AHAD HASAN TANIM

CIVIL ENGINEER ● WATER RESOURCES

✉ atanim@email.sc.edu;   🔷 ahad-hasan-tanim   iD 0000-0002-3987-1431   in tanim-b0a64bb1

EDUCATION

Ph.D.   2020 – 2023
Civil & Environmental Engineering, University of South Carolina
Advisor: Dr. Erfan Goharian
Dissertation: Towards Enhanced Flood Risk Management Life Cycle: Advances in Flood Inundation Modeling and Data-Driven Coastal Vulnerability analysis.

M.Sc.   2017 – 2019
Civil Engineering, Chittagong University of Engineering & Tech. (CUET), Bangladesh
Advisor: Dr. Aysha Akter
Thesis: Storm surge modeling in the northern Bay of Bengal.

B.Sc.   2011 – 2015
Civil Engineering, Chittagong University of Engineering & Tech. (CUET), Bangladesh

PROFESSIONAL EXPERIENCE

Postdoctoral Research Associate
Oak Ridge National Lab, Water Division   2024 –

Graduate Research Assistant   2019 – 2023
iWERS, University of South Carolina

Assistant Professor (Research)   2019 – 2020
Center for River, Harbor and Landslide Research, CUET

Research Lecturer   2017 – 2019
Center for River, Harbor and Landslide Research, CUET

Research Assistant   2015 – 2017
Center for River, Harbor and Landslide Research, CUET

RESEARCH INTEREST

Hydropower operation, Reservoir management, Compound flood simulation, Hydraulics of coastal areas, climate risk on water system, Flood modeling, delta dynamics

SOFTWARE/WEB APPS AND DATASETS

1. Bayes_Opt-SWMM: A Gaussian process-based Bayesian optimization tool for real-time flood modeling with SWMM (Link: https://github.com/Ahad-Hasan-Tanim10/Bayes_opt-SWMM)
2. Tanim, A. H., & Goharian, E. (2022). Towards an integrated probabilistic coastal vulnerability assessment: A Novel copula-based vulnerability index. Mendeley Data, V1. https://doi.org/10.17632/4x5w2n93rv.1
3. Jurisdiction App (E-permitting apps) of South Carolina Department of Transportation (Contributed to geospatial tools development)
4. Stream and Wetland Mitigation Webapp of South Carolina Department of Transportation. (Contributed to geospatial tools and analysis package development)

Github repository: https://github.com/Ahad-Hasan-Tanim10/

COMPETENCY

Operating System	Linux, MS
Programming Languages	Python, R, JavaScript
Hydrological modeling	HEC-HMS, SWMM/PCSWMM
Hydrodynamic modeling	HEC-RAS, ICPR, Delft3D, River2D
Geo-spatial processing	ArcGIS-Pro & Desktop, QGIS, Google Earth Engine
Coastal wave model	SWAN
Water distribution network analysis	CIVIL3D, EPA-NET
Satellite Image Processing	Landsat, Sentinel 1/2, ASCAT MetopB, AltiKa, CryoSat-2, GPM, TRMM
Text editing	LaTEX

SIGNIFICANT RESEARCH PROJECTS

Project name	Contributions
Multi-hazard Risk assessment of coastal disasters in the US East Coast	Assessing multi-sectoral vulnerability of coastal counties to understand how coastal disasters are putting risk across diverse geographic and population of the US East Coast. Developing geospatial tools and algorithms for decision support aimed at increasing the resiliency of coastal communities, planners, and managers. *[funded by the NOAA and SCDOT]*
Improving SCDOT Project Delivery through Identifying Potentially Suitable Locations for Mitigation and Standardizing Section 401/404 Permit Application Process.	Developed geospatial analysis tools and environmental apps for e-permit application of highway projects management that supports three crucial features: 1) consistent permit application submittals among consultants that led to delay in approval by the U.S. Army Corp of Engineers (USACE), 2) enhanced ability to consistently identify "red flags" early in the project development process, and 3) increase of mitigation credit coverage. *[funded by SCDOT]*
ASPIRE II: A Rapid Sensor network deployment System	Developed 'Bayes_Opt-SWMM' package using python programming for real-time data assimilation of water level monitoring sensors in

