

S. OLAREWAJU OLAGUNJU

PhD Researcher, Civil & Environmental Engineering

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RESEARCH PROFILE

PhD candidate in Civil and Environmental Engineering at Nazarbayev University, submitting the thesis within two months and expecting to defend within five months. Research spans four connected areas: urban building material stock and flow analysis, geospatial remote sensing for the built environment, natural language processing applied to circular economy discourse, and transboundary water governance. Author of seven peer-reviewed journal papers, with a further five manuscripts under review or submitted, including a submission to Nature Communications. Methods combine bottom-up material flow analysis with Monte Carlo uncertainty propagation, deep learning-based remote sensing, and large language model-based text classification, applied at city scale in Kazakhstan, Norway, and multi-country UN treaty and transboundary water corpora.

EDUCATION

2023 - Present PhD, Civil & Environmental Engineering, Nazarbayev University, Kazakhstan. Supervisors: Ferhat Karaca; Huseyin Atakan Varol (co-supervisor). Submitting thesis within two months; defense expected within five months.

2023 MSc, Civil & Environmental Engineering, Nazarbayev University, Kazakhstan

2019 BSc, Civil Engineering, University of Ilorin, Nigeria

RESEARCH EXPERIENCE

Research Fellow | Institute of Smart Systems and Artificial Intelligence (ISSAI), Nazarbayev University

Jun 2024 - Present

- Led the Global Flood Vulnerability Model (GFVM) project: a calibration-free, building-scale model integrating hierarchical DEM selection, deep learning-derived building heights (ConvNeXt), multi-hazard decomposition, and SHAP-based explainability, validated on the 2024 Petropavlovsk flood and published in Remote Sensing (2026).
- Conducted a four-city LiDAR validation study (Amsterdam, Paris, Toronto, Hong Kong) of two global building height datasets, quantifying domain shift and error propagation into downstream urban volumetric stock and disaster risk estimates.
- Applied bottom-up material flow analysis with Monte Carlo uncertainty propagation to building stocks in Astana (193 buildings) and Barcelona (1,746 buildings), integrating GIS-based typology classification with geometric measurement.
- Directed a field survey of approximately 350 Soviet-era buildings in Astana, building a georeferenced photographic dataset and a reconciled 228-building municipal registry to train a street-level building typology classification model.
- Developed an NLP pipeline (BERTopic, XLM-RoBERTa sentiment analysis, LLM-based 10R classification, fuzzy c-means clustering) mapping circular economy discourse transition gradients in Norwegian construction; under review at Journal of Cleaner Production.
- Developed a human-guided agentic AI classification pipeline coding a transboundary water governance corpus against the novel STREAM taxonomy, developed from UNEP and OECD circular economy documents; findings submitted to Nature Communications.
- Built and maintain a structured database of satellite-derived observations for urban-scale material flow analysis and construction activity monitoring.
- Author peer-reviewed research articles on GeoAI applications for urban material stock assessment and construction monitoring.

Graduate Research Assistant | Nazarbayev University

Nov 2021 - Aug 2023

- Led an industry-sponsored project funded by ArcelorMittal (Kazakhstan) evaluating Basic Oxygen Furnace (BOF) steel slag for railway ballast applications.
- Conducted laboratory characterization of BOF slag, including physical, mechanical, environmental, and chemical testing, and geotechnical testing (UCS, triaxial, bender element) for soil stabilization assessment.
- Evaluated results against Kazakhstan railway ballast standards (GOST) and prepared the final technical R&D report.

TEACHING EXPERIENCE

Teaching Assistant | Nazarbayev University, Astana, Kazakhstan

Aug 2023 - May 2024

- Supported instruction in Differential Equations and Linear Algebra (Fall 2023).
- Conducted tutorial sessions on statistical analysis, probability theory, and data interpretation (Spring 2024).
- Provided grading support and individualized assistance to reinforce core mathematical and statistical concepts.

PUBLICATIONS

Peer-Reviewed Journal Papers

- **Olagunju, S.O.**, Sharipova, A., Serikkyzy, A., Satybaldiyeva, D., Varol, H.A., Karaca, F. (2026). Global flood vulnerability model: building-level assessment using multi-source remote sensing. *Remote Sensing*, 18(9), 1425. <https://doi.org/10.3390/rs18091425>
- Sundetova, A., **Olagunju, S.O.**, Varol, H.A., Karaca, F. (2026). Potential contributions of building material stocks in Soviet-era buildings to urban mining and circular economy strategies. *Waste Management*, 225, 115776. <https://doi.org/10.1016/j.wasman.2026.115776>
- **Olagunju, S.O.**, Varol, H.A., Karaca, F. (2026). Curvature-aware urban terrain earthwork volume estimation: a multi-city remote sensing framework. *Geocarto International*. <https://doi.org/10.1080/10106049.2025.2609371>
- Mustafayeva, A., Bimykova, A., **Olagunju, S.O.**, Moon, S-W. (2023). Mechanical properties and microscopic mechanism of basic oxygen furnace slag-treated clay. *Buildings*. <https://doi.org/10.3390/buildings13122962>
- **Olagunju, S.O.**, Mukhtarkhan, D., Kim, J., Moon, S-W. (2023). Physical, mechanical, chemical and environmental characterization of stockpiled BOF slag as railway ballast material. *Construction and Building Materials*. <https://doi.org/10.1016/j.conbuildmat.2023.133613>
- Ocheme, J.I., **Olagunju, S.O.**, Khamitov, R., Satyanaga, A., Kim, J., Moon, S.W. (2022). Triaxial test behavior of CSA-treated sand with high confining pressure. *Journal of Geomechanics and Engineering*. <https://doi.org/10.12989/gae.2023.33.1.041>

