Md. Khayrul Islam Tuhin

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Profile

Dynamic GIS & Remote Sensing Specialist with 5+ years of expertise in environmental modeling, disaster risk analytics, and GeoAI-driven solutions. Combines technical proficiency in ArcGIS, QGIS, Google Earth Engine, HEC-RAS, and ERDAS Imagine with advanced programming skills in Python, JavaScript, and R. Recognized as NASA IASC Champion (2020) and Commonwealth Scholar (2021) for innovation and leadership in geospatial science. Author of 7+ international research publications in reputed journals such as Springer and Elsevier. Known for delivering high-impact insights through hydrological modeling, land use analysis, and multi-hazard risk mapping. A strategic thinker with a proven ability to merge spatial intelligence and socio-environmental data for sustainable and climate-resilient development.

Education

Masters of Science in Geography And Environments (Thesis), 01.2023 – 04.2024 | Dhaka, Bangladesh
University of Dhaka
Achieved CGPA 3.77 on scale of 4.00

Bachelor of Science in Geography And Environments, 01.2018 – 11.2022 | Dhaka, Bangladesh
University of Dhaka
Achieved CGPA 3.50 on scale of 4.00

Higher Secondary School Certificate, 2015 – 2017 | Dhaka, Bangladesh
Shahid Begum Sheikh Fazilatun Nessa Mujib Govt. College

Secondary School Certificate, 2015 | Dhaka, Bangladesh
Wazuddin High School

Awards and Scholarship

NASA's IASC Competition Champion, *NASA* 03.2020
Represented Bangladesh in NASA's IASC competition and won First Place as team leader of AstroBD with 17 Preliminary Discoveries and 1 Shared Discovery in February-March 2020.

Commonwealth of Learning Scholarship, 2021
Recipient of the prestigious Commonwealth of Learning Scholarship in 2021, awarded for outstanding academic achievement and IT related knowledge.

Professional Experience

1. **Associate Consultant**
   Geospatial Science and Research Foundation 08.2024 – Present | Dhaka, Bangladesh

- Develop and implement advanced GeoAI and geospatial models for environmental analysis, disaster risk management, and urban planning.
- Conduct urban environment assessments, including land use/land cover (LULC) change detection, urban heat island analysis, and fire hazard risk mapping.
- Utilize Google Earth Engine (GEE) and Python scripting for large-scale environmental monitoring, such as deforestation, soil moisture analysis, and water resource management.
- Prepare comprehensive project reports and presentations for stakeholders, summarizing insights and actionable outcomes.
- Collaborate with multidisciplinary teams to integrate socio-economic and environmental datasets for holistic spatial decision-making.
- Conduct spatial risk assessments and vulnerability mapping to support disaster preparedness and response strategies.

2. **Assistant Consultant,** 02.2024 – 07.2024 | Dhaka, Bangladesh
   End-to-End Landslide Early Warning and Anticipatory Action, Caritas Bangladesh

- Co-led the development of predictive models using GIS and remote sensing to enhance landslide forecasting and warning capabilities.
- Actively shaped project strategies by offering expert consultancy, ensuring innovative solutions for disaster preparedness.
- Directed on-site data collection and validation. Developed and maintained a comprehensive digital inventory of geographic data assets. Conducted analysis and risk assessment for landslide mitigation planning.
- Co-led educational sessions to improve local understanding and use of technological tools for disaster management.

3. **Research Associate (GIS & RS),** 06.2019 – 01.2024 | Dhaka, Bangladesh
   Geospatial Science and Research Foundation

- Developed predictive models for various sectors, including environmental analysis and land-use modeling.
- Proficient in GIS data handling, tools, and techniques, ensuring accurate and efficient geospatial analysis.
- Managed Geo-databases, ensuring data integrity and accessibility for research purposes.
- Conducted comprehensive Water-related analyses, contributing to informed decision-making processes.
- Established a reputation for effective problem-solving, resolving complex issues in project execution.
- Collaborated with cross-functional teams to integrate geospatial insights into broader research initiatives.
- Support the integration of remote sensing data with socio-economic and infrastructure datasets to enhance multi-criteria decision-making frameworks.

4. **Content Administrator and QAE,** 02.2019 – 05.2019 | Florida, United States
   Insider777 Inc.

- Used content management system to analyze user engagement and website traffic metrics.
- Collaborated with marketing and design teams to develop and plan site content, layout and style.
- Maintained content marketing calendar to schedule creation and delivery deadlines.
- Directed content of website by gathering information and integrating data from other departments. Approved, reviewed and edited content flowing to website.

