# NILOY BISWAS

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## Professional Summary

I am an Urban Planner with a **Master's degree in Urban and Rural Planning** from Khulna University. My work combines computer vision, transportation, reinforcement learning (RL), and intelligent transportation systems (ITS) to improve urban mobility and planning. I have experience in vehicle detection, land cover classification, GIS, and web mapping. I enjoy applying data-driven methods to solve transportation challenges and develop smarter, more efficient cities. My goal is to use technology and data to support better decision-making in urban development.

## Research and Publications

- Miah, M. T., Hossain, M. Z., **Biswas, N.**, & Rahaman, K. R. (2025). *Evaluating community vulnerability and co-management strategies in the Sundarbans forest-dependent region of Bangladesh: A socio-economic perspective. Local Environment*, Published online 29 October 2025.
  https://doi.org/10.1080/13549839.2025.2570498

- **Biswas, N.**, Biswas, J., Shahid, I. U., & Sabuj, M. H. (2025). *Mapping Wildfire Dynamics: GeoAI-Driven Comparative Analysis of Deep and Machine Learning Ensembles for Susceptibility Prediction in California.* **GeoMatics**, 5(1), 100081.
  https://doi.org/10.1016/j.geomat.2025.100081

- Exploring the Nexus Between Land Cover Change Dynamics and Spatial Heterogeneity of Demographic Trajectories in Rapidly Growing Ecosystems of South Asian Cities
  DOI: https://doi.org/10.1016/j.ecolind.2023.111299

- Geostatistical assessment of Spatial climate dynamics using mono window machine learning algorithm for decoding land cover and demographic shifts influence on thermal environment. DOI: https://doi.org/10.1007/s00704-025-05750-2.

### Submitted Research Article (Under Peer Review)

1) **Biswas, N.**, & Islam, K. S. (2025). Assessing the Impact of Land Use and Land Cover Changes on Land Surface Temperature Dynamics in the Coastal Region of Bangladesh: A Comprehensive Analysis Using Deep Learning Techniques and AHP Integration. Environmental Monitoring and Assessment (Springer Nature). [Manuscript ID:

fcc933b1-5854-433c-8fc7-dea6d7a28fd2] (Status: Under Peer Review) Note: Dr. Kazi Saiful Islam is the Principal Investigator (PI) of the research project.

2) **Biswas, N.,** & Islam, K. S. (2025). Integrating Deep Learning and GeoAI for Landslide Susceptibility Mapping and Road Vulnerability Index (RVI) Assessment in Hazard-Prone Regions. *Journal of Geomatics , Natural hazards( Taylor and Francis)*. (Status: Under Review)

3) **Biswas, N.,** & Islam, K. S.* (2025). *Evolution and Advances in Water Body Detection Using Remote Sensing: A Systematic Review of Methods, Sensors, and Fusion Approaches (1984–2025). [Manuscript under review].*

4) Biswas, J., & **Biswas, N.** (2025). *Improved Remote Sensing Ecological Index (IRSEI) for Monitoring Urban Sustainability: 100 Resilient Cities vs Non-resilient Cities in South Asia. Environment, Development and Sustainability (Springer)*. Manuscript ID: NVI-D-25-11098. *[Under review].*

5) Miah, M. T., Hasan, M. R., Fariha, J. N., Islam, R., **Biswas, N.,** Raiyan, R., & Rahaman, K. R. (2025). *Reinforcing Climate-Smart Ecosystem Strategies in Nova Scotia: A Machine-Learning Integrated Spatiotemporal Framework for Wildfire Severity Mapping and Drought Dynamics Prediction. Journal of Applied Physical Geography (JAPG)*. Manuscript ID: JAPG-D-25-03017. *[Under review].*

## Conference Papers

### ICERIE 2025

- Das, S., Biswas, N., Niha, A. I., & Paul, S. (2025). *Predicting Vegetation Trends in Sylhet Division: An LSTM-Based Analysis of NDVI Dynamics.* Proceedings of the 8th International Conference on Engineering Research, Innovation, and Education (ICERIE 2025). DOI: 10.2991/978-94-6463-884-4_11

### (ICCEI 2025) Conference Date 12-14 December

- Jahan, N., **Biswas, N.,** & Chaklader Swadin, B. (2025). *Influence of Private Vehicle Ownership on Household Travel Patterns in Khulna City.* Accepted.
- **Biswas, N.,** Gazi, B., & Ferdaus, M. R. (2025). *Analyzing and Predicting Urban Travel Behavior Using Structural Equation Modeling: A Case Study of Khulna City.* Accepted.