Conference Proceedings / Book Chapters

- **Olagunju, S.**, Suleimen, Z., Mukhtarkhan, D., Darbayeva, T., Muratova, A., Kim, J., Moon, S.W. (2023). Characterization of stockpiled Basic Oxygen Furnace (BOF) slag for railway ballast material application. In *Smart Geotechnics for Smart Societies* (pp. 2520-2523). CRC Press. <https://doi.org/10.1201/9781003299127-392>

Preprints

- Bissarinova, U., Awan, H.H., **Olagunju, S.O.**, Bolatkhanov, I., Turekhassim, A., Varol, H.A., Karaca, F. (2025). CSDS: AI-based construction site detection and segmentation tool for satellite images. *TechRxiv*. <https://www.techrxiv.org/doi/full/10.36227/techrxiv.176054630.07365932>

Under Review / Submitted

- Joint propagation of typology misclassification and geometric measurement errors in urban material stock assessment (floor-area-based material intensity models); under review at *Journal of Industrial Ecology*.
- How reliable are global building height datasets for urban volumetric stock estimation? LiDAR evidence from four cities; submitted to *Journal of Industrial Ecology*.
- Circularity is not a switch: mapping corporate discourse transition gradients with natural language processing; under review at *Journal of Cleaner Production*.
- Mapping circular economy alignment in global transboundary water policies by human-guided agentic AI; submitted to *Nature Communications*.
- A satellite imagery and airborne LiDAR dataset for construction earthwork segmentation and volume estimation; submitted to *Scientific Data*. Dataset (EarthworkSat-7K) publicly released at .

CONFERENCES & PRESENTATIONS

- 17th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering (ARC), ISSMGE, Astana, Kazakhstan (Aug 14-18, 2023). Presented "Characterization of stockpiled Basic Oxygen Furnace (BOF) slag for railway ballast material application."
- AI and the Circular Economy: Shaping the Future of Construction Policy and Practice, ISSAI, Nazarbayev University (Nov 2024). Invited talk on deep learning for sustainable construction and satellite-based material flow analysis in the built environment.
- 2nd NU SEDS Annual Research Conference, Nazarbayev University (Apr 9-10, 2026). Poster: "Global Building-Level Flood Vulnerability Assessment."

AWARDS & FUNDING

- 2026: Research Excellence Award, Nazarbayev University, for publishing in a top-10-percentile journal (Remote Sensing).
- Fall 2023: Dean's Award, Nazarbayev University, for achieving a semester GPA of 3.7/4.0 or above.
- 2021 - Present: "Abay Kunanbayev" Scholarship, Nazarbayev University, Kazakhstan (full-tuition, merit-based).

RESEARCH SKILLS & METHODS

Material Flow Analysis: Bottom-up MFA with Monte Carlo uncertainty propagation, building stock characterization, GIS-based typology classification

Remote Sensing: LiDAR and DEM processing, very high-resolution satellite image analysis, deep learning-based building height estimation, Google Earth Engine

Text & Discourse Analysis: Topic modelling (BERTopic), multilingual sentiment analysis (XLM-RoBERTa), LLM-based classification, agentic AI document pipelines

Quantitative Methods: Statistical analysis, predictive modelling, SHAP explainability, quantitative research design

TECHNICAL SKILLS

Programming: Python, R, SQL, Git and version control

GIS & Mapping: ArcGIS Pro, QGIS, Google Earth Engine

Visualization & Reporting: Matplotlib, Power BI, Tableau

SUPERVISION & MENTORSHIP

- Co-mentored one Master's student researching building material stocks and circular economy strategies in Soviet-era architecture, Nazarbayev University.
- Supervised six undergraduate researchers on the Global Flood Vulnerability Model project (computer vision, geospatial analytics, machine learning).
- Supervised four undergraduate researchers on the ArcelorMittal-funded steel slag research project.
- Supervising two undergraduate researchers on Soviet-era building typology classification.

EXTRACURRICULAR

- Captain, International Student Football Team, Nazarbayev University (2021 - Present).

REFERENCES

Available on request.