networks: A study on firms of an emerging market in Bangladesh. *Plos One*.
6. Rahman, M.H., Voumik, L.C., Rahman, M.M., Majumder, S.C. (2024). Scrutinizing the existence of the environmental Kuznets curve in the context of foreign direct investment, trade, and renewable energy in Bangladesh: impending from ARDL method. *Environment Development and Sustainability*.
7. Belal Hossain, M.B., Pingki, F.H., Sultana, M., Paray, B.A., Arai, T. (2024). The contribution of homestead pond fish culture to household food security and dietary diversity in central coast of a developing country. *Heliyon*.
8. Das, S.K., Khalilur Rahman, M., Roy, S. (2024). Does ownership type affect sustainability reporting disclosure? Evidence from an emerging market. *International Journal of Disclosure and Governance*.
9. Rahman, A.A., Murad, S.M., Wang, X. (2024). Exchange rate asymmetry and its impact on bilateral trade: Evidence from BCIM-EC countries using N-ARDL approach. *Heliyon*.
10. Raihan, A., Voumik, L.C., Ridwan, M.K., Soseco, T., Ismail, N.A. (2024). Indonesia's Path to Sustainability: Exploring the Intersections of Ecological Footprint, Technology, Global Trade, Financial Development and Renewable Energy. *Studies in Systems Decision and Control*.
11. Islam, M.S., Haque, M.Z., Islam, S.N., Hassan, A., Alam, M.M. (2024). Role of education human capital in ICT-trade relationship. *International Journal of Education Economics and Development*.

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 11 - Sustainable Cities and Communities

Noakhali Science and Technology University

December 2024

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.

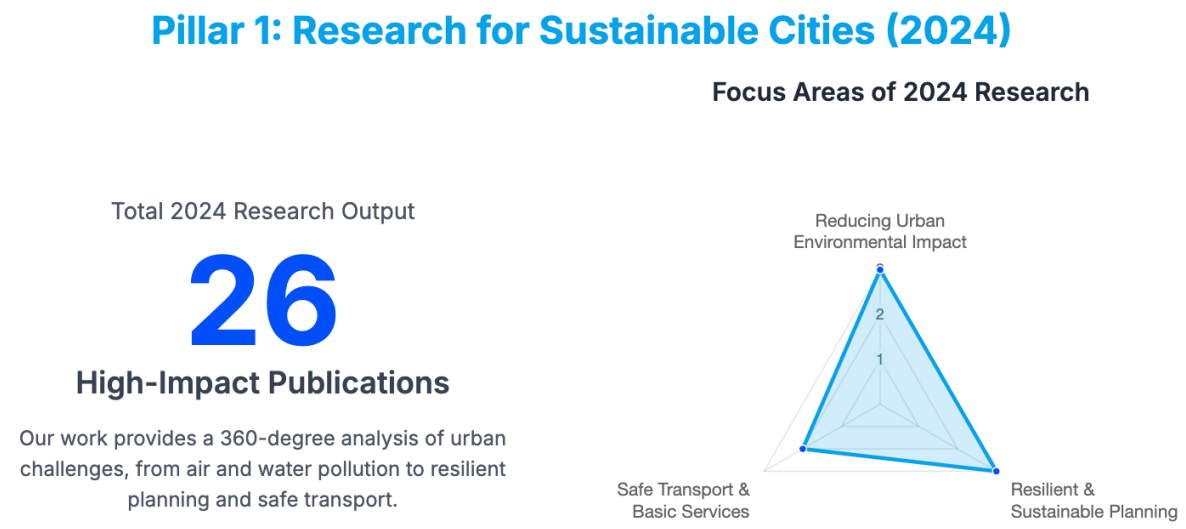
Our extensive 2024 research portfolio, featuring 26 high-impact publications, demonstrates a comprehensive, multi-disciplinary approach to this goal. Our work is organized around two key pillars:

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*.

9. Rahman, M., Chaity, I.J., Hossain, M.I.S., Siddique, M.A.M. (2024). Surface water pollution by some heavy metals in a remote island, Hatiya, northern Bay of Bengal. *Journal of Trace Elements and Minerals*.

10. Ridwan, M.K., Urbee, A.J., Voumik, L.C., Rashid, M., Esquivias, M.A. (2024). Investigating the environmental Kuznets curve hypothesis with urbanization, industrialization, and service sector for six South Asian Countries: Fresh evidence from Driscoll Kraay standard error. *Research in Globalization*.

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*.

17. Hossain, M.J., Sultana, N., Das, A., Rahman, M.M., Rahman, M.M. (2m, A., Rahman, M.M., Rahman, M.M. (2024). Analysis of effects of meteorological variables on dengue incidence in Bangladesh using VAR and Granger causality approach. *Frontiers in Public Health*.

18. Haque, M.R., Tusar, M.K., Mou, M.A., Rahaman, M.S. (2024). Assessment of LULC change and its impact on Surface Runoff using SCS-CN method for Noakhali Region, Bangladesh. *Present Environment and Sustainable Development*.

19. Belal Hossain, M.B., Yu, J.J., Sarker, P.K., Paray, B.A., Arai, T. (2024). Microplastic accumulation, morpho-polymer characterization, and dietary exposure in urban tap water of a developing nation. *Frontiers in Sustainable Food Systems*.

20. Paray, B.A., Yu, J.J., Sultana, S., Li, Y., Belal Hossain, M.B. (2024). Contamination, morphological and chemical characterization, and hazard risk analyses of microplastics in drinking water sourced from groundwater in a developing nation. *Frontiers in Environmental Science*.

21. Miah, M.M., Chakma, B., Hossain, K. (2024). Analyzing the Prevalence of and Factors Associated with Road Traffic Crashes (RTCs) among Motorcyclists in Bangladesh. *Scientific World Journal*.

22. Islam, M.S., Rony, M.A.T., Safran, M.S., Alfarhood, S., Che, D. (2024). Elevating Driver Behavior Understanding With RKnD: A Novel Probabilistic Feature Engineering Approach. *IEEE Access*.

23. Rakib, M.R.J., Sarker, A., Mejjad, N., Sharma, P., Idris, A.M. (2024). Spatiotemporal distribution, trophic transfer, and research uncertainty of heavy metals in a subtropical highly polluted Buriganga River: A critical review. *Regional Studies in Marine Science*.

24. Kubra, K., Mondol, A.H., Ali, M.M., Siddique, M.A.B., ISLAM, A.R.M.T. (2024). Assessment of As, Cr, Cd, and Pb in urban surface water from a subtropical river: contamination, sources, and human health risk. *International Journal of Environmental Analytical Chemistry*.

25. Ali, M.E., Shil, P., Shakib, M.S., Baten, M.A., Mayoa, F. (2024). A Comparative Analysis of Rainfall Forecasting in Cox's Bazar using SARIMA, LSTM and GRU. *2024 27th International Conference on Computer and Information Technology Iccit 2024 Proceedings*.

26. Azad, A.K., Atkison, T., Shah, A.F. (2024). A Review on Machine Learning in Intelligent Transportation Systems Applications. *Open Transportation Journal*.

NOAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 12 - Responsible Consumption and Production

Noakhali Science and Technology University

December 2024

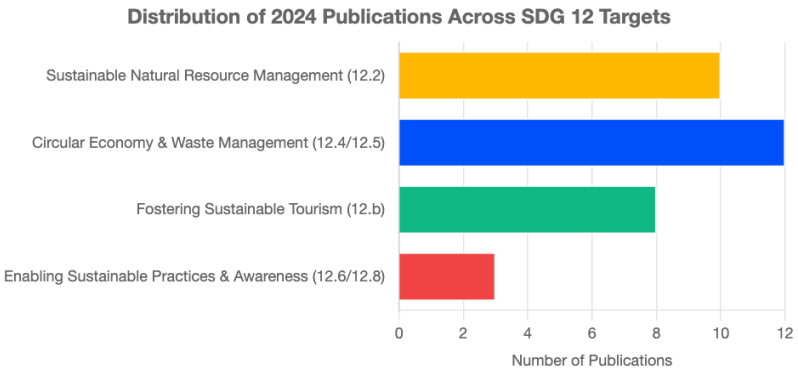
Introduction

Our institution is fully dedicated to advancing SDG 12: Ensure sustainable consumption and production patterns. This goal is central to decoupling economic growth from environmental degradation. We believe rigorous research and responsible institutional operations are essential to create the circular economy models, waste management systems, and resource efficiency policies needed for a sustainable future. Our strategy focuses on generating high-impact research (Pillar 1) across the lifecycle of consumption, and implementing accountable operational policies (Pillar 2) that model sustainable practices for our community.

Pillar 1: Progress through Research and Innovation (33 Publications)

Our 2024 research portfolio features 33 high-impact publications, demonstrating a comprehensive and deep commitment across the critical facets of SDG 12.

2024 Research Portfolio: 33 High-Impact Publications



Key Research Focus Areas:

- Circular Economy: Waste-to-Value Innovation, Microplastic Monitoring.
- Resource Management:Energy Efficiency, Sustainable Agriculture, Fintech & Resource Deployment.
- Sustainable Tourism: Monitoring Environmental Impact (Carbon, Energy Demand).
- Corporate Accountability: Sustainability Reporting & Green Finance.

33

Total Publications

A. Promoting Sustainable Natural Resource Management (Target 12.2)

Research in this area focuses on improving the efficient and sustainable use of energy, land, and natural resources across key economic sectors.

- **Resource Efficiency in Industry:** Our studies provide clear pathways for efficiency, including analyzing energy efficiency and waste reduction in economies like Japan (Onwe et al.), and promoting energy-efficient practices in textile manufacturing (Tushar et al.). We also assessed the impact of technology on optimizing energy utilization (Ridzuan et al.).