### ICCESD 2026

- **Biswas, N.,** Gazi, B., & Paul, S. (2026). *Assessment of Land Use Land Cover Changes and Future Predictions using CA-ANN Simulation for Khulna City Corporation, Bangladesh.* Accepted.
- Biswas, N., Gazi, B., & Paul, S. (2026). *Land Surface Temperature Trend Analysis and Prediction for Urban Heat Crisis Management in Khulna City Corporation, Bangladesh.* Accepted.

# Research Experience

**1.Research Associate – Multi-Sensor Fusion-Based Blue Space Detection Projection**

UGC-funded Project | *April 1, 2025 – Ongoing*
*PI: Dr. Kazi Saiful Islam*

- Conducting research on multi-sensor fusion techniques to enhance blue space detection and mapping.
- Using data from multiple sensors, including drone-based imagery, to identify and project blue spaces in urban environments, supporting environmental and urban planning.
- Analyzing the spatial distribution of water bodies to aid in sustainable urban development strategies.
- Flying drones for data collection to capture high-resolution imagery and spatial data of urban water bodies, facilitating accurate blue space detection.

**2.Research Assistant – The Geography of Housing Stress: A Study of Khulna City**
**Khulna City Corporation** | *January 2025 – April 2025*

UGC-funded Project, PI: **Dr. Kazi Saiful Islam**

1. Conducted multivariate spatial cluster analysis to identify patterns in housing and household characteristics.
2. Applied correspondence spatial association techniques to explore relationships between housing attributes and urban planning factors.
3. Provided data-driven insights to support housing policy development and infrastructure planning.

**3.TGVRL (Trans Geo Virtual Research Lab)** | *January 2023 – Present*

1. Conduct GIS-based transportation research, analyzing traffic data and accident reports.
2. Apply reinforcement learning (RL) techniques to optimize transportation planning and traffic management.
3. Use Python, R, and ArcGIS Pro for data analysis, visualization, and modeling.
4. Contribute to research reports and project proposals, focusing on data-driven urban mobility solutions.

**4.Research Assistant –** Assessing the Impact of Land Use and Land Cover Changes on Land Surface Temperature Dynamics in the Coastal Region of Bangladesh | *March 2024 – August 2024*

Ministry of Science and Technology, Government of Bangladesh, under the Special Research Grant (SRG-234554), PI: **Dr. Kazi Saiful Islam**

- Applied deep learning techniques to classify land use and land cover (LULC) changes using satellite imagery.
- Used Analytic Hierarchy Process (AHP) to assess the contribution of different land use types to rising land surface temperatures (LST) in Bangladesh's coastal areas.
- Analyzed LULC dynamics to understand their impact on coastal climate patterns and urban heat island effects.

# Professional Experience

### 1.Vehicle Detection Specialist

- Center for Environmental and Geographic Information Services (CEGIS) | *March 2024 – May 2024*
- Developed a deep learning-based vehicle detection model for the Sonagazi Feni Master Plan Project.
- Integrated the detection system into urban planning frameworks to enhance traffic management and transportation analysis.
- Analyzed vehicle movement patterns to provide data-driven insights for infrastructure development.

### 2.Intern – Web Mapping Portal

DatEx, Dhaka, Bangladesh | *December 2023 – January 2024*

- Designed and implemented a WebGIS portal for the Chattogram Development Authority to improve land administration.
- Developed an interactive mapping tool that enables users to visualize, search, and print Mouza-based maps.

# Educations

**Thesis Title:** *Modeling Social Welfare by Different Public Transport Modes in Dhaka City*
**Institution:** Khulna University | *Expected Completion: November2025*

**Master of Urban and Rural Planning (MURP)** *(*
**Khulna University**, Bangladesh | *Graduated : November 2025*

**Thesis Title:** *Modeling Social Welfare by Different Public Transport Modes in Dhaka City*

**Summary:** This thesis explores how buses, metro rail, and informal services like Leguna impact social welfare in Dhaka. Using survey data and discrete choice modeling, it assesses user preferences, affordability, and environmental effects. The study develops optimization models to compare transport modes in terms of revenue, ridership, and equity, aiming to support fairer fare policies and improve access for low-income communities.