5. **Growth Hacker,** 09.2018 – 02.2019 |Florida, United States
   Numio Labs

- Established strategic partnerships with key influencers and industry stakeholders, resulting in a **30%** expansion of brand visibility and reach within the target market.
- Led the implementation of referral programs and viral marketing initiatives, driving exponential growth in user referrals and organic traffic.
- Authored engaging content and thought leadership pieces, positioning Numio Labs as an authority in the field.

6. **Blockchain and Growth Hacker (Internship),** 03.2018 – 09.2018 |New York City, United States
   Hydrogen Technology

- Worked with customers to understand needs and provide excellent service.
- Resolved problems, improved operations and provided exceptional service.
- Prepared variety of different written communications, reports and documents.
- Maximized advertising efforts by developing content for media relations, corporate communications and social media posts.
- Collaborated with product development team to effectively modernize and update.

Project Integration

1. **Investigating the Impact of Climate Change on Water Security in the Barind Region of Bangladesh** — **University Grants Commission of Bangladesh**

   Conducted a comprehensive geospatial analysis to assess long-term hydrological changes in the Barind region using satellite imagery and climate datasets. Analyzed trends in rainfall variability, evapotranspiration, land use change, and water availability using tools such as Google Earth Engine (GEE), ArcGIS, and QGIS. Independently developed a climate change-induced water loss model by integrating precipitation (CHIRPS, GPM), evapotranspiration (MODIS, TerraClimate), and vegetation indices (NDVI, SAVI) to estimate seasonal and interannual water deficits. The model effectively identified critical zones of water stress and contributed to recommendations for climate-resilient irrigation planning, sustainable groundwater use, and adaptive water resource management. The study also highlighted spatial disparities in water vulnerability across upazilas and emphasized the urgency for localized water conservation strategies. Findings support the development of data-driven, climate-adaptive water governance policies in northern Bangladesh.

2. Hydrological Modeling of Riverbank Erosion of the Jamuna River of Bangladesh. — **University Grants Commission of Bangladesh**

Conducted hydrological and geomorphological modeling to assess riverbank erosion dynamics along the Jamuna River using multi-temporal satellite imagery and hydroclimatic data. Developed a spatial model to quantify erosion-prone zones by integrating flow velocity, rainfall trends, soil type, and historical river migration patterns. Utilized Google Earth Engine, ArcGIS, and Remote Sensing techniques to analyze channel shift, sediment load variation, and seasonal discharge impacts. The model provided spatial risk maps and predictive erosion zones, supporting evidence-based recommendations for erosion management, embankment planning, and disaster risk reduction strategies.

3. Infrastructure Optimization: Mapping Current Land Use. — **Bangladesh Road Transport Authority (BRTA)**

Conducted detailed land use and infrastructure mapping of the Gazipur Depot using high-resolution satellite imagery and GIS analysis. Identified and classified existing land use patterns, including transportation facilities, open spaces, and built-up areas, to support optimization of depot layout and operational efficiency. Employed remote sensing techniques combined with ArcGIS and QGIS for accurate spatial data extraction and visualization. Delivered comprehensive geospatial reports and maps that informed strategic infrastructure planning and enhanced resource allocation for the BRTA.

4. Unexplored By BRAC — **BRAC**

Led the comprehensive mapping and spatial analysis of BRAC's program activities across Bangladesh to identify unexplored and underserved areas. Mapped activity patterns, classified operational zones, and assessed accessibility using remote sensing data and GIS tools. Employed advanced spatial analysis and visualization techniques with Google Earth Engine, ArcGIS, and QGIS to support strategic decision-making and resource allocation. Delivered actionable insights and interactive maps that guided BRAC's expansion planning and improved outreach effectiveness.

5. Digital Land Survey – 2024. — **Bangladesh Road Transport Authority (BRTA)**

Conducted detailed land surveys by integrating multiple survey datasets to improve measurement accuracy for land parcels. Processed and validated spatial data to ensure consistency and precision. Prepared comprehensive survey reports summarizing findings and recommendations, which were submitted to BRTA stakeholders to support land management and planning decisions.