- **Sustainable Agriculture and Food Production:** We are developing methods for environmentally responsible food systems. Key works include research on climate-adaptive strategies for agricultural resilience (Al Mamun et al.), analyzing the environmental impact of fertilizer use (Akther et al.), and improving the efficiency of sustainable aquaculture through induced breeding (Yasmin et al.).
- **Macroeconomic Resource Analysis:** Our researchers are analyzing the frameworks for sustainable resource deployment, including the role of Fintech (Raihan et al.) and exploring the links between resource use, ecological footprints, and economic growth in nations like Vietnam and Indonesia (Raihan et al.).

B. Advancing the Circular Economy and Waste Management (Targets 12.4, 12.5)

This cluster focuses on the environmentally sound management of chemicals and wastes (Target 12.4) and substantially reducing waste generation (Target 12.5).

- **Monitoring Waste and Chemical Pollution:** We are leaders in identifying and tracking pollution. This includes critical reviews of heavy metal contamination in food webs (Rakib et al.) and urban surface water (Kubra et al.). We have a particularly strong focus on monitoring microplastic pollution in prawns (Rabari et al.), urban tap water (Belal Hossain et al.), and groundwater (Paray et al.).
- **Waste-to-Value Innovation:** Our research is pioneering the circular economy by turning waste into high-value products. Key studies include the sustainable synthesis of nano-fertilizer from solid marine wastes (Alam et al.) and developing value-added metal nanoparticles from waste (Narwal et al.).
- **Waste Management Policy and Technology:** We are developing solutions for better waste management, including analyzing policy responses to global disruptions (Hossain et al.) and developing advanced deep learning models for waste classification (Ayman et al.).

C. Fostering Sustainable Practices and Awareness (Targets 12.6, 12.8, 12.b)

This theme covers research on sustainable tourism, corporate accountability, and public frameworks for responsible consumption.

- **Sustainable Tourism (Target 12.b):** We provide the data and frameworks for a responsible tourism industry. Our research analyzes green tourism sustainability (Tafsirun et al.) and monitors the industry's environmental impact, including its effect on carbon emissions in Asia (Voumik et al.) and Eastern Africa (Chowdhury et al.).
- **Corporate Accountability (Target 12.6) and Finance:** We promote transparency through critical analysis of sustainability reporting disclosure in emerging markets (Das et al.) and research the necessary financial instruments, such as Green Bonds, to fund the transition to a sustainable economy (Kumar et al.).
- **Public Awareness (Target 12.8):** Our work promotes sustainable lifestyles by providing models for public institutions. The study by Tanzin et al. provides a framework for transforming a university library into a "Green Library," serving as a powerful, public-facing model of sustainable practices.

Pillar 2: Progress through Institutional Operations and Modeling

Our operational policies ensure that the university practices what it researches, embodying responsible consumption and production patterns.

A. Sustainable Procurement and Use Minimization

Practice Area	Status	Policy/Practice	Target Alignment
Ethical & Sustainable Sourcing (12.2.1)	Awaiting final approval	We have a Sustainable Procurement Strategy to embed ESG (Environmental, Social, and Governance) considerations into all purchase decisions, ensuring positive outcomes and ethical supply chains.	12.7
Minimization of Plastics (12.2.5)	Awaiting final approval	An institution-wide strategy is in place to minimize single-use plastics, promoting reusable, compostable, and refillable alternatives across campus. Student clubs actively support this (image attached).	12.8
Reduction of Disposables (12.2.6)	Awaiting final approval	Active reduction of disposable items (paper cups, towels, and excess printing) by adopting digital-first practices and following green event guidelines.	12.8
Supply Chain Compliance (12.2.7, 12.2.8)	Awaiting final approval	All outsourced services (catering, cleaning, and maintenance) are required to comply with our pilot waste minimization and waste management policies. Suppliers of equipment, stationery, and building contractors are actively encouraged to comply.	12.6, 12.7

B. Waste Management and Reporting

Indicator	Status	Key Action and Impact	Target Alignment
Hazardous Waste Disposal (12.2.3)	Awaiting final approval	A pilot policy and process are in place for the safe identification, segregation, storage, and vendor disposal of all hazardous materials, ensuring environmentally sound management.	12.4

Waste Measurement & Tracking (12.2.4, 12.3.1)	Awaiting final approval	The University is trialling a new system to measure all waste streams and track volumes sent to landfill versus recycled. Currently, we use approximate estimates, but the new system will enable accurate tracking in the near future.	12.5
Sustainability Reporting (12.4.1)	Annual	We publish a sustainability report annually, detailing the university's ongoing activities, performance, research, and initiatives related to environmental and social sustainability, promoting corporate and institutional transparency.	12.6

Conclusion

Our 33 publications in 2024, coupled with a rigorous overhaul of our institutional operations, demonstrate a deep, multifaceted, and practical commitment to SDG 12. We have produced a comprehensive body of work that addresses every major facet of this goal: from macro-level analysis of resource efficiency and sustainable tourism, to the micro-level development of waste-to-value technologies and the critical monitoring of microplastic pollution. Operationally, the development of a Sustainable Procurement Strategy and the creation of comprehensive policies for hazardous waste and digital waste tracking—all currently awaiting final approval—showcase our dedication to modeling responsible consumption. The annual publication of our sustainability report ensures accountability and transparency in our journey toward a circular, sustainable economy. We remain committed to scaling these efforts in both research excellence and institutional practice to further our impact on global responsible consumption and production patterns.

Appendix: SDG 12 Targeting 2024 Publications Referenced

1. Howlader, M., Shuvo, S.N.A., Selim, A., Fahad, A.A., Rahman, M.M. (2024). Abundance and distribution of anthropogenic marine litter on the beaches of Sonadia Island: An Ecologically Critical Area. *Regional Studies in Marine Science*.

2. Aspy, N.N., Voumik, L.C., Esquivias, M.A., Das, M.K., Pattak, D.C. (2024).[4] Impact of tourism, globalization, and technological patents on ecological footprint in ASEAN countries: static and dynamic panel regression approaches. *Discover Sustainability*.
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.5 Discover Sustainability.
4. Raihan, A., Guneysu Atasoy, F., Coskun, M.B., Atasoy, M., Yer, H. (2024). Fintech adoption and sustainable deployment of natural resources: Evidence from mineral management in Brazil.6 Resources Policy.
5. Rakib, M.R.J., Sarker, A., Nahida, Z.T., Kumar, R., Malafaia, G. (2024).7 A critical review on heavy metal contamination in aquatic food webs by edible fish species: a special case concerning Bangladesh.8 Environmental Monitoring and Assessment.
6. 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.
7. Ridwan, M.K., Akther, A., Al-Absy, M.S.M., Yağiş, O., Jaheer Mukthar, K.P. (2024). The Role of Tourism, Technological Innovation, and Globalization in Driving Energy Demand in Major Tourist Regions. International Journal of Energy Economics and Policy.
8. Tafsirun, U., Farhana, A., Alam, M.F.E., Castanho, R.A. (2024). Green tourism sustainability and its impact on green environment achievement. Cultural Gastronomy and Adventure Tourism Development.
9. Alam, M.K., Sahadat Hossain, M., Islam, M.S., Bahadur, N.M., Ahmed, S. (2024). Sustainable synthesis and characterization of nano-triple superphosphate from solid marine wastes. Materials Advances.
10. Tushar, S.R., Imtiazh, M.S.A., Noor, R.B., ISLAM, A.R.M.T., Kabir, M.M. (2024). An Intuitionistic fuzzy approach to modeling the drivers to promote Energy-Efficient textile Manufacturing: Implications for sustainable development. Journal of King Saud University Science.
11. Akther, T., Selim, M.M.I., Hossain, M.S., Kibria, M.G. (2024). Synergistic role of agriculture production, fertilizer use, tourism, and renewable energy on CO2 emissions in South Asia: A static and dynamic analysis. Energy Nexus.
12. Al Mamun, M.A., Li, J., Cui, A., Chowdhury, R., Hossain, M.L. (2024). Climate-adaptive strategies for enhancing agricultural resilience in southeastern coastal Bangladesh: Insights from farmers and stakeholders. Plos One.
13. Raihan, A., Hasan, M.A., Voumik, L.C., Akter, S.M.S., Ridwan, M.K. (2024). Sustainability in Vietnam: Examining economic growth, energy, innovation, agriculture, and forests' impact on CO2 emissions. World Development Sustainability.
14. Voumik, L.C., Islam, M.A., Nafi, S.M. (2024). Does tourism have an impact on carbon emissions in Asia? An application of fresh panel methodology. Environment Development and Sustainability.
15. Deb, S.K., Nafi, S.M., Valeri, M. (2024). Promoting tourism business through digital marketing in the new normal era: a sustainable approach.10 European Journal of Innovation Management.