 CGPA: **3.50**

**Bachelor of Urban and Rural Planning (BURP)**
**Khulna University**, Bangladesh | *Graduated: December 2023*

**Dissertation Title:**
*Developing a Deep Learning-Based Traffic Detection Tool for Efficient Traffic Estimation in Khulna City: Focusing on Local Vehicle Dynamics*
Developed a deep learning-based traffic detection tool utilizing YOLO and ResNet101 to analyze and track vehicles in real-time, aiming to enhance traffic management and urban planning in Khulna City

- CGPA: **3.07**

## Certificates

- Monitoring, Evaluation, Accountability and Learning (MEAL DPro) – *Humanitarian Leadership Academy / OpenIGO, 2025*
    Gained comprehensive knowledge of MEAL frameworks, including logical framework design, theory of change, indicator development, data collection, analysis, accountability, and adaptive learning.
- Reinforcement Learning: Beginner to Master – AI in Python (Udemy)
- Mapping and Spatial Analysis with ArcGIS (Bohubrihi, 2022)
- GIS Data Formats, Design, and Quality (UC Davis, Coursera, 2022)
- Data Analysis with IBM SPSS Software (Bohubrihi, 2021)
- Microsoft Office Online Course (Udemy, 2021)
- ArcGIS Online Course (UC Davis, 2020)
- AutoCAD Software Specialization (Udemy, 2020)
- Photoshop and Adobe Illustrator Course (Coursera, 2020)

## Trainings

Power BI for Data Visualization and Monitoring – *Khulna University, Urban and Rural Planning Discipline (2024)*
Gained hands-on experience in developing interactive dashboards, managing data pipelines, and visualizing performance indicators using Microsoft Power BI for planning and MEAL applications

Disaster Risk Management – Youth Nexus & American Corner Khulna (2022)-Learned risk assessment techniques and disaster response strategies.

Urban Climate Resilience – GIZ Bangladesh (2022): Gained insights into climate adaptation strategies and sustainable urban planning.

Online GIS Training Program – Central University of Karnataka (2020): Developed skills in spatial data analysis, remote sensing, and GIS applications.

Machine Learning Training – Khulna University (2023): Explored machine learning algorithms for urban and transportation planning.

Google Earth Engine Training – Forestry Discipline, Khulna University (2024): Learned to analyze satellite imagery for environmental and land-use studies using Google Earth Engine.

## Skills

- ✓ Web Mapping Technologies: Experienced in Leaflet, OpenLayers, and Google Maps API, developing interactive WebGIS applications to visualize and analyze spatial data for urban planning projects.
- ✓ Geospatial Data Analysis: Proficient in QGIS, ArcGIS, and PostGIS, applying GIS tools for vehicle movement analysis, transportation planning, and land cover classification.
- ✓ Programming Languages: Skilled in JavaScript, Python, and SQL, with experience developing a deep learning model for vehicle detection in the Sonagazi Feni Master Plan Project. Automated data processing and GIS workflows to enhance spatial analysis efficiency.
- ✓ Project Management & Leadership: Led a vehicle detection team, managing ground truth data collection and video acquisition. Ensured accurate data labeling and preprocessing, improving model performance for traffic analysis.
- ✓ Version Control & Development Tools: Experienced with Git and Visual Studio Code, managing collaborative research projects to ensure smooth workflow and reproducibility.
- ✓ Teamwork & Communication: Coordinated with field surveyors, GIS analysts, and planners to integrate AI-driven insights into urban planning. Presented findings through technical reports and visualizations, supporting data-driven decision-making.

## Career Objectives

I'm working toward a career that brings together data science, AI, machine learning, and transportation planning to solve real-world problems in cities. I'm especially interested in using GeoAI and data-driven approaches to improve how we manage traffic, plan infrastructure, and respond to environmental challenges. Over time, I've also developed a strong interest in applying these tools to study climate-related hazards like landslides, droughts, and wildfires. Whether it's making urban systems more efficient or helping

communities become more resilient to extreme events, I'm motivated by research that can create meaningful, practical impact.

## Languages

- Fluent in Bengali and English

## Organizations

1. Member | Bangladesh Institute of Planners (BIP) | (October 2025 – Current)
2. Genius **Club:** Contributing to initiatives that support exceptional individuals facing educational barriers, helping them access opportunities for growth and development.
3. Come **For Road Child:** Working to provide education, essential resources, and support to street children, empowering them for a better future.
4. International **Youth Change Maker:** Engaging in youth-driven initiatives that foster positive social change through education, innovation, and community development.

## Awards & Grants

**University Grants Commission (UGC) Research Grant** – Bangladesh
*Year: 2025*

- Awarded a **nationally competitive research grant** by the University Grants Commission (UGC) for Master's thesis research: *"Modeling Social Welfare by Different Public Transport Modes in Dhaka City."*
- Selected among top proposals for its focus on sustainable urban transport, accessibility, and equity.
- Funding supported survey design, data collection, and development of quantitative models to guide policy and planning in Dhaka.

## References

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**Relationship:** Lab Supervisor for my research work