6. Digital Land Use and Socio-economic Survey of Jhilongjha Mouza, Cox's Bazar. — **Dhaka College**

Led and managed the first-ever fully digital land use survey of Dhaka College, overseeing planning, data collection, processing, analysis, and reporting. Employed KoboToolbox, KML-based location methods, and various GIS software to conduct precise field surveys, ensuring accurate parcel detection. Validated land use data with satellite imagery to assess accuracy at its peak. Integrated socio-economic data to analyze links between land use changes and socio-economic issues. Delivered detailed presentations and comprehensive reports to stakeholders, setting a new standard for digital land use assessments.

Software Skills

ArcGIS / ArcGIS Pro

1	2	3	4	5

- Proficient in ArcGIS Pro, **3D visualization**, and **temporal mapping** for dynamic spatial storytelling
- Built **advanced spatial models** using **Geoprocessing Tools**, **Model Builder**, **MCDA**, and **ArcPy automation**
- Integrated raster, vector, and remote sensing data for **predictive modeling** and impact assessments
- Designed high-quality maps with **multi-layer symbology**, **rule-based cartography**, and **batch production**
- Managed **geodatabases** with smart validation, attribute rules, and **multi-layer spatial analysis**
- Delivered insights through **interactive maps**, dashboards, and policy-ready layouts
- Performed **hydrological** and terrain analysis for flood, erosion, and environmental risk modeling
- Applied **spatial statistics**, **hotspot analysis**, and **accuracy assessments** for **model validation**
- Bridged ArcGIS with Google Earth Engine for **cloud-based geospatial analysis**
- Collaborated across disciplines to integrate **socio-economic** data into spatial **decision-making**

Google Earth Engine

1	2	3	4	5

- **Designed and implemented 150+ custom GEE scripts** for spatial modeling, classification, and time-series analysis of floods, LULC, drought, vegetation, and land surface temperature (LST).
- Developed **SAR-based flood detection workflows** using Sentinel-1 VV/VH bands with speckle filtering and change detection for high-resolution mapping.
- Built **NDVI, MNDWI, NDBI,** and **LST models** including classification and **time-series visualizations**.
- Created **climate and drought monitoring systems** integrating **CHIRPS, GPM, SMAP, GLDAS, MODIS,** and **reanalysis datasets**, computing **SPEI** and soil moisture anomalies.
- Analyzed urban **heat islands, eco-resilience,** and **wetland degradation** using long-term thermal and vegetation indices.
- Applied supervised classifiers for **LULC classification, accuracy assessments**, and **change detection** over multiple decades.
- Processed large climate reanalysis datasets to **model future scenarios**, **seasonal forecasts,** and **trend analyses**.
- Generated interactive outputs: **GIFs, multi-year charts, geospatial animations,** and **downloadable maps** to support **research and decision-making**.

Erdas Imagine

1	2	3	4	5

- Created robust **LULC change models** using cross-tab and transectional matrices
- Performed **image enhancement and correction** to refine spectral accuracy
- Built **spatial models** for multi-date analysis and environmental trend detection
- Used **NDVI, MNDWI, and LST indices** for eco-climatic assessments
- Aligned multi-temporal images through **image-to-image registration**
- Conducted **accuracy assessment** with confusion matrix and Kappa statistics
- Integrated ERDAS with GIS for seamless raster-vector workflows

QGIS / ENVY / ARES	1	2	3	4	5

- Created thematic maps with advanced symbology & labeling
- Used Raster Calculator for spatial modeling and suitability analysis
- Automated tasks with **PyQGIS** for faster data processing
- Performed land cover change detection with classification plugins
- Designed print-ready layouts and map compositions
- Conducted **LULC Prediction** -based analysis efficiently

HEC-RAS	1	2	3	4	5

- Simulated river flow and floodplains with precision modeling
- Integrated **DEM data and cross-sections** for hydraulic analysis
- Created flood hazard maps linking **HEC-RAS and GIS**
- Analyzed water surface profiles to support erosion and risk studies

Programming Language

Language	Key Skills & Applications
Python	Functions, loops, NumPy arrays, Pandas, ArcPy scripting, geospatial modeling, automation
JavaScript	GEE scripting, custom UI tools, arrays, objects, async logic for remote sensing workflows
R	Statistical functions, dataframes, tidyverse, spatial packages (sf, raster), visualization
C	Functions, arrays, pointers, algorithm design, logic building, foundational programming
HTML	Semantic structuring, responsive layout design, map embedding, dashboard interface design