for Flood Risk Assessment and Prediction in Emergencies.	hydrologic models and optimization of flood modeling performance to achieve smart stormwater management goals in Rocky Branch Watershed of Columbia, SC *[funded by USC]*.
Vulnerability of Coastal Stormwater Management Ponds to Compound Effects of Sea Level Rise and Inland Flooding.	Estimating the vulnerability of the coastal systems to natural hazards using two coastal vulnerability models: 1) comprehensive, objective, and data-driven geospatial models, 2) stochastic algorithms of copula. *[funded by SCDOT, SC Sea Grant and NOAA]*
Coastal Compound Flood Simulation through Coupled Multidimensional Modeling Framework	Development of a fully coupling procedure to represent nonlinear and complex compound flood processes and interconnectivity among Multidimensional Hydraulics (pipe and channel), Hydrodynamics (2D overland flow), and distributed Hydrologic (MH3) models for enhancing their physical representation in modeling *[funded by USC and Streamline Tech]*.
AGU Community Science Project - Assessing the cumulative groundwater and health impact of facilities in the Lower Richland area of South Carolina	Helps other team members to understand potential groundwater contamination stemming from the operational activities of industrial establishments and existing landfills and supported other team members in understanding the environmental issues by delivering critical geospatial information on project needs. Oversaw geospatial analysis using ArcGIS to support the community science project and address critical inquiries regarding potential contamination sources. Coordinated environmental permitting tasks.
Coupled human-natural systems modeling and nature based Solution for Coastal sustainability for enhanced water resources resiliency in the Vietnamese Mekong Delta	Supported communities and people of the Coastal Mekong Delta on the frontlines of climate change with innovative breakwater technology and resilient hydraulic design innovation. Explored nature-based solutions to extend primitive coastal resilient features with new engineering design concept. *[Funded by Ministry of Science and Technology (MOST) Vietnam]*
Remote sensing-based rainfall characterization: Temporal trend and spatial analysis	Developed copula based multivariate bias correction models and engaged triple collocation techniques for eliminating errors in spatial rainfall products for Bangladesh addressing terrain dependent rainfall errors. Wrote modeling frameworks in R programing *[Funded by CRHLSR, CUET]*
Multi criteria-based analysis of coastal flood hazard	Developed coastal vulnerability analysis techniques analyzing broad ranges of spatial factors. Conceptualized an index approach for combining hydroclimate, physical characteristics, and socio-economic factors using Fuzzy logic theory. *[Funded by CRHLSR, CUET]*
Potentialities of Low Flow Restoration in Karnafuli-Halda River	'Environmental flow' (EF) determination for an ungauged tidal rivers face challenges regarding reservor operation and integrated river basin management. A noble approach developed comprising of hydrological, hydrodynamic and habitat simulation to define Weighted Usable Area of ecological species. The Hydrodynamic model outcomes showed EF resulted in a set of low flow indices. *[Funded by DRE, CUET]*
Modelling of water logging in the selected parts of Chittagong & identification of Urban flood hotspot	Worked on hydrologic and hydraulic modeling to understand meaningful impact of flood in urban sustainability and vulnerability. Determined fragility and most vulnerable areas in urban stormwater management combining geospatial knowledge base and hydrologic modeling. *[Funded by DRE, CUET]*

PUBLICATIONS

Journal Articles

1. **Tanim, A. H.,** Smith-Lewis, C., Downey, A. R., Imran, J., & Goharian, E. (2024). Bayes_Opt-SWMM: A Gaussian process-based Bayesian optimization tool for real-time flood modeling with SWMM. *Environmental Modelling & Software*, 106122.

2. **Tanim, A. H**., McKinnie, F. W., & Goharian, E. (2024). Coastal Compound Flood Simulation through Coupled Multidimensional Modeling Framework. Journal of Hydrology, 630, 130691.

3. **Tanim, A. H.,** Smith, C., Downy R., Imran, J. and Goharian, E (2023) 1. Bayes_Opt-SWMM: A Gaussian process-based Bayesian optimization tool for real-time flood modeling with SWMM. (Under Review)

4. **Tanim, A. H.,** McKinnie, F. W.; and Goharian, E. "Coastal Compound Flood Simulation through Coupled Multidimensional Modeling framework." Journal of Hydrology (In Press)

5. **Tanim, A. H.,** and Goharian, E. "Toward an Integrated Probabilistic Coastal Vulnerability Assessment: A Novel Copula- Based Vulnerability Index". Water Resources Research 59, no. 2 (2023): e2022WR033603. https://doi.org/https://doi. org/10.1029/2022WR033603.

6. **Tanim, A. H.,** Goharian, E.; and Moradkhani, H. "Integrated socio-environmental vulnerability assess- ment of coastal hazards using data-driven and multi-criteria analysis approaches". Scientific Reports 12, no. 1 (2022): 11625. https://doi.org/10.1038/s41598-022-15237-z

7. **Tanim, A. H.,** and Goharian. E. "Developing a hybrid modeling and multivariate analysis framework for storm surge and runoff interactions in urban coastal flooding". Journal of Hydrology 595 (2021): 125670. https://doi.org/10.1016/j.jhydrol.2020.125670

8. **Tanim, A. H.;** Goharian, E "Flood Detection in Urban Areas Using Satellite Imagery and Machine Learning". Water 14, no. 7 (2022): 1140.