16. Rabari, V., Rakib, M.R.J., Patel, H.V., Malafaia, G., Trivedi, J.N. (2024). Microplastic prevalence in epipelagic layer: Evidence from epipelagic inhabiting prawns of north-west Arabian Sea. Marine Pollution Bulletin.
17. Das, S.K., Khalilur Rahman, M., Roy, S. (2024).11 Does ownership type affect sustainability reporting disclosure? Evidence from an emerging market. International Journal of Disclosure and Governance.
18. 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.
19. Iqbal, M.A., Siddiqua, S.A., Faruk, M.O., ISLAM, A.R.M.T., Salam, M.A. (2024). Systematic review and meta-analysis of the potential threats to respiratory health from microbial Bioaerosol exposures.12 Environmental Pollution.
20. Yasmin, R., Rahman, M.M., Chakraborty, S., Arai, T., Hossain, M.B. (2024). Comparative evaluation of the efficacy of three GnRH analogues in induced breeding of stinging catfish, Heteropneustes fossilis under hatchery conditions.13 Frontiers in Sustainable Food Systems.
21. Raihan, A., Voumik, L.C., Ridwan, M.K., Soseco, T., Ismail, N.A. (2024). Indonesia's Path to Sustainability: Exploring the Intersections of Ecological Footprint, Technology, Global Trade, Financial Development and Renewable Energy. Studies in Systems Decision and Control.
22. Chowdhury, T.S., Mawa, M.J., Islam, R.U., Uddin, I., Rahman, M.H. (2m, R.U., Uddin, I., Rahman, M.H. (2024). Nature and cause of CO2 emission in Eastern Africa: Role of tourism and afforestation towards reduce CO2 emission. Social Sciences and Humanities Open.
23. Kumar, B., Tiasha, A.M., Shah, A., Urbee, A.J. (2024).14 Green Bonds in Modern Portfolios: Risk-Return Dynamics. Green Bonds and Sustainable Finance the Evolution of Portfolio Management in Conventional Markets.
24. Tanzin, M., Hoq, K.M.G. (2024). Transforming the Dhaka University Library into a Green Library: Opportunities and Challenges.15 Electronic Green Journal.
25. Belal Hossain, M.B., Yu, J.J., Sarker, P.K., Paray, B.A., Arai, T. (2024). Microplastic accumulation, morpho-polymer characterization, and dietary exposure in urban tap water of a developing nation. Frontiers in Sustainable Food Systems.
26. Paray, B.A., Yu, J.J., Sultana, S., Li, Y., Belal Hossain, M.B. (2024). Contamination, morphological and chemical characterization, and hazard risk analyses of microplastics in drinking water sourced from groundwater in a developing nation. Frontiers in Environmental Science.
27. Narwal, N., Katyal, D., Malik, A., Rakib, M.R.J., Kakakhel, M.A. (2024). Sustainable advances in the synthesis of waste-derived value-added metal nanoparticles and their applications.16 Green and Sustainable Approaches Using Wastes for the Production of Multifunctional Nanomaterials.
28. Ridzuan, A.R., Abd Rahman, N.H., Keshminder, J.S., Voumik, L.C., Ali, M. (2024). Assessing the Impact of Technology Advancement and Foreign Direct Investment on Energy Utilization in Malaysia: An Empirical Exploration with Boundary Estimation. Lecture Notes in Networks and Systems.

29. Deb, S.K., Kuri, B.C., Nafi, S.M. (2024).17 Application of Knowledge Management in Tourism and Hospitality Industry: A Sustainable Approach. Contributions to Management Science.
30. Hossain, M.A., Ferdous, N., Ferdous, E. (2024).18 Crisis-driven disruptions in global waste management: Impacts, challenges and policy responses amid COVID-19, Russia-Ukraine war, climate change, and colossal food waste.19 Environmental Challenges.
31. Rahman, M.H., Voumik, L.C., Nafi, S.M., Zimon, G. (2024). Effects of tourism and other macroeconomic variables on women's employment in agricultural, industry and service sectors: evidence from African countries. Current Issues in Tourism.
32. Kubra, K., Mondol, A.H., Ali, M.M., Siddique, M.A.B., ISLAM, A.R.M.T. (2024). Assessment of As, Cr, Cd, and Pb in urban surface water from a subtropical river: contamination, sources, and human health risk. International Journal of Environmental Analytical Chemistry.
33. Ayman, U., Rahim, M.A., Haque, I.A., Saha, D., Rahat, M.A.M. (2024). EfficientNet-Based Deep Learning Model for Advanced Waste Classification. 2024 27th International Conference on Computer and Information Technology Iccit 2024 Proceedings.

NOAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 13 - Climate Action

Noakhali Science and Technology University

December 2024

Introduction: A Deep Commitment to Climate Action

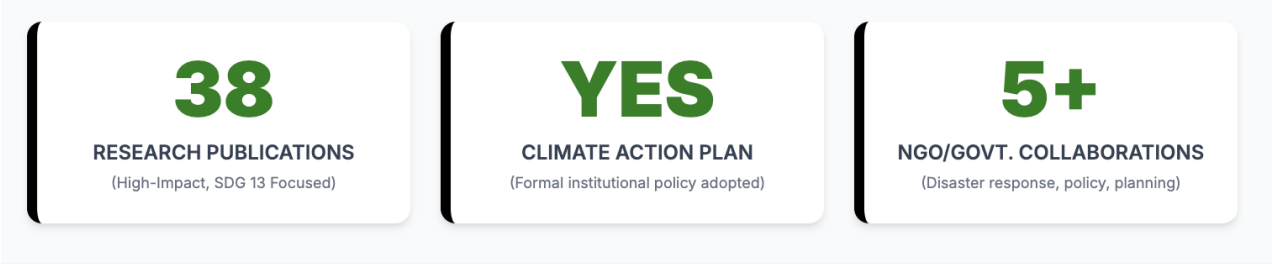
Our institution is unequivocally committed to Sustainable Development Goal 13: Take urgent action to combat climate change and its impacts. We recognize climate change as the defining challenge of our time, one that intersects with every other aspect of sustainable development.

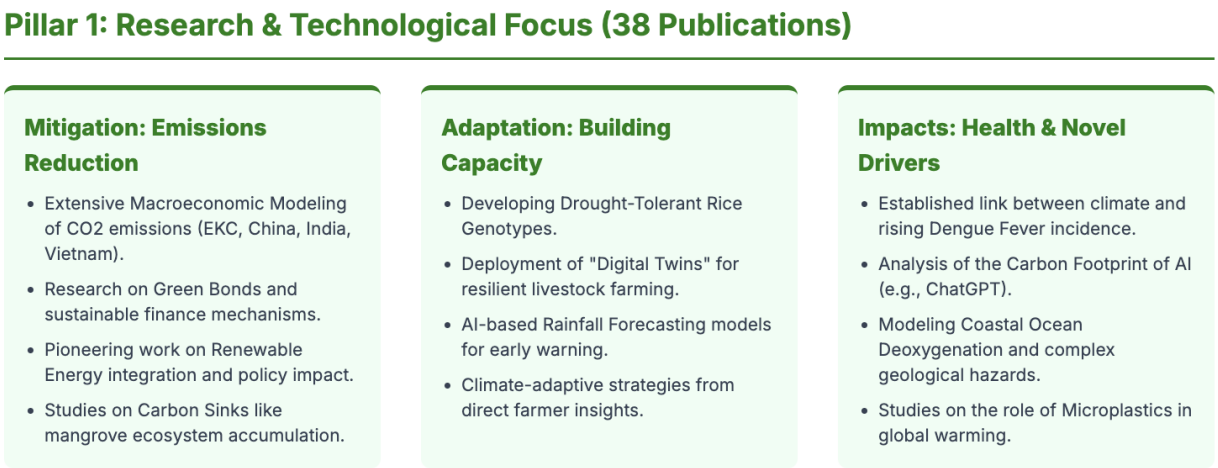
Our extensive 2024 research portfolio, featuring **38 high-impact publications**, demonstrates a comprehensive and robust strategy to address this goal. Our work is organized around three core pillars that directly align with the targets of SDG 13:

- **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.





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.), Indonesia (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.

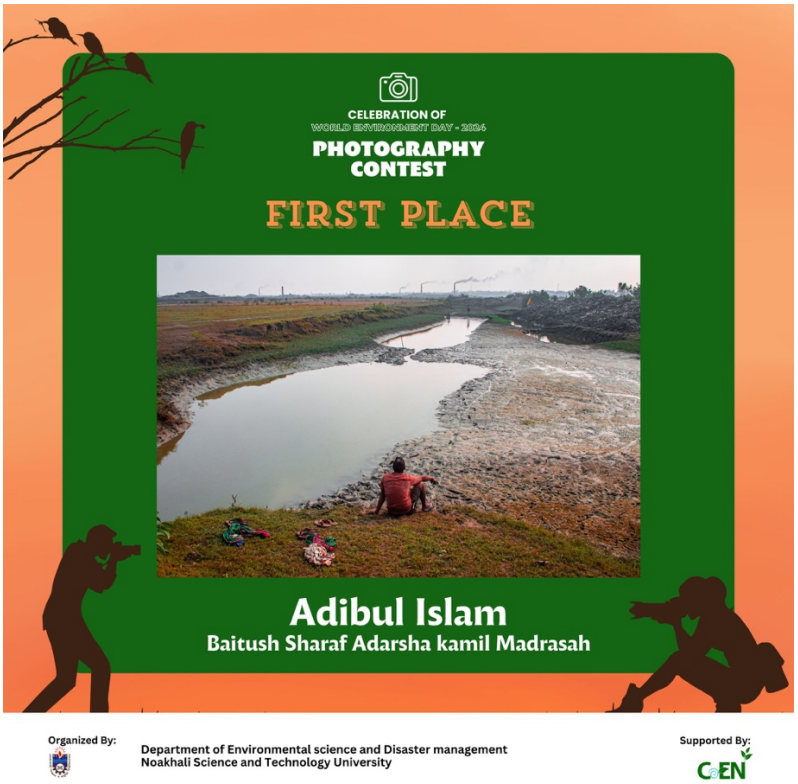
Pillar 2: Progress through Institutional Operations and Modeling

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 Environ (CPE), on climate adaptation projects.



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*.
3. Raihan, A., Rahman, J., Tanchangya, T., Ridwan, M.K., Bari, A.B. (2024). Influences of economy, energy, finance, and natural resources on carbon emissions in Bangladesh. Carbon Research.
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.
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7. Hossain, M.M., Sultana, F., Khan, S., Tran, L.S.P., Mostofa, M.G. (2024). Carrageenans as biostimulants and bio-elicitors: plant growth and defense responses. Stress Biology.
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.
9. Akther, T., Selim, M.M.I., Hossain, M.S., Kibria, M.G. (2024). Synergistic role of agriculture production, fertilizer use, tourism, and renewable energy on CO2 emissions in South Asia: A static and dynamic analysis. Energy Nexus.
10. Al Mamun, M.A., Li, J., Cui, A., Chowdhury, R., Hossain, M.L. (2024). Climate-adaptive strategies for enhancing agricultural resilience in southeastern coastal Bangladesh: Insights from farmers and stakeholders. Plos One.
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trade, and renewable energy in Bangladesh: impending from ARDL method. Environment Development and Sustainability.

