

MIR MOHAMMAD HAMZA

Industrial Ecology · Material Flow Analysis · Systems Modelling for Sustainability

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PROFILE

Sustainability researcher with a systems-based approach to sustainable development and a focus on industrial ecology. Skilled in systems thinking and quantitative modelling, with applied experience across research and international consultancy projects spanning material flow analysis, life-cycle assessment, and techno-economic evaluation. Seeking to advance technical expertise and theoretical grounding in socio-ecological transitions and circular industrial systems through doctoral study.

RESEARCH INTERESTS

- **Material Flow Analysis (MFA)** of plastics, metals, construction and demolition materials, and textiles
- **Life-Cycle Assessment (LCA) and Techno-Economic Assessment (TEA)** of plastic and textile alternatives, energy systems, and food–agriculture systems
- **Stock–flow modelling** of waste management systems (municipal solid waste, plastics, metals) and socio-ecological systems

EDUCATION

MSc in Environmental Science and Management

2025-2026

North South University, Dhaka, Bangladesh

School of Life and Health Sciences, Department of Environmental Science and Management

CGPA: 3.97 / 4.00

Thesis: *Modelling future plastic waste pathways and intervention prioritisation in Bangladesh: an integrated assessment framework*

Supervisor: Dr Mohammad Sujauddin

BSc in Economics (Minor in Mathematics)

2019 – 2023

North South University, Dhaka, Bangladesh

School of Business and Economics, Department of Economics

CGPA: 3.65 / 4.00 (90%) · 120 credits completed

A Levels — British Council, Muscat

2015 – 2017

Business Studies (A), Economics (B)

IGCSE / O Levels — Sri Lankan School

2013 – 2015

Economics, Mathematics, English Language, Accounting (A); Business Studies, ICT (B)

PUBLICATIONS

- **Hamza, M. M.**, Biswas, M. K., Noor, K. M. A., *et al.* (2025). A modular framework for modeling anthropogenic and environmental trade-offs in sustainable textile material choices. *Modeling Earth Systems and Environment*, 11, 448. <https://doi.org/10.1007/s40808-025-02632-4>
- Noor, M. T., **Hamza, M. M.**, Khan, M. R., Hossain, M. M., Tasmin, S., & Sujauddin, M. (2027). Last dance in Paris. *Renewable and Sustainable Energy Reviews*, 243, 117390. <https://doi.org/10.1016/j.rser.2026.117390>
- **Hamza, M. M.**, Noor, T., Biswas, M. K., Zhou, H., Ahmed, S. A., Al Mamun, A., Li, W., Yu, J., Liu, X., Hossain, M. M., Murakami, S., & Sujauddin, M. (2026). Modelling future plastic waste

pathways and intervention prioritisation in Bangladesh: An integrated assessment framework.
Resources, Conservation and Recycling. [Manuscript under review]

RESEARCH EXPERIENCE

Research Assistant — Decoupling Lab

January 2023 – Present

Department of Environmental Science and Management, North South University

Supervisor: Dr Mohammad Sujauddin, Associate Professor

Present and future state of municipal solid waste management in Dhaka: a material flow and life-cycle approach

Oct 2025 – Present

Funding: North South University (Grant CTRG-22-SHLH-48; USD 5,000)

Role: Research Assistant appointed by Dr Mohammad Sujauddin)

Building a comprehensive picture of Dhaka's municipal solid waste (MSW) landscape—quantifying current generation characteristics and their socio-economic determinants, forecasting future trends, and assessing existing waste-management governance to inform long-term policy.

- Survey and collect data on demographic and socio-economic factors affecting waste generation in Dhaka
- Review existing strategies, plans, policies, legislation, and institutional capacity of relevant entities
- Build and estimate an econometric model of MSW generation determinants
- Manuscript writing

Modelling future plastic waste pathways and intervention prioritisation in Bangladesh (MSc Thesis)

Jun 2025 – Jun 2026

Role: Lead researcher (appointed by Dr Mohammad Sujauddin)

A dynamic stock–flow model of plastic waste generation in Bangladesh, capturing generation through final disposal alongside collection, sorting, and recycling. A no-intervention baseline projects three plastic types over 25 years at annual intervals; six interventions are then modelled with associated economic costs under four scenarios—Collect and Dispose, Recycling, Reduce and Substitute, and System Change—to estimate leakage rates, terrestrial and aquatic accumulation, and intervention costs.