Research and Publications

1. Islam, M. A., Parvin, M. I., Perveen, M. F., Jamal, M. R., Faruque, M. J., Hossen, B., **Tuhin, M. K. I.**, & Sarker, M. M. (2023). Assessment of Land Use Transition and Crop Intensification Using Geospatial Technology in Bangladesh. In *Case Studies in Chemical and Environmental Engineering*, Elsevier. https://doi.org/10.1016/j.cscee.2024.100660 **(Q1 Indexed, Impact Factor: 7.4, CiteScore: 8.5)**
2. Nafee, K. M., Al Fahad, M. S., **Tuhin, M. K. I.**, Hossen, M. S., & Ullah, M. S. (2023). Mapping of Landslide Susceptibility using state-of-the-art method and Geospatial Techniques in the Rangamati District in the Chattogram Hill Tracts region of Bangladesh. In *Landslide: Susceptibility, Risk Assessment, and Sustainability - Application of Geostatistical and Geospatial Modeling*, Springer. https://doi.org/10.1007/978-3-031-56591-5_5
3. Ullah, M. S., **Tuhin, M. K. I.**, Shapla, T., & Suhi, K. F. F. (2024). Geospatial modeling of wetland changes in the fringe area of Dhaka City: Past, present and future scenarios. *The Dhaka University Journal of Earth and Environmental Sciences, 12(2)*. https://doi.org/10.3329/dujees.v12i2.73166

4. Nafee, K. M., Ullah, M. S, Al Fahad, M. S., **Tuhin, M. K. I.**, & Nusrat, M., (2025). Geospatial Techniques for Mapping, Monitoring, and Modeling Erosion of Jamuna River in the Shahjadpur Upazila of Sirajganj District, Bangladesh to Support Risk Management, In *Remotely Sensed Rivers in the Age of Anthropocene*, Springer. https://doi.org/10.1007/978-3-031-82311-4_11

5. **Tuhin, M. K. I.**, Mishu, S. R., Sazuty, I. J., & Meem, R. A. (2025). Linking climate stress with vegetation and wetland degradation: A geospatial assessment of eco-resilience in the Barind Tract, Bangladesh. In *Eco-resilience: Climate change, land degradation and sustainable solutions*. Springer Cham. https://doi.org/10.1007/978-3-032-00708-7_7

6. Ullah, M. S. & **Tuhin, M. K. I.** (Accepted). Geostatistical and Geospatial Modeling of Landslide Susceptibility Mapping in Rangamati District, Chittagong Hill Tracts, Bangladesh - Springer.

7. Reyad, A. A., Ullah, M. S., & **Tuhin, M. K. I.** (2025). Exploring vegetation dynamics with NDVI and predicting the future vegetation coverage in the Chittagong Hill Tracts of Bangladesh using ANN-CA model. Ecological Modelling. Manuscript submitted for publication (Manuscript No. ECOMOD-25-1295).

Professional Certification

Fundamentals of GIS, 03.2019 – 05.2019 | Dhaka, Bangladesh
University of Dhaka

The certification provided a foundational understanding of Geographic Information Systems (GIS), covering essential concepts such as spatial data, geodatabase management, geodatabase design, digitizing, georeferencing, mapping, and GIS applications.

Certified Network Security Specialist (CNSS), 02.2020 – 10.2020 | United Kingdom
International Cybersecurity Institute

The course focused on core cybersecurity principles, this certification covered network security protocols, threat mitigation, and risk management in IT infrastructures.

Fundamentals of Remote Sensing, 08.2020 – 10.2020 | Dhaka, Bangladesh
Geospatial Science And Research Foundation

The course introduced the basic principles of remote sensing, including satellite imagery, sensor technologies, and data analysis techniques such as supervised and unsupervised classification, NDVI, MNDWI, LST, NDBI etc. used for Earth observation. It also covered practical applications in environmental monitoring, urban planning, and natural resource management, providing hands-on experience with processing and interpreting multispectral satellite data. This foundation enabled a deeper understanding of how remote sensing supports sustainable decision-making across various fields.

Professional GIS, 08.2021 – 10.2021 | Dhaka, Bangladesh
Geospatial Science And Research Foundation

An advanced course that delved deeper into the professional applications of GIS, with a focus on spatial data management and analysis, network analysis, cyclone tracking, multi weighted model designing, hydrological modeling, spatial data prediction model and advance modeling for decision-making.

Fundamentals And Applied Remote Sensing, 11.2021 – 01.2022 | Dhaka, Bangladesh
Geospatial Science And Research Foundation

The course covered remote sensing theory and practical skills, including electromagnetic radiation, and sensor technologies like optical, radar, and LiDAR. Use of ERDAS Imagine, ENVI, and ArcGIS to process satellite imagery and applied remote sensing for land use, deforestation, and urban analysis.