19. Akter, M.M., Surovy, I.Z., Sultana, N., Nam, S.Y., Kabir, M.M. (2024). Techno-economics and environmental sustainability of agricultural biomass-based energy potential. Applied Energy.
20. Alam, M.B., Hossain, M.S. (2024). Investigating the connections between China's economic growth, use of renewable energy, and research and development concerning CO2 emissions: An ARDL Bound Test Approach. Technological Forecasting and Social Change.
21. Voumik, L.C., Islam, M.A., Nafi, S.M. (2024). Does tourism have an impact on carbon emissions in Asia? An application of fresh panel methodology. Environment Development and Sustainability.
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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 14 - Life Below Water

Noakhali Science and Technology University

December 2024

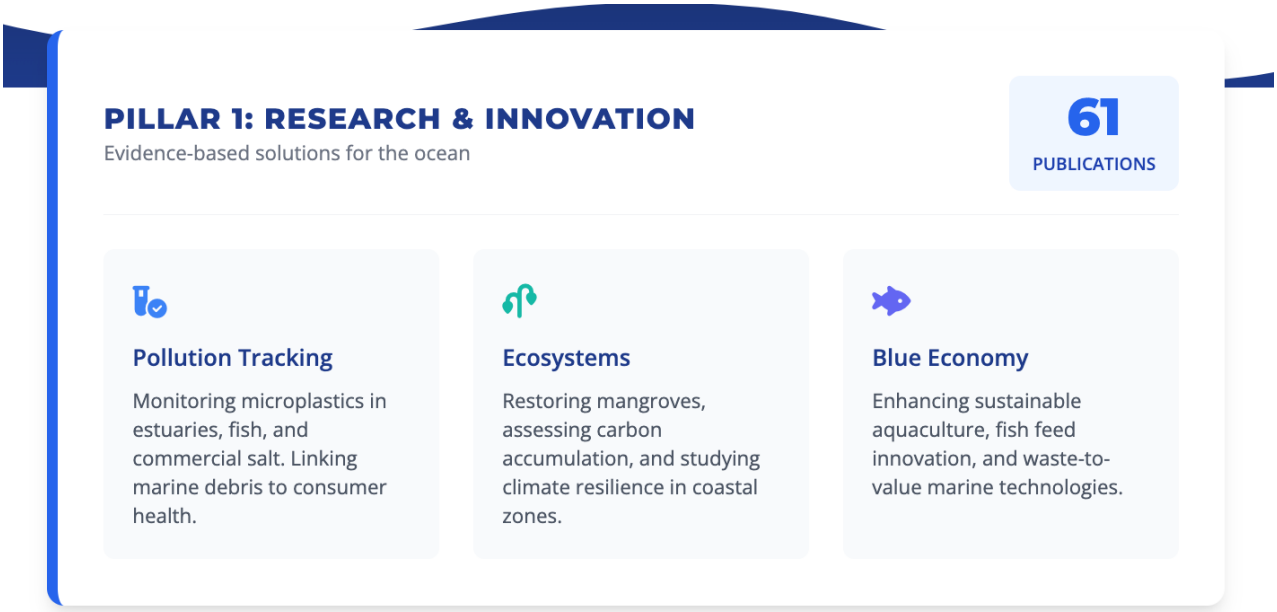
Introduction

Noakhali Science and Technology University (NSTU) is deeply committed to Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development. We recognize the critical importance of marine and coastal ecosystems to global health, climate regulation, and economic prosperity.

Our 2024 contributions demonstrate a profound engagement with this goal, organized around two key pillars:

- **Research and Innovation:** Tackling challenges from molecular-level pollution (microplastics) to large-scale ecosystem management and sustainable fisheries.
- **Operations and Community Engagement:** Implementing rigorous campus pollution controls, protecting local biodiversity sanctuaries, and empowering coastal communities through education.

This report details our key 2024 accomplishments supporting the targets of SDG 14.



Pillar 1: Progress through Research and Innovation

Our 2024 research portfolio, featuring 61 high-impact publications, provides the evidence base to understand and improve marine sustainability.

Section 1.1: Combating Marine Pollution (Target 14.1)

A massive component of our research is dedicated to preventing and reducing marine pollution, with a major focus on microplastics (MP).

- **Microplastics Monitoring:** The study by Banik et al. leads our tracking efforts by quantifying MPs in estuaries, while Fardullah et al. and Rabari et al. have assessed water,

sediments, and the epipelagic layer. Crucially, our researchers are tracking MPs moving up the food chain, from copepods (Khan et al.) to farmed tilapia (Siddique et al.) and commercial fish species (Sultana et al.; Belal Hossain et al.).

- **Impact on Consumers:** Linking pollution to human consumption, Siddique et al. and Md Saad et al. identified significant MP contamination in sea salt, while Paray et al. investigated drinking water. De-la-Torre et al. analyzed the release of MPs from face masks, directly connecting public health measures to marine outcomes.
- **Chemical and Litter Analysis:** Beyond plastics, Lipi et al. assessed heavy metal contamination from shipbreaking, and Rakib et al. tracked metals in fish feed. Howlader et al. provided critical assessments of anthropogenic litter on ecologically critical beaches.

Section 1.2: Protecting and Restoring Marine & Coastal Ecosystems (Targets 14.2, 14.3)

We are actively researching the health, management, and resilience of vital coastal ecosystems.

- **Ecosystem Management:** Supporting Target 14.2, Md Monzer Hossain et al. quantified the ecosystem services of the Sundarbans, while Ahmed et al. measured carbon accumulation in mangroves. Jannah et al. assessed the impact of tidal barriers on benthic communities, providing data for sustainable infrastructure.
- **Climate Change Resilience:** Addressing Target 14.3, Bhuiyan et al. investigated ocean oxygen declination, and Rahman et al. studied the effect of elevated temperatures on fish health. Mahmud et al. and Al Mamun et al. are developing adaptation strategies, such as mitigating salt stress in seedlings and promoting climate-adaptive agriculture for coastal communities.
- **Restoration Strategies:** Tanjin et al. demonstrated the use of aquatic plants for phytoremediation of heavy metals, and Haque et al. showed how artificially induced habitat complexity can successfully restore macroinvertebrate diversity.

Section 1.3: Promoting Sustainable Fisheries, Aquaculture, and Blue Economy (Targets 14.4, 14.7, 14.a)

Our R&D ensures the long-term viability of marine resources for food and economic benefit.

- Sustainable Fisheries: Supporting Target 14.4, Dipty et al. and Al Nahid et al. provided essential biodiversity assessments and larval fish assemblage data. Palash et al. and Sarker et al. conducted detailed fishery biology studies of key commercial species to inform stock management.
- **Sustainable Aquaculture:** Paul et al. and Yasmin et al. advanced induced breeding techniques to reduce pressure on wild stocks. Akter et al. developed sustainable plant-based fish feed, while Shazada et al. focused on genetic resource conservation via sperm storage.
- **Blue Economy:** Hossain et al. provided a high-level analysis of the sustainable blue economy. Dey et al. analyzed consumer willingness to pay for safer fish, and Kawsar et al. pioneered waste-to-value pathways by synthesizing nano-plaster from waste marine shells, contributing to a marine circular economy.

Pillar 2: Progress through University Operations and Community Engagement

NSTU's operational strategy focuses on stewardship, direct conservation, and community empowerment. We have translated our research findings into tangible on-the-ground actions that engage our students, faculty, and the broader coastal community.

Section 2.1: Empowering Communities and Sustainable Livelihoods

We serve as a vital hub for knowledge transfer, actively extending our expertise to help local populations manage aquatic resources sustainably.

- **Aquaculture Training and Livelihood Support:** The Department of Fisheries has taken direct action to support coastal farmers. A notable initiative involved a specialized training programme in Cox's Bazar, where 60 farmers were trained on using crab supplement feed. By transferring this technical knowledge, we are not only boosting local production but also securing livelihoods and promoting sustainable aquaculture practices that reduce pressure on wild stocks.
- **Water Conservation Outreach:** Recognizing the scarcity of fresh water, NSTU offers free educational programmes for the community. This includes hands-on workshops on rainwater harvesting, where community participants are taught practical methods to conserve water. These efforts demonstrate our active role in promoting sustainable water management beyond the university campus.
- **Combating Overfishing:** Our faculty members are on the front lines of national conservation efforts. Experts from the Department of Fisheries and Marine Science have served as key advisors in the government's "Gravid Hilsa Conservation Programme." By educating local fishing communities on the critical importance of protecting threatened fish populations during breeding seasons, we actively contribute to the fight against illegal, unreported, and unregulated (IUU) fishing (image attached below, left side).

Section 2.2: Sustainable Campus Operations

NSTU recognizes that ocean conservation begins on land. We have implemented robust, adaptive policies to minimize our ecological footprint and prevent land-based pollution from reaching marine environments.

- **Water Quality Standards:** The university has formally adopted a *Water Management and Sustainability Policy*, with full activation scheduled for 2026. We are currently in a trial

phase to test and refine our procedures. During this period, we are piloting protocols for the pre-treatment of laboratory wastewater, establishing water quality testing routines, and developing guidelines for the safe disposal of hazardous chemicals. We are also evaluating drainage system maintenance needs to better prevent pollution of nearby wetlands. This adaptive phase (2024–2026) ensures that we can identify and resolve operational challenges before the policy becomes fully mandatory.

- **Action Against Plastic Pollution:** To combat the global crisis of marine debris, NSTU has launched a campus-wide action plan to reduce plastic waste. This initiative includes restrictions on single-use plastics, the promotion of reusable alternatives, and active collaboration with campus canteens to minimize packaging waste. These operational measures are supported by student-led awareness campaigns, ensuring a culture of sustainability that prevents plastic from entering local waterways.

