Shahzaib Khan

PhD Candidate, University of Washington, Seattle, WA

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I study Earth's surface water resources, focusing on sustainable and efficient approaches to their management. My work leverages satellite remote sensing and modeling to create practical tools that connect cutting-edge research with real-world applications.

Education

PhD in Civil and Environmental Engineering (Expected to Finish in Dec 2025)
University of Washington, Seattle, WA, USA

MS in Civil and Environmental Engineering (2022)
University of Washington, Seattle, WA, USA

B.Tech with Honors in Civil Engineering (2021)
Indian Institute of Technology (IIT) Gandhinagar, Gujarat, India

Professional Employment History

Graduate Research Assistant (Sep 2021 - Present)
University of Washington

Summer Intern at Jet Propulsion Laboratory (July 2025 – Sept 2025)
NASA, California

Student Research Internship (May 2019- Jul 2019, May 2020 – July 2020)
IIT Gandhinagar

Class Representative (2019-2020, 2020-2021)
IIT Gandhinagar

Publications

1. **S. Khan**, Z. N. Hossain, S. Suresh, and F. Hossain (2025). The Untapped Hydropower Potential of Large Cities of The World, Earth's Future Commentary (In Review)

2. **S. Khan**, F. Hossain, M. Ahamed, and K. Islam (2025). Satellite Data Rendered Irrigation using Penman-Monteith and SEBAL (sD.R.I.P.S) for Surface Water Irrigation Optimization, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* (In Review, preprint - https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5049583).

3. **S. Khan,** F. Hossain, et al. (2024). A Network Design Approach for Citizen Science-Satellite Monitoring of Surface Water Volume Changes in Bangladesh, *Environmental Modelling and Software***.** https://doi.org/10.1016/j.envsoft.2023.105919.

4. **S. Khan,** F. Hossain, et al. (2022) Understanding Volume Estimation Uncertainty of Lakes and

Wetlands Using Satellites and Citizen Science**,** *IEEE JSTARS.* https://doi.org/10.1109/JSTARS.2023.3250354

5. **S. Khan,** N. Kamboj, U. Bhatia (2020) Lifeline Infrastructures and Hydro-climate Extremes: A Future Outlook, *Climate Change and Extreme Events*. https://doi.org/10.1016/B978-0-12-822700-8.00004-4

6. A. M. Gómez, S. Biancamaria, T. Pavelsky, K. Nielsen, G. Parkins, M. Lane, **S. Khan**, F. Hossain, R. Bhattarai, S. Ghafoor, J.F. Crétaux, C. Yanez, N. Picot (2025). Evaluation using In-Situ Observations from National Governments and Citizen Scientists Suggests Nadir Altimeters can Accurately Measure Water Levels Changes Regardless of Lake Area. *GIScience and Remote Sensing,* https://doi.org/10.1080/15481603.2025.2543521

7. Minocha**,** S., F. Hossain, P. Das, S. Suresh**, S. Khan,** G. Darkwah, K. Andreadis, H. Lee, G. Holt, S. Galelli (2023). Reservoir Assessment Tool: A scalable and easy-to-apply python based software architecture to empower the global water community, *Geoscientific Model Development*, https://doi.org/10.5194/gmd-2023-130.

8. Darkwah, G, F. Hossain, V. Tchervenski, G. Holtgrieve, C. Seaton, D. Graves, S. Minocha, P. Das, **S. Khan**, S. Suresh (2024) Reconstruction of the Hydro-Thermal History of Regulated River Networks Using Satellite Remote Sensing and Data-driven Techniques, *Earth's Future, vol 12(10)*, https://doi.org/10.1029/2024EF004815.

9. S. Suresh, F. Hossain, S. Minocha, P. Das, **S. Khan**, H. Lee, K. Andreadis and Perry Oddo (2023). Satellite-based Tracking of Reservoir Operations for Flood Management during the 2018 Extreme Weather Event in Kerala, India, *Remote Sensing of Environment, vol. 307*, https://doi.org/10.1016/j.rse.2024.114149.

10. Minocha, S., Pei-Hsin Pei, **S. Khan**, and F. Hossain (2023) Factors influencing Lake Surface Temperature for Reservoirs of the Columbia River Basin**,** *Northwest Science, vol. 97(4,* https://doi.org/10.3955/046.097.0403

11. Das, P., F. Hossain, **S. Khan**, N. K. Biswas, H. Lee, T. Piman, C. Meechaiya, U. Ghimire, K. Hosen (2022) Reservoir Assessment Tool 2.0: Stakeholder driven Improvements to Satellite Remote Sensing based Reservoir Monitoring**,** *Environmental Modeling and Software.* https://doi.org/10.1016/j.envsoft.2022.105533.