- Research design and methodology
- Model coding, documentation, and validation (MATLAB)
- Oversaw data collection, cleaning, and validation from field surveys, literature, and national documents
- Model output analysis, statistical testing, and interpretation; manuscript writing

Potential of closed-loop metabolism of textile fibres in Bangladesh's textile and apparel industry

Nov 2024 – Present

Role: Research Assistant (appointed by Dr Mohammad Sujauddin)

A static, economy-wide Material Flow Analysis (EW-MFA) of the textile–apparel industry for base year 2021, spanning raw-material inputs through production, consumption, disposal, recycling, and reuse. Indicators including Direct Material Input (DMI), Total Material Requirement (TMR), and cyclical use rate quantify resource efficiency and circularity, supporting future scenarios and intervention analysis. Data drawn from UN Comtrade, industry surveys, expert interviews, and literature.

- Conduct economic valuation of textile material flows
- Perform uncertainty analysis on material-flow parameters
- Conduct policy analysis to identify gaps and opportunities for closed-loop metabolism in Bangladesh

Decision support system for optimising recycled content in yarns across environmental, technical, and economic trade-offs (Published)

Nov 2023 – Jun 2025

Role: Lead researcher and author (appointed by Dr Mohammad Sujauddin)

Investigated the environmental, technical, and economic implications of incorporating pre-consumer textile waste into yarn for Bangladesh's knitwear industry. LCA quantified impacts of compositions from 100% virgin cotton to blends with up to 80% recycled content; standardized testing assessed yarn quality; and a TOPSIS multi-criteria decision analysis identified optimal compositions across scenarios including organic-cotton adoption, energy-source shifts, and projected raw-material scarcity. Published in Modeling Earth Systems and Environment.

- Designed and coordinated the overall research project
- Conducted primary data collection and analysis
- Performed Life Cycle Assessment and technical evaluations
- Implemented the TOPSIS multi-criteria decision analysis
- Interpreted results and wrote the manuscript

Policy and financing strategy for the National Action Plan for Sustainable Plastics Management, and a PPP model for plastic-recycling investment

Jan 2023 – Jul 2023

Funding: The World Bank

Identified and drafted policies and regulations to support Bangladesh's action plan for sustainable plastic management—harmonising with existing work plans, recommending public institutional structures, outlining a pathway to Extended Producer Responsibility (EPR), and proposing circular business models based on industrial symbiosis. Contributed to Tasks 1 and 2.

- Analysed existing national plastics regulations, identified gaps, and benchmarked international best practice on accountability, communication, and private-sector engagement
- Contributed to drafting national policy regulations, including anti-litter provisions and packaging-reduction guidelines, and explored options for private-sector participation
- Designed Extended Producer Responsibility (EPR) guidelines to assist the Government of Bangladesh in formulating EPR regulations
- Conducted a techno-economic analysis of single-use plastic alternatives to assess economic feasibility

PROFESSIONAL & CONSULTANCY EXPERIENCE

Consultant — Value Chain Assessment; Integrated MFA / LCA / TEA *Nov 2025 – Feb 2026*

World Bank–financed SUP Value Chain Study and Training Program; implemented by the Department of Environment (MoEFCC, Bangladesh) and SACEP

- Co-developed the integrated methodology for value-chain, material-flow (MFA), life-cycle (LCA), and techno-economic (TEA) assessment of single-use plastics (SUPs)
- Performed statistical analysis of value-chain survey data (frequency tables, correlation analysis, visualization) to characterize market and actor dynamics and bottlenecks
- Led the national plastics MFA for Bangladesh (FY2023–2024), including mass-balance structure and flow visualization
- Applied waste-flow diagram methodology to develop a SUP-focused MFA for Dhaka South City Corporation (DSCC)
- Built an LCA model quantifying environmental impacts of the existing DSCC SUP waste-management system and compared alternative scenarios (e.g., waste-to-energy, increased recycling)
- Supported TEA / cost–benefit evaluation and synthesized integrated LCA+TEA results into policy-relevant trade-off insights
- Co-wrote the policy document recommending a phased SUP waste-management roadmap and phase-out guidelines for problematic SUP items

Quantitative Modeling and Sustainability Consultant — Rural Access *Oct 2024 – Apr 2025*