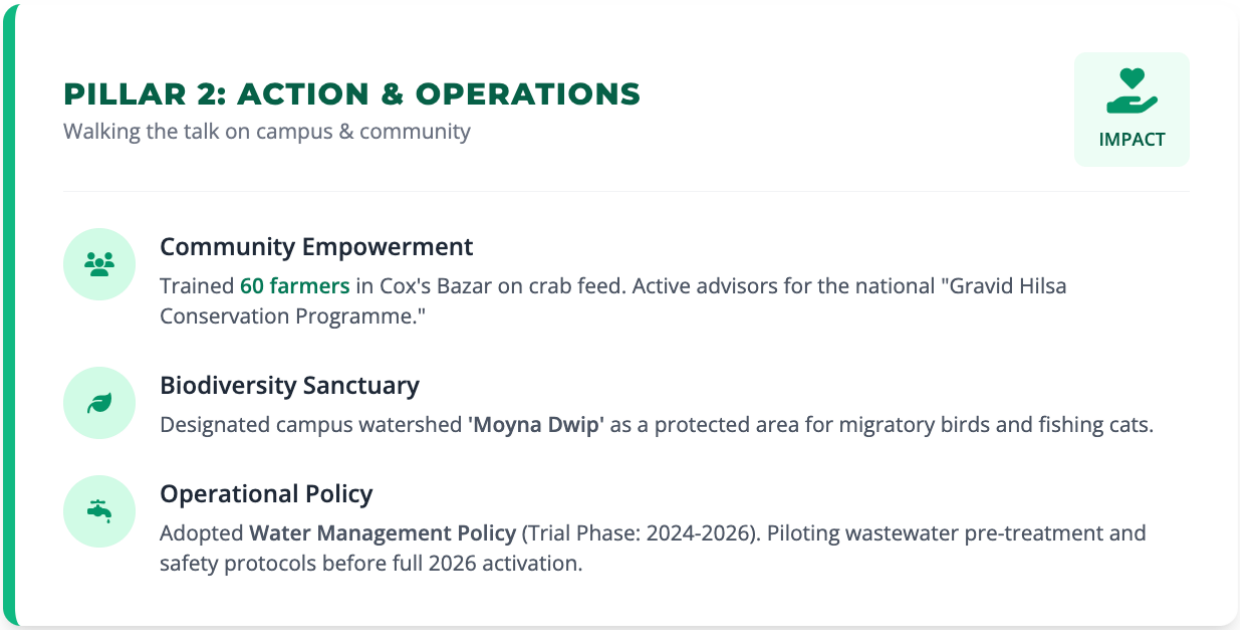
Section 2.3: Ecosystem Conservation and Biodiversity

We are actively engaged in the direct conservation of ecosystems, transforming our campus into a model for biodiversity protection.

1. **Campus Sanctuary ('Moyna Dwip'):** We have officially designated our campus watershed area, known locally as 'Moyna Dwip', as a protected biodiversity sanctuary. A dedicated committee oversees the management of this area to ensure it remains a safe habitat for diverse species, including migratory birds during winter and fishing cats year-round. This initiative is part of a broader watershed management strategy based on location-specific aquatic diversity (see the attached image on the right side of the previous page).
2. **World Ocean Day Advocacy:** Led by the Department of Oceanography, the university observes World Ocean Day annually with extensive public awareness programmes. These student-led initiatives are crucial for educating the broader public on the importance of protecting seas and marine resources, fostering a new generation of ocean stewards.

Section 2.4: Policy on Sustainable Food and Strategic Partnerships

- **Sustainable Procurement Policy:** NSTU has integrated sustainability into its supply chain through a formal commitment within its *Sustainable Procurement Policy*. This ensures that all food served on campus that originates from aquatic ecosystems is sustainably and legally harvested, reinforcing our stance against destructive fishing practices.
- **Strategic Partnerships for Resilience:** To scale our impact, we have signed a Memorandum of Understanding (MoU) with the *Centre for People and Environ (CPE)*. This partnership supports the Department of Environmental Science and Disaster Management in developing planetary health resilience planning. Through this collaboration, we work with local and regional stakeholders to strengthen environmental stewardship and protect shared aquatic ecosystems.



Conclusion

Our 2024 contribution to SDG 14 is comprehensive and actionable. Our 61 research publications provide the scientific foundation for combating pollution and restoring ecosystems. Operationally, we walk the talk by maintaining our campus as a biodiversity sanctuary, enforcing strict pollution controls, and directly training local farmers in sustainable aquaculture. Together, these pillars represent a holistic commitment to the "Blue Economy" and the preservation of life below water.

Appendix: SDG 14 Targeting 2024 Publications Referenced

1. Jannah, M.R., Saha, D., Bappy, M.M.M., ... Arai, T., Belal Hossain, M.B. (2024). Macrobenthos community responses to tidal barrier in a sub-tropical river estuary: Insights for coastal management. *Regional Studies in Marine Science*.
2. Lipi, J.A., Belal Hossain, M.B., Jolly, Y.N., ... Arai, T., Yu, J.J. (2024). Response of benthic assemblages to heavy metal contamination from shipbreaking operations in a tropical coastal area. *Regional Studies in Marine Science*.
3. Howlader, M., Shuvo, S.N.A., Selim, A., ... Fahad, A.A., Rahman, M.M. (2024). Abundance and distribution of anthropogenic marine litter on the beaches of Sonadia Island: An Ecologically Critical Area. *Regional Studies in Marine Science*.
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6. 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*.
7. 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*.
8. Faisal, M., Rima, N.N., Riya, K.K., ... Yu, J.J., Belal Hossain, M.B. (2024). Assessing health hazards of dried fish consumption from coastal markets in a developing nation. *Journal of Agriculture and Food Research*.
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11. Dipty, A.K., Uddin, M.E., Sarker, M.J., Rahman, A.K.M.M. (2024). Diversity of fishery resources and catch efficiency of fishing gears in the Feni Riv(Bangladesh). *Limnology and Freshwater Biology*.
12. Narwal, N., Kakakhel, M.A., Katyal, D., ... Khoo, K.S., Kataria, N. (2024). Interactions Between Microplastic and Heavy Metals in the Aquatic Environment: Implications for Toxicity and Mitigation Strategies. *Water Air and Soil Pollution*.
13. Md Monzer Hossain, S., Gain, A.K., Paul, N.K., Biswas, S.R. (2024). A trait-based approach to quantify ecosystem services delivery potentials in the Sundarbans mangrove forest of Bangladesh. *Ecological Indicators*.
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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 15 - Life on Land

Noakhali Science and Technology University

December 2024

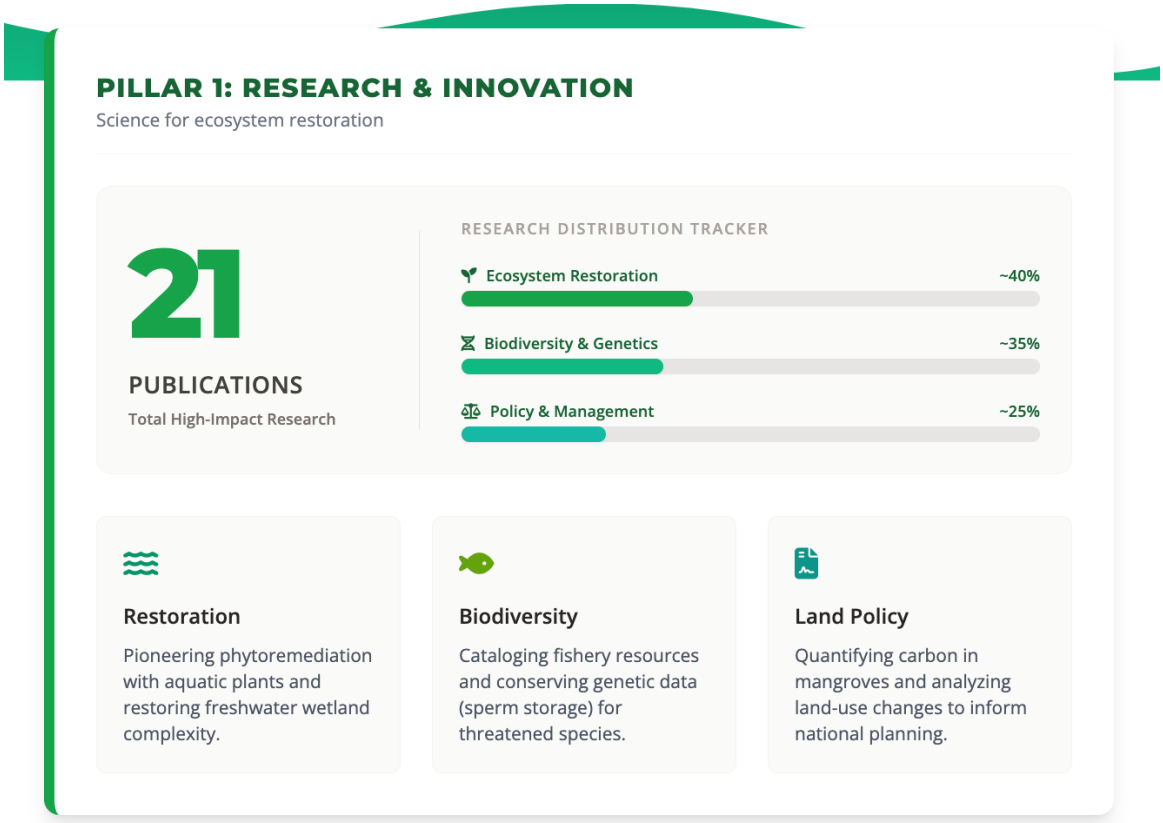
Introduction

Noakhali Science and Technology University (NSTU) is deeply committed to Sustainable Development Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Our 2024 research portfolio, featuring 21 distinct publications, demonstrates a comprehensive approach to this goal. Our work is organized around two key pillars:

- **Research and Innovation:** Engaging in monitoring, conserving, and restoring the planet's vital ecosystems—from inland freshwater habitats to coastal mangrove forests.
- **Operations and Community Engagement:** Directly protecting campus biodiversity through sanctuaries, empowering local agriculture, and implementing sustainable land-use policies.

This report details our key 2024 accomplishments supporting the targets of SDG 15.



Pillar 1: Progress through Research and Innovation

Our researchers are actively engaged in monitoring, conserving, and restoring the planet's vital ecosystems.