9. **Tanim, A. H.,** Mullick, M. R. A. and Sikdar, M. S. "Evaluation of spatial rainfall products in sparsely gauged region using copula uncertainty modeling with triple collocation". Journal of Hydrologic Engineering 26, no. 4 (2021): 04021004

10. Anh, D.T., **Tanim, A.H.,** Kushwaha, D.P., Pham, Q.B., Bui, V.H., "Deep learning long short-term memory combined with discrete element method for porosity prediction in gravel-bed rivers" Int. J. Sediment Res. 38 (2023), 128–140.

11. Akter, A., and **Tanim, A. H**. "A modeling approach to establish environmental flow threshold in ungauged semid- iurnal tidal river". Journal of Hydrology 558 (2018): 442–459. https://doi.org/https://doi.org/10.1016/j.jhydrol.2018. 01.061.

12. **Tanim, A. H.,** and Akter, A. "Storm-surge modelling for cyclone Mora in the northern Bay of Bengal". 172, no. 3 (2019): 73–94. https://doi.org/10.1680/jmaen.2019.1

13. Akter, A., and **Tanim, A. H**. "Salinity Distribution in River Network of a Partially Mixed Estuary". Journal of Waterway, Port, Coastal, and Ocean Engineering 147, no. 2 (2021): 04020055. https://doi.org/10.1061/(ASCE)WW. 1943-5460.0000621.

14. Akter, A., **Tanim, A. H.,** and Islam, M. K. "Possibilities of urban flood reduction through distributed- scale rainwater harvesting". Water Science and Engineering 13, no. 2 (2020): 95–105. ISSN: 1674-2370. https://doi.org/10.1016/j.wse.2020.06.001

15. Mullick, M. R. A., **Tanim, A. H.,** and Islam, S. M. S. "Coastal vulnerability analysis of Bangladesh coast using fuzzy logic based geospatial techniques". Ocean & Coastal Management 174 (2019): 154–169. ISSN: 0964- 5691

16. Mullick, Md Reaz Akter, KM Ashraful Islam, and **Tanim, A. H.,** "Shoreline change assessment using geospatial tools: a study on the Ganges deltaic coast of Bangladesh". Earth Science Informatics 13 (2020): 299–316

17. Nguyen N-M, Do Van D, Le DT, Nguyen Q, Pham NT, **Tanim, A. H.**, et al. Experimental modeling of bed morphological changes and toe erosion of emerged breakwaters due to wave-structure interactions in a deltaic coast. Marine Geology 2022; 454:106932. https://doi.org/https://doi.org/10.1016/j.margeo.2022.106932

18. Nguyen N-M, Van D Do, **Tanim, A. H.**, Cong SD, Chuong LT, Hai TD, et al. Experimental and numerical modeling of pile-rock breakwater gap arrangement for optimal coastal erosion protection in deltaic coasts. Ocean Engineering 2023; 280:114625. https://doi.org/https://doi.org/10.1016/j.oceaneng.2023.114625

19. Dang, N. M., Vien, L. N., **Tanim, A. H.**, Gagnon, A. S., & Anh, D. T. (2024). A Framework Using Applied Process Analysis Methods to Assess Water Security in the Vu Gia–Thu Bon River Basin, Vietnam. Sustainability, 16(13), 5749.

20. Nguyen N-M, Van D Do, Le DT, Nguyen Q, Tran B, Nguyen TC, **Tanim A. H.,** et al. Physical and numerical modeling of four different shapes of breakwaters to test the suspended sediment trapping capacity in the Mekong Delta. Estuarine, Coastal and Shelf Science 2022; 279:108141. https://doi.org/https://doi.org/10.1016/j.ecss.2022.108141.

21. Le Xuan T, Ba HT, Thanh VQ, Wright DP, **Tanim A. H.,** Tran Anh D. Evaluation of coastal protection strategies and proposing multiple lines of defense under climate change in the Mekong Delta for sustainable shoreline protection. Ocean Coast Manag 2022; 228:106301. https://doi.org/https://doi.org/10.1016/j.ocecoaman.2022.106301.

22. Nguyen N-M, Van D Do, Le DT, Cong SD, **Tanim A. H.,** Pham NT, Nguyen Q, et al. Wave reduction efficiency for three classes of breakwaters on the coastal Mekong Delta. Appl Ocean Res 2022; 129:103362. https://doi.org/https://doi.org/10.1016/j.apor.2022.103362.

