Ram Krishna Mazumder, Ph.D.

Postdoctoral Research Fellow
NIST Center for Risk-Based Community Resilience Planning
Civil, Environmental and Architectural Engineering
The University of Kansas, Lawrence, KS 66045
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Google Scholar: https://goo.gl/E9k4AJ, Website: https://rxm562.github.io/

Education

Case Western Reserve University, Ohio, USA — Aug. 2016 - July 2020
Ph.D., Civil Engineering
Dissertation: Risk-Based Asset Management Framework for Water Distribution Systems

University of Geneva, Geneva, Switzerland — Apr. 2014 - Feb. 2015
Postgraduate Diploma, Geological and Climate Related Risk

Sapienza University of Rome, Rome, Italy — Dec. 2011 - Dec. 2012
M.S., Evaluation, Control and Reduction of Seismic Risk

Shahjalal University of Science and Technology, Sylhet, Bangladesh — Jan. 2005 - June 2009
B.S., Civil and Environmental Engineering

Research Interests

- Resilient Civil Infrastructure Systems
- Structural Reliability Analysis
- Earthquake Engineering
- Risk Assessment and Management
- Community Resilience Analysis
- Machine Learning and Data Analytics

Professional Experience

Postdoctoral Researcher, NIST Center for Risk-Based Community Resilience Planning — Aug. 2020 - Present
Dept. of Civil, Environmental & Architectural Engineering
University of Kansas, Lawrence, Kansas

Graduate Research and Teaching Assistant — Aug. 2016 - July 2020
Department of Civil Engineering
Case Western Reserve University, Cleveland, Ohio

Lecturer/Assistant Professor — May. 2013 - Aug. 2016
Institute of Earthquake Engineering Research
Chittagong University of Engineering and Technology, Chittagong, Bangladesh

Research Engineer — Oct. 2010 - Dec. 2011
Bangladesh University of Engineering and Technology, Dhaka, Bangladesh

Project Engineer — June 2010 - Sep. 2010
Trust Alliance Technology Limited, Dhaka, Bangladesh

Structural Engineer — July 2009 - May. 2010
Asian Disaster Preparedness Center, Dhaka, Bangladesh

Awards and Honors

2020 **Kenneth M. Haber Award**, School of Grad Studies, Case Western Reserve University
2020 **The Best Poster Award**, American Society of Civil Engineers (ASCE), Pipelines 2020
2019 **ASCE - Utility Engineering and Surveying Institute (UESI) Scholarship**, Pipelines 2019
2019 **Service Award**, Graduate Student Council, Case Western Reserve University
2018 **The Roy Harley Prize**, School of Grad Studies, Case Western Reserve University
2015 **German Research Center for Geosciences (GFZ) Fellowship**, for training on Seismic Hazard
2014 **Wilsdorf Foundation and Solidarity Int. Fellowship**, for PG Specialization at University of Geneva
2011 **Erasmus Mundus Master Scholarship**, for M.S. at Sapienza University of Rome

Post-Doctoral Research

University of Kansas Aug. 2020 – to date

Advisor: Dr. Elaina J. Sutley

Project - 1: Center of Excellence for Risk-Based Community Resilience Planning, NIST

- Modelling of post-disaster recovery and restoration of buildings and infrastructure systems
- Analyzing role of historical housing disparities in households recovery and community disaster resilience.

Project - 2: Assessing the Role of Buildings and Organizations in Community Disaster Resilience

- Modelling of community resilience through holistic integration of the technical, organizational, social, and economic systems imperative to a community's functionality.

Project - 3: Impact and Recovery in Rural Kansas after an EF4 Tornado

- Modelling of rural housing recovery considering repair, functionality restoration, stability and accessibility, re-occupancy.

Doctoral Research

Case Western Reserve University Aug. 2016 – July 2020

Advisor: Dr. Yue Li

Project : NSF Multi-agent Sustainable Water Decision Theory: Nexus Water, Road, & Social Contractual Systems

- Developed a physical probabilistic model for time-variant reliability analysis of water distribution systems.
- Developed seismic resilience and functionality analysis framework of water networks using probabilistic approaches.
- Developed a python-based open-source tool to estimate seismic damage & renewal cost of water distribution systems.
- Formulated a post-disaster sequential recovery planning framework to find an optimal recovery path that maximizes the functionality of water distribution systems during the repair process.
- Formulated a decision-support tool for interdependent water and road networks utilizing fuzzy hierarchical inference and complex network theory to prioritize maintenance tasks.
- Investigated the feasibility of machine learning applications in failure risk analysis of corroded steel pipelines.

Publications

Peer-Reviewed Journal Articles

1. Enderami, S. A., **Mazumder, R. K.**, Dumler, M. D., and Sutley, E. J. (202X). Virtual Testbeds for Community Resilience Analysis: State of the Art Review and Consensus Study, *Natural Hazards Review, ASCE* (Accepted).

2. Wang, X., **Mazumder, R. K.**, Salarieh, B., Salman, A. M., Shafieezadeh, A., and Li, Y. (202X). Machine Learning for Risk and Resilience Assessment in Structural Engineering: Progress and Future Trends, to be submitted to *Journal of Structural Engineering, ASCE* doi:10.1061/(ASCE)ST.1943-541X.0003392

3. Daniel, L., **Mazumder, R. K.**, Enderami S. A., Sutley, E. J., and Lequesne, R. D. (2022). A Community Capitals Framework for Linking Buildings and Organizations for Enhancing Community Resilience through the Built Environment, *Journal of Infrastructure Systems, ASCE*, 28(1), 04021053. doi:10.1061/(ASCE)IS.1943-555X.0000668.