12. P. Das, F. Hossain, H. B. Helgason, and **S. Khan**. Satellites over the amazon capture the choking of the "house of god" by the Belo Monte Dam – they can help find solutions, too, May 2022 [*Non-Peer-Reviewed*], *Link*

Conferences and Oral Presentations

1. **S. Khan**; F. Hossain; M. Ahamed (2024). sD.R.I.P.S: Satellite Data Rendered Irrigation Using Penman and SEBAL - A Framework For Surface Water Irrigation Optimization. [*AGU Conference 2024*]

2. **S. Khan**; et al, (2024). sD.R.I.P.S-Sense: A Hybrid Framework of Satellite and Sensor-Based

Data Rendered Irrigation Using Penman and SEBAL Model. [*AGU Conference 2024*]

3. T. Pavelsky, F. Hossain, S. K. Ghafoor, G. Parkins, A. M. Gomez, **S. Khan**, R. Bhattarai and M. Hendrickson (2024). Building a Global Lake Observation System through the Lake Observations by Citizen Scientists and Satellites (LOCSS) Project. [*AGU Conference 2024*]

4. **S. Khan**; F. Hossain, et al, (2023). An Optimal Network Design Framework for Citizen Science-Satellite Monitoring of Surface Water Volume Changes in Bangladesh. [*AGU Conference 2023*]

5. A. M. Gomez, T. Pavelsky, G. Parkins, M. Lane, **S. Khan**, F. Hossain, R. Bhattarai, S. K. Ghafoor, J.F. Crétaux (2023). Regional lake monitoring network design aided by Citizen Scientists and Satellites [*AGU Conference 2023*]

6. S. Minocha, F. Hossain, P. Das, S. Suresh, **S. Khan**, G. Darkwah (2023). Collaborative Water Management for Advancing Open Science in Regulated River Basins with the Open-Source Reservoir Assessment Tool (RAT) 3.0: A Python Package Integrating Cloud Computing, Satellite Data, and Modeling [*AGU Conference 2023*]

7. S. Suresh, F. Hossain, S. Minocha, P. Das, **S. Khan**, H. Lee, K. Andreadis, P. Oddo (2023). Satellite Earth Observations Based Tracking of Reservoir Operations for Flood Preparedness in Mountainous and High Precipitation Regions: A Case of the 2018 Kerala Floods. [*AGU Conference 2023*]

8. A. M. Gomez, D.R. Arias, T. Pavelsky, G. Parkins, M. Lane, L.D. Donado, **S. Khan**, F. Hossain, W.J.G Ríos, R. Bhattarai, S.K. Ghafoor (2023). Enhancing levels of engagement in citizen science projects involving lake water level monitoring. [*AGU Conference 2023*]

9. **S. Khan**; F. Hossain; T. Pavelsky, et.al, Investigating Volumetric Uncertainty of Lakes and Wetlands Using Satellites and Citizen Science, American Water Resources Association Annual Conference 2022, Seattle, WA, Nov. 7-9, 2022 [*AWRA Conference 2022*]

10. A. M. Gomez, S. Biancamaria, T. Pavelsky, G. Parkins, M. Lane, **S. Khan**, F. Hossain, R. Bhattarai, S.K. Ghafoor, J.F. Crétaux, N. Picot (2023). Nadir altimeter validation in small lakes using multisource ground observations. [*AGU Conference 2022*]

11. **S. Khan**, D. Upadhyay, U. Bhatia, Extreme Precipitation Volatilities and Its Implication for Critical Infrastructures in India, American Meteorological Society (AMS) Conference (15th Symposium on Societal Applications: Policy, Research and Practice) 2020, Boston, MA, Jan. 14-15, 2020. [*AMS Conference 2020*]

Awards, Honors, and Media Presence

1. Appreciation Award (2023) for SWOT training, Bangladesh Water Development Board [UW News Link]
2. NASA Certificate of Appreciation (2022), SWOT Early Adopter Virtual Hackathon

3. American Water Resources Association Fellowship (2023), [Link]
4. Deans List for exceptional performance in academia, IIT Gandhinagar
5. IRAS system featured in NASA article [Link]
6. sD.R.I.P.S-Sense work featured in UW News [Link]

Notable Tools Developed

1. sD.R.I.P.S – A scalable and user-friendly tool to guide the water providers and consumers to guide the user on how much water to apply based on the actual crop water need.
2. sD.R.I.P.S-Sense – A hybrid tool that dynamically switches between satellite-based monitoring of the water need of the crop and a hybrid of the satellite and in situ sensor data for monitoring the water need of the crop based on the availability of the sensor data. Used by landscape workers at the University of Washington.
3. SWOT Raster Visualizer – Visualizes the SWOT Raster Product to monitor water surface elevation and understand flood propagation for Tripura state (India) during the 2024 floods.
4. IRAS – Generates weekly irrigation advisory for rice in Northeastern and Northwestern Bangladesh. Used by the Department of Agricultural Extension of Bangladesh.
5. PyWRIS – A Python API to access Water Resource and Information System (WRIS, India) data.