23. Nguyen N-M, Van DD, Le Duy T, Pham NT, Duc Dang T, **Tanim A.H.,** Wright D, Thanh PN, Anh DT. The Influence of Crest Width and Working States on Wave Transmission of Pile–Rock Breakwaters in the Coastal Mekong Delta. Journal of Marine Science and Engineering. 2022; 10(11):1762. https://doi.org/10.3390/jmse10111762

24. Anh, D.T., Thanh, D.V., Le, H.M., **Tanim A.H.,** et al. Effect of Gradient Descent Optimizers and Dropout Technique on Deep Learning LSTM Performance in Rainfall-runoff Modeling. Water Resour Manage 37, 639–657 (2023). https://doi.org/10.1007/s11269-022-03393-w

SELECTED CONFERENCE PRESENTATIONS AND POSTERS

1. **Tanim, A. H**., Smith, C.; Imran, J., Downey, A., and Goharian, E. (2023). "Bayes-Opt_SWMM: Uncertainty-Aware Real-Time Urban Stormwater Modeling with a Gaussian Process-based Bayesian Optimization" American Geophysical Union Fall Meeting 2023, 11-15 December 2023, San-Franscisco, CA.

2. **Tanim, A. H**., Goharian, E. and Imran, J. "BayesOpt-SWMM: A Gaussian process-based Bayesian Op- timization Tool for Parameter Calibration and Uncertainty Analysis of SWMM Model". In AGU Fall Meeting Abstracts, vol. 2022, H35I–1228. 2022.

3. **Tanim, A. H.,** Goharian, E. and McKinnie, F W. "Compound flood simulation in Charleston peninsula under climate change and sea level rise". In AGU Fall Meeting Abstracts, vol. 2021, H35I–1133. 2021.

4.   Islam, S. M. S, **Tanim, A. H.,** and Mullick, M. R. A. "Vulnerability Assessment of Bangladesh Coastline Using Gornitz Method". In Water, Flood Management and Water Security Under a Changing Climate: Proceedings from the 7th International Conference on Water and Flood Management, 301–313. Springer, 2020.

5.   **Tanim, A. H.,** Goharian, E. and Moradkhani, H. "A Multi-dimensional and Integrated Socio-Environmental Vulnerability Assessment in Coastal Systems". In AGU Fall Meeting Abstracts, vol. 2020, H223–09. Dec. 2020.

6.   **Tanim, A. H.** and Goharian, E. "Hybrid modeling framework for simulating compound floods in a coastal city". In World Environmental and Water Resources Congress 2020: Groundwater, Sustainability, Hydro-Climate/Climate Change, and Environmental Engineering, 218–228. American Society of Civil Engineers Reston, VA, 2020.

7.   **Tanim, A. H.** and Goharian, E. Developing a Hybrid Modeling and Multivariate Analysis Framework for Storm Surge and Runoff Interactions in Urban Coastal Flooding, International Conference of Water and Flood Management, BUET, Virtual Online, 2020

BOOK CHAPTERS

1. Akter, A., and Tanim, A. H. Predicting Low Flow Thresholds of Halda-Karnafuli Confluence in Bangladesh, 303–314. Springer, 2021.
2. Islam, S.M.S., Tanim, A.H., Mullick, M.R.A. (2020). Vulnerability Assessment of Bangladesh Coastline Using Gornitz Method. In: Haque, A., Chowdhury, A. (eds) Water, Flood Management and Water Security Under a Changing Climate. Springer, Cham. https://doi.org/10.1007/978-3-030-47786-8_21

HONORS & AWARD

1. 2021 Deepal S. Eliatamby Endowed Fellowship in University of South Carolina.
2. Editor Choice award in ASCE Journal of Waterway, port, coastal and ocean engineering.
3. CUAHSI National Water Center Innovators Program Summer Institute Internship (2020).
4. ASCE Technical Contribution of the Year 2022 Award for the project "Improving SCDOT Project Delivery through Identifying Potentially Suitable Locations for Mitigation and Standardizing Section 401/404 Permit Application Process.
5. FACT Fellowship from Purdue University.

PROFESSIONAL SERVICE

Professional Affiliation

American Geophysical Union (AGU); American Society of Civil Engineers (ASCE), AGU Community Scientist

Manuscript Reviewed (23 review)

1. ASCE Journal of Water Resources Planning and Management (2),
2. Water Resources Management (9),
3. Annals of GIS (1),
4. Environmental Earth Sciences (1),
5. Scientific Reports (1)
6. Environmental Modeling & Software (4)

Conference organization and Volunteer experiences
1. International Conference of Advances in Civil Engineering (2016),
2. ASCE Environmental and Water Resources Institute (2022),

REFERENCES

Available Upon Request