Shahzaib Khan

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Education

PhD in Civil and Environmental Engineering (Jan 2023 – Expected to Finish in Dec 2025)
University of Washington, Seattle, WA, USA
MS in Civil and Environmental Engineering (Sep 2021 – Dec 2022)
University of Washington, Seattle, WA, USA
BTech in Water Resources Engineering (July 2017 – July 2021)
Indian Institute of Technology (IIT) Gandhinagar, Gujarat, India

Coursework

Geospatial Data Analysis, Satellite Remote Sensing, Physical Hydrology, Advanced Hydrology, Data Analysis in Water Sciences, Hydraulic Design for Environmental Engineering, Sediment Transport, Applications in Geographic Information Systems, Water Resource System Management and Operations, Fundamentals of Climate Change, Introduction to Machine Learning, Scientific Writing, Advanced Satellite Remote Sensing, Data Visualization, Software Development

Professional Employment History

Graduate Research Assistant (Sep 2021 - Present)
University of Washington
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**, F. Hossain, M. Ahamed (2024). Satellite Data Rendered Irrigation using Penman-Monteith and SEBAL (sD.R.I.P.S) for Surface Water Irrigation Optimization, *Agricultural Water Management* (In revision, preprint - https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5049583).

2. **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.

3. 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 (2024). 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* (In review).

4. 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.

5. 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.

6. 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.

7. 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)*

8. 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.

9. **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

10. **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

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*]

Research Experience

1. Developed an open-source, scalable, and user-friendly framework to assist water canal operators in allocating water efficiently based on crop water demand and in-field conditions, addressing the challenges posed by climate change.
2. Designed an open-source, scalable gauge network framework for lakes and wetlands by integrating citizen science with satellite-derived data. This framework identifies the optimal number and strategic placement of gauges to ensure effective regional representation.
3. Redesigned and developed Integrated Rice Advisory System (IRAS) tool for Bangladesh incorporating the satellite-based Surface Energy Balance Algorithm (SEBAL) and the Penman-Monteith equation. The tool assesses whether irrigated rice fields are over- or under-irrigated and provides tailored irrigation advisories for farmers. This work was highlighted in a NASA article.
4. Investigated the uncertainties in the volume change of water in lakes and focusing on the variability introduced by different water surface detection methods, including radar and optical sensors, while leveraging elevation data collected through citizen science.

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 be applied 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 SWOT Raster Product to monitor water surface elevation and understand flood propagation for Tripura state (India) during 2024 floods.
4. IRAS – Generates weekly irrigation advisory for rice for 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.

Teaching Experience

1. Teaching Assistant for CEWA 566 (Satellite Remote Sensing For Water Resources) in Fall 2024 and taught Google Earth Engine.

Awards, Honors, and Media Presence

1. Appreciation Award (2023) for SWOT training, Bangladesh Water Development Board
2. NASA Certificate of Appreciation (2022), SWOT Early Adopter Virtual Hackathon
3. American Water Resources Association Fellowship (2023), University of Washington
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]

Community Services

Peer Reviews for International Scientific Journals

1. Geophysical Research Letters (1)
2. Environmental Modelling and Software (1)
3. Earth Science Informatics (1)

Capacity Building and Outreach

1. Trained 25 participants from 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 Directorate of Agricultural Extension on using the ‘Integrated Rice Advisory System (IRAS)’ The training was held in December 2023 in Bangladesh.
3. Trained and helped participants during the 2022 SWOT Early Adopter Virtual Hackathon organized by NASA, CNES, and UW
4. Trained the Department of Hydrology and Meteorology of Nepal on using satellite 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