Section 1.1: Assessing and Restoring Terrestrial & Freshwater Ecosystems (Targets 15.1, 15.3)

A primary focus of our work is on Target 15.1 (conserve and restore terrestrial and inland freshwater ecosystems) and Target 15.3 (combat desertification and restore degraded land and soil). Our research provides critical assessments of ecosystem health and pioneers new restoration techniques.

- **Monitoring Ecosystem Degradation:** We are actively monitoring pollution in critical habitats. The study by Rahman, M.S. et al. on heavy metals in afforested mangrove sediment provides a baseline for contamination and risk in coastal ecosystems.
- **Developing Restoration Solutions:** Our researchers are innovating in ecosystem restoration. The work by Tanjin, F. et al. identifies the phytoremediation potential of aquatic plants, offering a natural solution to clean up heavy metal pollution in estuaries. Similarly, the study by Haque, M.A. et al. provides a case study on how artificially induced habitat complexity can be used to actively restore macroinvertebrate diversity in freshwater wetlands.
- **Conserving Freshwater Resources:** Our work on inland water is critical for this goal. We have produced key assessments of groundwater vulnerability (Iqbal, M.A. et al.) and analyzed the sustainability challenges of changing water extraction methods (Jakariya, M. et al.), both of which are fundamental to protecting freshwater ecosystems.

Section 1.2: Halting Biodiversity Loss (Targets 15.5, 15.6)

Our institution has a strong research focus on Target 15.5 (halt biodiversity loss and protect threatened species) by cataloging diversity and understanding the biology of key species.

- **Assessing Biodiversity:** The study by Dipty, A.K. et al. provides a comprehensive assessment of the fishery resource diversity and gear efficiency in the Feni River, creating a vital inventory for conservation management.
- **Foundational Biology for Conservation:** We have produced a wealth of species-specific biological research, which is the cornerstone of any conservation program. This includes detailed studies on the breeding biology and condition of *Lepidocephalichthys guntea* (Ahmed, S. et al.), the spawning and larval rearing of *Xenentodon cancila* (Paul, S.K. et al.), the biometry and growth patterns of the polychaete *Namalycastis fauveli* (Sarker, M.J. et al.), and the consumption patterns of the Asian Clam (Aweng, E.R. et al.).
- **Conserving Genetic Resources (Target 15.6):** Our research extends to the conservation of genetic diversity, as shown in the review by Shazada, N.E. et al. on sperm storage for common carp, a critical technique for both sustainable aquaculture and the preservation of genetic lineages.

Section 1.3: Sustainable Forest Management & Integrating Ecosystems into Planning (Targets 15.2, 15.9)

Our researchers are providing the high-level data needed to promote Target 15.2 (sustainable management of all types of forests) and Target 15.9 (integrate ecosystem and biodiversity values into national and local planning).

- **Promoting Forestry and Afforestation:** We have a major research cluster on the role of forests in climate mitigation and environmental health. This includes analyses of the role of

forestry in BIMSTEC nations (Ridwan, M.K. et al.), the impact of forests on CO2 emissions in Vietnam (Raihan, A. et al.), the role of forestry in reducing India's carbon footprint (Rahman, M.M. et al.), and the role of afforestation in Eastern Africa (Chowdhury, T.S. et al.).

- **Valuing Ecosystem Services:** We are actively quantifying the value of our natural ecosystems. The study by Ahmed, S. et al. measures the ecosystem carbon accumulation in mangroves, while the work by Md Monzer Hossain, S. et al. uses a trait-based approach to quantify the ecosystem services of the Sundarbans.
- **Informing Land Use and National Policy:** Our research provides direct inputs for sustainable planning. We have produced dynamic assessments of land use alterations on ecosystem service value (Roy, S.K. et al.) and the impact of LULC change on surface runoff (Haque, M.R. et al.). This pillar also includes high-level analyses of national policies—such as optimal EV charging station locations (Ahmed, M. et al.) and energy choices (Kaya, F. et al.)—that are essential for integrating environmental sustainability into all forms of development planning.

Pillar 2: Progress through University Operations and Community Engagement

Beyond research, NSTU actively manages its land, protects local species, and educates the community on sustainable agriculture and ecosystem management.

Section 2.1: Campus Conservation and Biodiversity Protection

We have transformed our campus into a living laboratory for conservation, directly implementing policies to protect threatened species and habitats.

- **Moyna Dwip Bird Sanctuary:** NSTU directly contributes to ecosystem protection through the *Moyna Dwip Bird Sanctuary Initiative*. This designated "no-development zone" provides a safe habitat for over 50 species of migratory and resident birds, as well as diverse aquatic life. We strictly restrict plastic use, noise pollution, and human intrusion in this area to maintain ecological balance.
- **Protection of Threatened Species:** Our biodiversity policy mandates the identification and protection of IUCN Red Listed species found on campus. Currently, a specific conservation campaign is underway to protect the habitat of the endangered Fishing Cat.
- **Native Species Priority:** To reduce the impact of invasive species, NSTU follows a strict policy prioritizing native plants in all landscaping and afforestation activities. Regular

ecological surveys are conducted to identify and manage alien species that could threaten local biodiversity.

Section 2.2: Community Outreach and Sustainable Land Management

We extend our impact beyond the campus borders by empowering local communities with the knowledge to manage land sustainably.

- **Agricultural Outreach:** The Department of Agriculture conducts practical outreach programs for local farmers. A notable success story involves the cultivation of six varieties of cotton in coastal areas, guided by our faculty and the Cotton Development Board (*image attached on the left side of the previous page*). This initiative transferred vital skills for sustainable farming in saline-prone regions.

- **Promoting Sustainable Tourism:** Addressing land use for tourism, our researchers engage with communities in Saint Martin Island. By analyzing tourist perceptions, we are raising awareness about responsible behavior to protect the island's fragile coastal ecosystem.
- **Public Education Events:** NSTU organizes major events to promote environmental stewardship. The *1st International Seminar on Climate Change and Environmental Sustainability (ISCCES-2024)* brought together students, researchers, and locals to discuss smart farming and climate mitigation (see the attached image on the following page). Additionally, we collaborated with the Bangladesh Red Crescent Society to celebrate International Disaster Preparedness Day (*image attached on the previous page*), thereby fostering community resilience.

Section 2.3: Sustainable Operations and Policy

Our operational framework ensures that our consumption and waste management practices do not degrade terrestrial ecosystems.

- **Sustainable Food Procurement:** NSTU has adopted a sustainable procurement strategy for campus food. We prioritize local suppliers and ethically farmed produce, ensuring that our food systems are resource-efficient and have a low environmental impact.
- **Waste and Water Management:** We are currently in an adaptive trial phase (2024–2026) for our *Waste Management & Sustainability Policy* and *Water Management Policy*. These protocols cover the safe disposal of hazardous materials, the reduction of plastic waste, and rigorous water quality standards to prevent pollution of nearby soil and wetlands. This phased approach ensures we refine our systems for maximum effectiveness before full adoption.

Conclusion

Our 2024 contributions to SDG 15 reflect a holistic dedication to "Life on Land." Through 21 high-impact publications, we are advancing the science of ecosystem restoration and biodiversity conservation. Simultaneously, our operational actions—from maintaining the Moyna Dwip Sanctuary to training farmers in sustainable cotton cultivation—demonstrate that NSTU is not just studying the environment but actively protecting it.

Appendix: SDG 15 Targeting 2024 Publications Referenced

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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 16 - Peace, Justice, and Strong Institutions

Noakhali Science and Technology University

December 2024

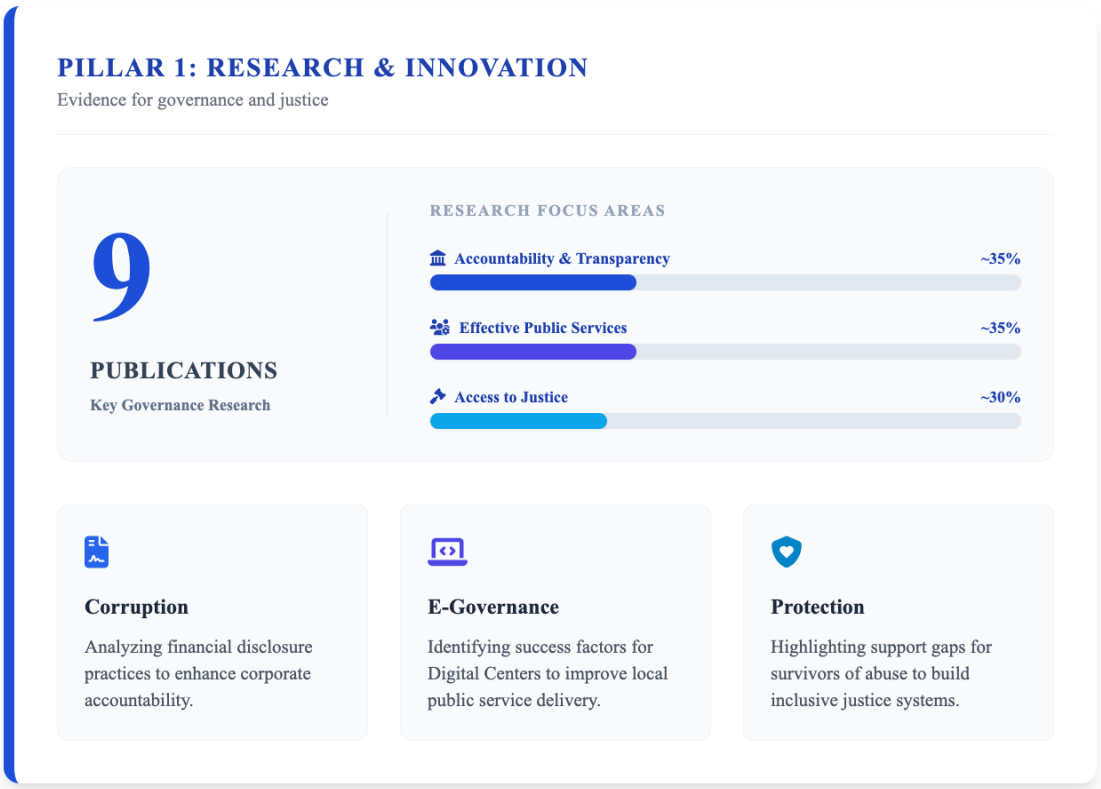
Introduction

Noakhali Science and Technology University (NSTU) is firmly committed to Sustainable Development Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.