Python Scripting in ArcGIS, 03.2022 – 06.2022 | Dhaka, Bangladesh
Geospatial Science And Research Foundation

An advance training focused on Python scripting in ArcGIS using ArcPy. Learned to automate geospatial tasks such as database management, spatial analysis etc. Performed advanced analyses like automatic spatial analysis, streamlining workflows and enhancing efficiency in geospatial data processing.

Big Data Analysis Using Google Earth Engine (GEE) : Tools and Techniques, 04.2023 – 07.2023 | Dhaka, Bangladesh
Geospatial Science And Research Foundation

The course focused on Google Earth Engine, teaching cloud-based analysis of large-scale geospatial datasets. It emphasized land use/land cover (LULC) mapping, climatic monitoring of gases like NO, NO_2, CO_2, SO_2, and flood detection and management. Participants gained expertise in environmental monitoring using advanced geospatial tools.

Data Science & Analytics, 10.2024 | United States
HP Foundation

Completed a comprehensive course on Data Science and Analytics, focusing on the transformative impact of data in the digital era. Gained insights into data collection, storage, and analysis, with an emphasis on enhancing customer experiences and driving innovation. Developed essential skills in programming, data visualization, and cloud computing. Engaged in practical exercises to solidify knowledge of data governance and the challenges posed by rapid data growth.

Landslide Monitoring and Risk Assessment Using NASA Earth System Data 03.2025 | United States
NASA Applied Remote Sensing Training Program

Completed specialized training on Landslide Monitoring & Risk Assessment using NASA Earth System Data, focusing on remote sensing and geospatial modeling. Gained hands-on experience with GPM, MODIS, and SRTM datasets for hazard analysis. Applied the SALaD (Semi-Automatic Landslide Detection) model for post-event landslide detection using optical imagery and the LHASA (Landslide Hazard Assessment for Situational Awareness) model for real-time susceptibility mapping based on rainfall thresholds and terrain factors. Utilized SAR data and open-source tools to automate workflows, validate outputs, and enhance early warning systems in data-scarce, hazard-prone areas.

Monitoring Global Terrestrial Surface Water Height Using Remote Sensing 05.2025 | United States
NASA Applied Remote Sensing Training Program

Completed introductory training on monitoring global freshwater bodies using satellite remote sensing. Gained knowledge of historical and current water height datasets derived from missions such as TOPEX-Poseidon, Jason-1/2/3/6, and the latest SWOT mission. Learned to analyze surface water dynamics-including lake and river elevation, slope, width, and discharge- using high-resolution SWOT data (~200 m). Explored applications of these datasets in water resource management, transboundary river monitoring, and disaster resilience. Acquired hands-on experience with accessing SWOT products and using visualization tools like SWOTviz and WISP to support data-driven decision-making for hydrological and environmental monitoring.

Introduction to the Integration of Animal Tracking and Remote Sensing 05.2025 | United States
NASA Applied Remote Sensing Training Program (ARSET)

Completed specialized training on integrating animal telemetry with satellite-based environmental datasets to analyze habitat use and ecological change. Gained an understanding of major animal tracking sensors, NASA's history of animal tracking, and the Internet of Animals initiative. Learned how to pair time-matched remote sensing products-including Level-3/4 datasets such as OSCAR ocean surface currents-with high-frequency animal location data. Acquired skills in data standardization, home range analysis using utilization distributions, and species distribution modeling to characterize habitat suitability. Explored trade-offs in spatiotemporal matching and computational constraints, with practical examples for both marine and terrestrial ecosystems.

LiDAR Profiling Satellite Observations for Air Quality Applications 06.2025 | United States

NASA Applied Remote Sensing Training Program (ARSET)

Completed specialized training on active remote sensing techniques using spaceborne LiDAR systems for atmospheric and air quality applications. Gained foundational knowledge of LiDAR principles, including laser pulse transmission, backscatter measurement, and vertical profiling of aerosols, trace gases, and clouds. Studied key past and current LiDAR missions such as CALIOP, CATS, ICESat-2, and EarthCARE, learning how to interpret lidar curtain imagery to identify cloud phases, aerosol types, and plume altitudes. Developed practical skills in discovering, accessing, and analyzing LiDAR datasets through NASA Earthdata portals to support air quality assessment and scientific research.

References

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