Research Experience

1. Developing a Python package to generate satellite-informed weekly irrigation advisories for farmers and canal operators. The package integrates in-situ sensor and local weather station data, if available, to bias-correct global numerical weather models, improving the accuracy of evapotranspiration estimates.
2. Created an open-source, scalable, and user-friendly framework that helps water canal operators allocate water more efficiently based on crop water demand and actual field conditions, supporting climate change adaptation in irrigation management.
3. Explored the potential of the SWOT satellite's on-demand raster generation tool (SWODLR), demonstrating its ability to generate configurable rasters at finer spatial resolution than standard products to improve understanding of flood propagation.
4. Designed an open-source framework for scalable gauge networks in lakes and wetlands by integrating citizen science with satellite-derived data. The framework optimizes gauge placement to ensure representative monitoring of regional surface water storage.
5. Redesigned and advanced Integrated Rice Advisory System (IRAS) tool for Bangladesh incorporating the satellite-based Surface Energy Balance Algorithm (SEBAL) and the Penman-Monteith equation to assess irrigation sufficiency in rice fields. The system provides tailored advisories for farmers and was featured in a NASA article.
6. Investigated uncertainties in lake water volume change estimates, focusing on variability introduced by radar- and optical-based water surface detection methods, while leveraging citizen science elevation data.

Teaching Experience

1. Teaching Assistant for CEWA 566 (Satellite Remote Sensing For Water Resources) in Fall 2024, and taught Google Earth Engine.
2. Guest lecturer for Environmental and Water Program Seminar, organized by the University of Washington's Civil and Environmental Engineering Department.

Journal Review Experience

1. Geophysical Research Letters (1)
2. Environmental Modelling and Software (1)
3. Earth Science Informatics (1)
4. Discover Geoscience (1)
5. Scientific Reports (1)

Training and Outreach

1. Trained 25 participants from the Bangladesh Water Development Board on '*Remote sensing based surface water tracking, citizen science, Cloud Computing and the Surface Water and Ocean Topography (SWOT) Mission*'. The training was held in December 2023 in Bangladesh.
2. Trained the Directorate of Agricultural Extension on using the '*Integrated Rice Advisory System (IRAS)*'. The training was held in December 2023 in Bangladesh.
3. Trained the participants during the *2022 SWOT Early Adopter Virtual Hackathon* organized by NASA, CNES, and the University of Washington.
4. Trained the Department of Hydrology and Meteorology of Nepal on *'Utilizing Satellite Remote Sensing Data to Monitor Lakes'*.
5. Revived UW Chapter of the *American Water Resources Association (AWRA)* after COVID-19

Society Affiliations

1. American Geophysical Union, *Student Member (*2022–current)
2. American Water Resources Association, *Student Member (*2022–current)

Summer School

1. Attended Summer School on Climate, Science and Engineering Policy Dialogue of Civilizations Summer 2020, Northeastern University, Boston, by Professor Auroop Ganguly (Northeastern University) and Professor Udit Bhatia (IIT Gandhinagar).

Stakeholders Engagement

Bangladesh Water Development Board (A government agency that is responsible for water management in Bangladesh).
Department of Agricultural Extension (A government agency in Bangladesh that provides extension services to the farmers in accessing and utilizing better know-how to increase profitable crop production.
Crown Farms (A private farm in South Africa)
University of Washington Landscape Workers
Pakistan Council of Research in Water Resources (A government agency that is responsible for water management in Pakistan).

Computing Skills

Cloud computing and programming: Google Earth Engine, Python, MATLAB, Bash
Hydrological Modelling: VIC, HEC-RAS, HEC-HMS
GIS Analysis and Database: ArcGIS, QGIS, GDAL
Drafting and Documentation: Microsoft Office
Version Control: Git
Web and Visualization: HTML, JavaScript, Leaflet.js, Highcharts.js

Recommendations By

Dr. Faisal Hossain (University of Washington)