We believe that strong, transparent, and accountable institutions are the foundation upon which all other SDGs are built. Our 2024 contributions are organized around two key pillars:

- **Research and Innovation:** Investigating governance, combating corruption, analyzing e-governance success, and protecting vulnerable populations through evidence-based study.
- **Operations and Community Engagement:** Ensuring inclusive decision-making through our Regent Board, enforcing zero-tolerance anti-corruption policies, and actively collaborating with government bodies to shape national policy.

This report outlines our key 2024 accomplishments in support of the targets of SDG 16.



Pillar 1: Progress through Research and Innovation

Our 2024 research portfolio, featuring 9 key publications, directly addresses the core targets of SDG 16.

Section 1.1: Enhancing Institutional Accountability and Transparency (Targets 16.5, 16.6, 16.10)

A major focus of our research is on strengthening institutional effectiveness by promoting transparency and combating corruption.

- **Analyzing Good Governance:** The research by Murad, S.M. provides a high-level analysis of the relationship between economic uncertainty and good governance from a global perspective. This work provides foundational evidence on why strong, predictable institutions are essential for stability.
- **Combating Corruption:** We are directly tackling Target 16.5 (Substantially reduce corruption and bribery). The study by Masud, M.A.K. et al. on corruption disclosure practices provides a critical analysis of transparency in both Islamic and conventional financial firms, offering a framework to enhance accountability.
- **Protecting Information Integrity:** Recognizing new threats to public trust, our research addresses Target 16.10 (Ensure public access to information). The work by Salam, M.A. et al. on deepfake applications explores a significant emerging threat to truth and information, providing the basis for policies to protect the public and institutions from sophisticated misinformation.

Section 1.2: Building Effective, Responsive, and Inclusive Institutions (Targets 16.6, 16.7)

We are actively researching how to make institutions more effective and responsive to citizen needs, a core component of Target 16.6 (Develop effective, accountable and transparent institutions).

- **Analyzing E-Governance Success:** Two of our key studies evaluate the success of Bangladesh's digitization efforts. The work by Nur Ullah, M. & Biswas, B. identifies the critical success factors for e-governance in Union Digital Centers, providing a model for effective public service delivery at the local level.
- **Centering Citizen Participation:** Building on this, the study by Biswas, B. et al. on Pourasava Digital Centers is a direct investigation of Target 16.7 (Ensure responsive, inclusive, participatory... decision-making). It explicitly analyzes how citizen participation moderates the satisfaction and intended use of public e-services, proving that institutional success is directly linked to inclusivity.
- **Informing Responsive Policy:** The work by Al-Masud, A. et al. on public attitudes toward microplastics provides a model for responsive policymaking. By analyzing public perceptions, it offers a pathway for institutions to design policies that are more effective and aligned with public values.

Section 1.3: Ensuring Access to Justice and Inclusive Policymaking (Targets 16.2, 16.3, 16.b)

Our research extends to the protective role of institutions, particularly in providing justice for the vulnerable and ensuring sustainable policies for all.

- **Protecting Vulnerable Populations:** Our research gives a voice to the marginalized and supports Target 16.2 (End abuse... and all forms of violence against children). The study by Siddik, M.A.B. et al. on male child sexual abuse survivors highlights a critical gap in support

systems, providing the evidence needed to build more inclusive and effective justice and mental health services.

- **Promoting Non-Discriminatory Sustainable Policies (Target 16.b):** Our work also examines the role of strong institutions in managing resources and technology for the public good. The research by Jakariya, M. et al. on sustainable solutions for water access, and by Ridzuan, A.R. et al. on the governance of technology and foreign investment, both underscore the need for strong, non-discriminatory policies to ensure that development is equitable and sustainable.

Pillar 2: Progress through University Operations and Community Engagement

NSTU embodies the principles of SDG 16 in its own governance, ensuring representation, transparency, and active engagement with the state and civil society.

Section 2.1: Inclusive Governance and Representation

We have established a governance structure that ensures participatory decision-making at the highest levels.

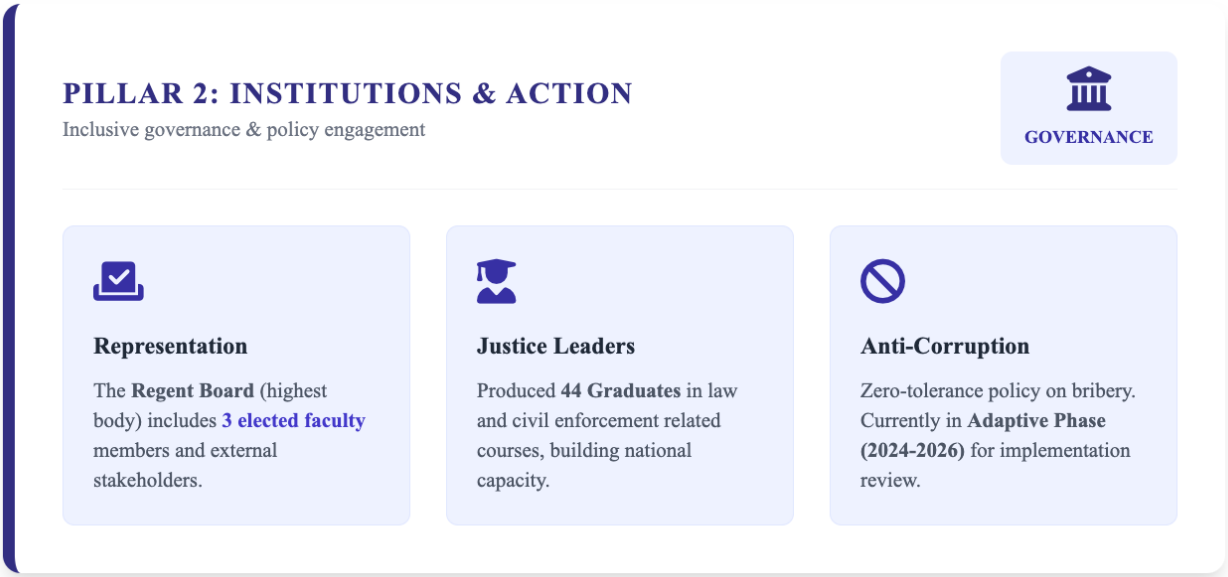
- **Elected Representation (The Regent Board):** Our highest governing body, the *Regent Board*, is structured to ensure diverse representation. It includes three faculty members elected directly by the Academic Council, alongside government nominees and civil society members. This structure prevents unilateral decision-making and ensures that the academic community has a direct vote in university affairs.
- **Student Representation:** NSTU officially recognizes an independent *Students' Union* and has approved a formal constitution (in Bangla) to govern its democratic operation. While currently inactive, the framework exists to provide students with a formal voice in university governance and social activities.
- **External Stakeholder Engagement:** The Regent Board formally includes representatives from government agencies, industry, and the local community. This mechanism ensures that external perspectives are integrated into our strategic planning and that local stakeholders have a meaningful mechanism for participating in university decision-making.

Section 2.2: Institutional Integrity and Anti-Corruption

NSTU is committed to maintaining the highest standards of integrity through rigorous policy enforcement.

- **Anti-Bribery & Anti-Corruption Policy:** We have adopted a comprehensive policy that explicitly prohibits bribery, facilitation payments, and nepotism. It applies to all staff, students, and third-party vendors. Key features include a zero-tolerance approach, whistleblower protection, and clear disciplinary protocols aligned with the Government Servants (Discipline and Appeal) Rules 2018.
- **Adaptive Implementation Phase:** The period from 2024 to 2026 is designated as an "adaptive phase" for this policy. During this time, we are actively monitoring its implementation, conducting awareness training, and refining reporting mechanisms before final institutional adoption in 2026.

- **Financial Transparency:** In alignment with Target 16.6, NSTU publishes its *Annual Performance Report*, which includes key financial data such as expenditure details. We adhere to government transparency regulations to ensure responsible public disclosure of financial data.



Section 2.3: Policy Engagement and Academic Freedom

We act as a bridge between academia and the state, providing expert advice and maintaining a free intellectual environment.

- **Expert Government Advisory:** NSTU provides direct expert advice to local, regional, and national government bodies. Our faculty actively participate in committees and provide evidence-based guidance on critical national issues such as climate resilience, food security, and local governance strengthening.
- **Policy-Focused Collaborations:** We undertake research specifically designed to inform government policy. A prime example is the *AQUAFOOD* project, a collaboration with the University of Copenhagen and Bangladesh Agricultural University, which contributes evidence for sustainable aquatic food system policies in Bangladesh.
- **Academic Freedom:** We uphold a formal *Policy on Academic Freedom*, ensuring that senior and junior academics alike have the right to freely choose their research areas and speak publicly about their work. Furthermore, the university serves as a neutral platform where diverse political stakeholders can come together to frankly discuss community challenges in a safe space.

Section 2.4: Developing the Next Generation of Justice Professionals

- **Graduates in Law and Enforcement:** NSTU is actively training the next generation of leaders in justice and civil enforcement. In the reporting year, **44 graduates** completed degrees in law and enforcement-related courses, contributing directly to the national talent pool required to build strong legal institutions.

Conclusion

Our 2024 research on SDG 16 provides critical insights into building, maintaining, and improving strong institutions. We have produced vital work on combating corruption, analyzed the success factors for e-governance, and highlighted critical gaps in justice for the most vulnerable. Operationally, our inclusive Regent Board, rigorous Anti-Corruption Policy, and active role in government advisory demonstrate our commitment to fostering a society built on transparency, accountability, and justice for all.