- Developed a quantitative actuarial assessment framework for microinsurance under Rural Access's BMMDP climate-adaptive microinsurance proposal (funded by Swisscontact)
- Provided methodological support for proposals on value-chain analysis, sustainability assessment, monitoring and evaluation, and strategic business advisory

Data Analysis Consultant — Feed the Future (USAID)

Oct 2024 – Feb 2025

Technical and business advisory support for RUSTIC, Tetra, and Plenary Aqua; implemented by Abt Associates, Triangulum Consulting, and Rural Access

- Built process inventories from business and process data for techno-economic assessment, financial planning, and GHG inventories
- Assessed carbon-credit potential via GHG inventories using IPCC methodology across Scope 1, 2, and 3 emissions
- Prepared cash-flow projections, financial statements, and ROI analyses to evaluate investment viability
- Analysed market-research data and prepared market-research plans with cash-flow projections and ROI calculations

Consultant — Green Earth Quest

Sep 2023 – Feb 2024

Funded by the World Bank; implemented by EATL

- Prepared question sets on environment and climate change for school, college, and university levels
- Designed educational materials for competition participants
- Judged university-level second-round submissions and the school-level grand finale

Financial Analyst — Infrastructure Investment Assessment for Plastic Waste in Urban Growth Centers

Jan 2023 – Feb 2024

Funded by the World Bank; implemented by Maxwell Stamp Ltd.

- Designed and implemented a dynamic stock–flow system using P2O modelling
- Estimated infrastructure needs for sustainable plastic-waste management
- Developed cost-estimation models for waste-management systems
- Conducted GHG emissions analysis

TEACHING EXPERIENCE

Teaching Assistant — Dr Mohammad Sujauddin

Spring 2023 – Present

Department of Environmental Science and Management, North South University

Delivers lectures across advanced undergraduate and graduate courses:

- **ENV 455 — Research Methods:** experimental design, sampling methods
- **ENV 418 — Conservation and Sustainable Development:** life-cycle assessment, material flow analysis
- **ENV 414 — Waste Management:** circular economy, industrial symbiosis, material flow analysis
- **ENV 501 — Fundamentals of Environmental Science and Management:** circular economy

HONOURS & AWARDS

- Second Runner-Up, SDG Policy Challenge, ICCCAD and the Embassy of Sweden in Bangladesh (2023)
- First Place, ACCA Accounting Case Competition, British Council Muscat (2016)
- Edexcel High Achiever Award — World Highest in IAS Business Studies (2016)
- Edexcel High Achiever Award — outstanding O Level results (2015)

PROFESSIONAL SERVICE & MEMBERSHIP

- **Peer Reviewer**, Discover Sustainability (Springer Nature), 2025
- **Student Member**, International Society for Industrial Ecology (ISIE), since December 2024

LEADERSHIP & ORGANIZATIONAL EXPERIENCE

President & Executive Board Member — Young Economists' Forum, North South University

2021 – 2023

President (2022–23) and Treasurer (2021–22)

- Coordinated club activities and aligned them with the organization's mission; oversaw administrative and financial responsibilities
- Collaborated with Bangladesh Bank, the National Board of Revenue (NBR), and the Ministry of Finance
- Organized Econsilium (Bangladesh's first economics consultancy case competition), the National Conference on Current Economic Challenges, Brown Bag research seminars, and related webinars
- Hosted the National Conference on Current Economic Challenges, North South University (February 2023)

Private Tutor — Mathematics, Science, Economics, English

2015 – Present

- Tutors students from Grade 8 to Grade 12 across the IGCSE, IAL, and IB curricula

TECHNICAL SKILLS

Programming & analysis: Python (intermediate), MATLAB (intermediate), STATA (intermediate), R (intermediate), LaTeX (intermediate)

Methods: Material Flow Analysis (MFA / EW-MFA), Life-Cycle Assessment (LCA), Techno-Economic Assessment (TEA), dynamic stock–flow modelling, multi-criteria decision analysis (MCDA), econometric modelling, GHG inventories (IPCC, Scope 1–3)

Productivity: MS Word, Excel, PowerPoint, Access; Google Workspace

LANGUAGE PROFICIENCY

Educated throughout in English-medium institutions.

- **TOEFL:** 113 / 120 (2024)
- **IELTS:** 8.5 / 9 (2018)
- **IGCSE English Language:** Grade A

REFERENCES

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