Appendix: SDG 16 Targeting 2024 Publications Referenced

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SDG PROGRESS REPORT 2024

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RANKING AND STRATEGIC DEVELOPMENT CELL (RSDC, NSTU)

Comprehensive Report: SDG 17 - Partnerships for the Goals

Noakhali Science and Technology University

December 2024

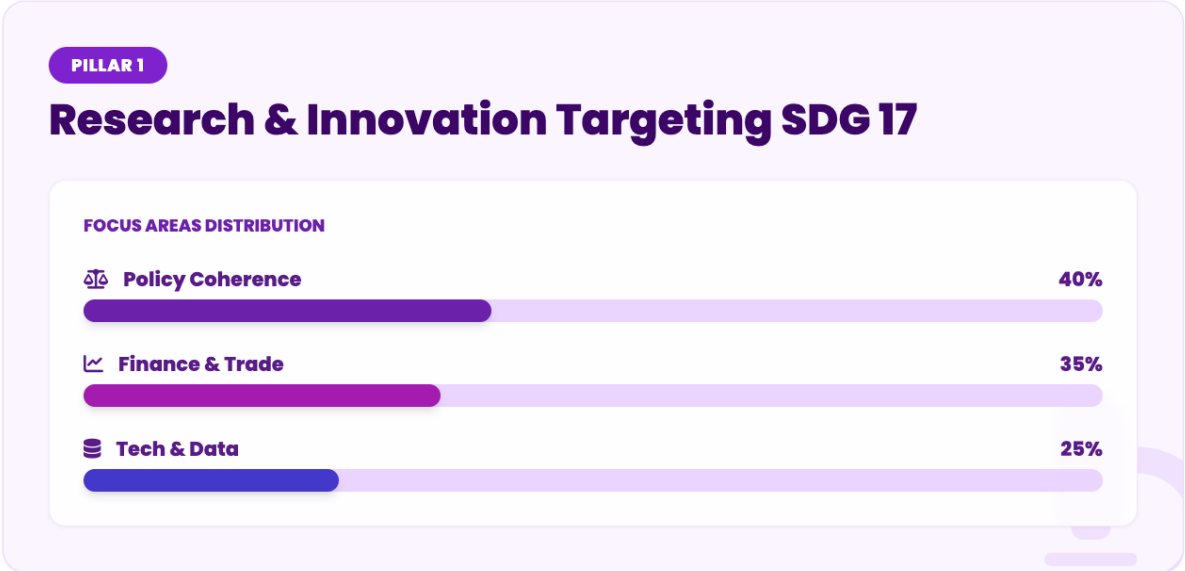
Introduction

Our institution is fundamentally committed to Sustainable Development Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development. We recognize that no other goal can be achieved without a robust framework of global cooperation, financial mobilization, technology sharing, and data-driven policymaking.

Our 2024 contributions demonstrate that partnership is not just a theoretical goal for us, but the primary method of our work. Our efforts are organized around two key pillars:

- **Research and Innovation:** Leading global exchange of knowledge on finance, trade, and technology to solve complex challenges.
- **Operations and Community Engagement:** Actively collaborating with national government, international bodies, and NGOs to implement sustainable policies on the ground.

This report outlines our key 2024 accomplishments in support of the targets of SDG 17.



Pillar 1: Progress through Research and Innovation

Our extensive 2024 research output, comprising 49 high-impact publications, underscores our role as a hub for global knowledge exchange.

Section 1.1: Fostering International Partnerships & Policy Coherence (Targets 17.14, 17.16, 17.17)

A vast portion of our 2024 research is inherently collaborative, focusing on global and regional partnerships to promote policy coherence.

- **Leading International Research Consortia:** Our researchers are at the center of global analysis, examining systemic issues in multi-country blocs. This includes studies on BRICS nations (Kaya, F. et al.; Voumik, L.C. et al.), ASEAN countries (Hossain, M.S. et al.; Aspy, N.N. et al.; Rahman, M. et al.), BIMSTEC nations (Ridwan, M.K. et al.), South Asia (Akther, T. et al.), BCIM-EC countries (Rahman, A.A. et al.), Eastern Africa (Chowdhury, T.S. et al.), and Indian Ocean nations (Hossain, M.A. et al.).
- **Analyzing Policy Coherence:** We produce critical work on the complex interplay between economic, social, and environmental policies. Key studies analyzed the links between energy choices and health outcomes (Kaya, F. et al.), tourism and ecological footprints (Aspy, N.N. et al.), and the intersection of forestry, urbanization, and finance (Ridwan, M.K. et al.). We also examined the impact of global crises on waste management (Hossain, M.A. et al.), providing essential evidence for governments to create coherent policies.

Section 1.2: Mobilizing Finance and Trade for Development (Targets 17.3, 17.5, 17.10)

We are actively researching the financial "means of implementation," providing analysis on global trade and financial flows.

- **Analyzing Financial Flows:** Our work tracks and analyzes the impact of Foreign Direct Investment (FDI) and remittances. This includes studies on the impact of geopolitical risk and trade openness on FDI (Hossain, M.S. et al.) and the impact of remittances on GDP in South Asia (Jui, F.N. et al.).
- **Strengthening Trade & Financial Systems:** Our research supports multilateral trade and sustainable markets. This includes analyses of exchange rate asymmetry on bilateral trade (Rahman, A.A. et al.), the role of Fintech in sustainable resource management (Raihan, A. et al.), and corporate accountability through sustainability reporting disclosure (Das, S.K. et al.). We also investigated the role of the informal sector on economic growth (Sultana, N. et al.).

Section 1.3: Strengthening Technology, Data, and Capacity Building (Targets 17.6, 17.7, 17.9, 17.18)

This pillar highlights our work in creating and sharing the technical and intellectual capital needed to achieve the SDGs.

- **Technology & Innovation Transfer:** We are developing and sharing new technologies, such as deep transfer learning (Shakib, M.S. et al.) and electrodialysis (Kabir, M.M. et al.). Our researchers also provided techno-economic analyses of green technologies (Akter, M.M. et al.) and developed methodologies for mitigating salt stress in crops (Mahmud, F.M. et al.).

- **Data, Monitoring & Accountability:** Our research provides critical monitoring data, including dynamic assessments of land-use change (Roy, S.K. et al.), groundwater vulnerability monitoring (Iqbal, M.A. et al.), and the quantification of ecosystem services (Md Monzer Hossain, S. et al.).
- **Capacity Building:** We are building local capacity through stakeholder-driven strategies, such as climate-adaptive farming (Al Mamun, M.A. et al.) and sustainable solutions for water and sanitation (Jakariya, M. et al.; Karim, F.S. et al.). We also analyzed success factors for e-governance to build institutional capacity (Nur Ullah, M. et al.).

Pillar 2: Progress through University Operations and Community Engagement

Beyond research, NSTU actively partners with government bodies, NGOs, and international organizations to translate goals into reality.

Section 2.1: National Policy Influence and Cross-Sectoral Dialogue

We directly contribute to national policy development by identifying challenges and modeling solutions with government stakeholders.

- **Direct Policy Input (Aquaculture):** NSTU has significantly influenced national food security policies through two key projects: *Tengra fish cage culture* and *nutritionally balanced crab feed development*. These initiatives identified farming challenges and helped local and regional authorities formulate sustainable aquaculture strategies to enhance rural income and zero hunger (SDG 2).

- **High-Level Government Dialogue:** We actively initiate cross-sectoral dialogue. In a recent high-level meeting, the NSTU Vice-Chancellor met with the Advisor to the *Ministry of Environment, Forest and Climate Change*. This dialogue focused on critical regional issues, resulting in government pledges to support projects for reducing water salinity and establishing a migratory bird sanctuary.

Section 2.2: International Collaboration and Best Practices

Our commitment to partnership extends across borders, where we collaborate to gather data and define global best practices.

- **Global Data Collection:** NSTU researchers collaborate internationally to measure progress on the SDGs. A notable example is our joint study with scholars from *Australia, Saudi Arabia, and Brunei*, exploring pond fish culture and household food security in coastal regions.
- **Defining International Best Practice:** We review and develop best practices through comparative research. In 2024, we partnered with institutions in *India, China, Pakistan, and Saudi Arabia* to analyze meteorological trends (reference evapotranspiration). This comparative approach aids in better assessment of water-energy-climate linkages (SDG 7), providing evidence for adaptive strategies across different nations.

Section 2.3: NGO Partnerships and Crisis Response

We believe in the power of civil society partnerships to address immediate humanitarian needs.

- **Flood Response with Numerous Institutions, including BRAC IT:** During the 2024 floods, NSTU students and faculty partnered with *BRAC IT, a sister concern of the BRAC*, the largest NGO in Bangladesh (image attached below, left side). Together, we organized relief funds, distributed food and medicine, and provided humanitarian assistance to flood-affected communities, demonstrating a rapid, effective partnership for crisis response.

Section 2.4: Education and Community Outreach

We are embedding the SDGs into the fabric of our curriculum and sharing this knowledge with the wider community.

- **Curriculum Integration:** Across our 33 academic departments, NSTU offers programs that inherently align with specific SDGs. For instance, *Environmental Science* addresses Climate Action (SDG 13), while *Economics* addresses No Poverty (SDG 1). We also offer dedicated

degrees and courses that combine theoretical sustainability knowledge with practical modules.

- **Community Literacy and Outreach:** We measure and improve sustainability literacy through active outreach. The student organization *'Luminary'* provides regular educational support to underprivileged children (image attached above, right side). Additionally, students from the Education faculty complete six-month internships in local primary schools, directly transferring knowledge to the community and ensuring that the next generation is literate in sustainable development.

Conclusion

Our 49 publications in 2024 serve as a powerful testament to our role as a central hub for global partnerships. Our research is not siloed; it is collaborative, international, and cross-sectoral. Operationally, our direct work with the Ministry of Environment, our crisis response with BRAC, and our international research collaborations prove that NSTU is actively mobilizing the partnerships necessary to achieve the Sustainable Development Goals.

Appendix: SDG 17 Targeting 2024 Publications Referenced

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