4. **Mazumder, R. K.**, Rana, S., and Salman, A. M. (2021). First Level Seismic Risk Assessment of Old Unreinforced Masonry (URM) Using Fuzzy Synthetic Evaluation, *Journal of Building Engineering*, 44, 103162. doi:j.jobe.2021.103162

5. **Mazumder, R. K.**, Salman, A. M., and Li, Y. (2021). Failure Risk Analysis of Pipelines using Data-Driven Machine Learning Algorithms, *Structural Safety*, 89, 102047. doi:10.1016/j.strusafe.2020.102047 **[One of the most cited articles published in Structural Safety since 2019]**

6. **Mazumder, R. K.**, Salman, A. M., Li, Y., and Yu, X. (2021). Asset Management Decision Support Model for Water Distribution Systems: Impact of Water Pipe Failure on Road and Water Networks, *Journal of Water Resources Planning and Management, ASCE,* 147(5), 04021022. doi:10.1061/(ASCE)WR.1943-5452.000136

7. Li., W., **Mazumder, R. K.**, and Li, Y. (2021). Reliability Analysis of Buried Water Pipelines Under Active Corrosion: A Finite Element Analysis Approach, *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems: Part A. Civil Engineering*,7(4), 04021064. doi:10.1061/AJRUA6.0001178

8. **Mazumder, R. K.**, Salman, A. M., and Li, Y. (2020). Post-Disaster Sequential Recovery Planning for Water Distribution Systems using Topological and Hydraulic Metrics, *Journal of Structure and Infrastructure Engineering*, 1-16. doi:10.1080/15732479.2020.1864415

9. **Mazumder, R. K.**, Fan, X., Salman, A. M., Li, Y., and Yu, X. (2020). Framework for Seismic Damage and Renewal Cost Analysis of Buried Water Pipelines, *Journal of Pipeline Systems Engineering and Practice, ASCE*, 11(4), 04020038. doi:10.1061/(ASCE)PS.1949-1204.0000487

10. **Mazumder, R. K.**, Salman, A. M., Li, Y., and Yu, X. (2020). Seismic Functionality and Resilience Analysis of Water Distribution Systems, *Journal of Pipeline Systems Engineering and Practice, ASCE*, 11(1), 04019045. doi:10.1061/(ASCE)PS.1949-1204.0000418 **[Editor's Choice Article]**

11. Haque, D. M. E., Mimi, A., **Mazumder, R. K.**, and Salman, A.M. (2020). Evaluation of Natural Hazard Risk for Coastal Districts of Bangladesh Using the INFORM Approach, *International Journal of Disaster Risk Reduction*. 48: 101569. doi:10.1016/j.ijdrr.2020.101569

12. **Mazumder, R. K.**, Salman, A. M., Li, Y., and Yu, X. (2019). Reliability Analysis of Water Distribution Systems using Physical Probabilistic Pipe Failure Method, *Journal of Water Resources Planning and Management, ASCE*, 145(2): 04018097, doi:10.1061/(ASCE)WR.1943-5452.0001034

13. **Mazumder, R. K.**, Salman, A. M., Li, Y., and Yu, X. (2018). Performance Evaluation of Water Distribution Systems and Asset Management: State-of-the-Art Reviews, *Journal of Infrastructure Systems, ASCE*, 24(3): 03118001, doi:10.1061/(ASCE)IS.1943-555X.0000426

14. **Mazumder, R. K.**, and Salman, A. M. (2018). Seismic Damage Assessment Using GIS and RADIUS: A Case Study of Sylhet City, Bangladesh, *Int. Journal of Disaster Risk Reduction*, 34 (2019), 243-254, doi:10.1016/j.ijdrr.2018.11.023

15. **Mazumder, R. K.**, Uddin, S., Dey, R., and Ansary, M. A. (2016). Analytical Fragility Curves for Reinforced Concrete Building Using Single Point Scaled Spectrum Matched Ground Motion Analyses, *Malaysian Journal of Civil Engineering*, 28(3):394-406, https://mjce.utm.my/index.php/MJCE/article/view/433

16. **Mazumder, R. K.**, and Ansary, M. A. (2014). Application of Capacity Spectrum Method based on ATC 40 and BNBC 1993, *Journal of Advanced Structures and Geotechnical Engineering*, 03(04):364-367, http://basharesearch.com/1030411.html

17. **Mazumder, R. K.**, Khair, A., Sakib, N., Bhuiyan, A. R., and Alam, J. (2014). Rapid Assessment Procedure for Seismic Evaluation of Existing Buildings: A Case Study for CUET Campus, *J. of South Asian Disaster Studies*, 5(1-2):09-26

Other Peer-reviewed Journal Papers [Education and Diversity]

18. Donkor, F. K. and **Mazumder, R. K.**, Hosseinzadeh, S., and Roy, S. (2020). A User-Centric Design Approach to Understand International Education in the Contemporary World: Motivations and Gender Preferences for Studying in Europe, *Journal of Research in International Education*, 19(1), 54-68. doi:10.1177/1475240920916046

19. Donkor F.K. and **Mazumder, R. K.** (2020). Women and the Environment: Southern Perspectives and Global Implications, *in Gender Equality, Encyclopedia of the UN Sustainable Development Goals*. doi:10.1007/978-3-319-70060-1

Peer-reviewed Journal Papers (Under Review)

20. **Mazumder, R. K.**, and Sutley, E. J. (202X). Post-Earthquake Community Resilience Analysis: Integrating Essential Infrastructure Systems Services with Building Functionality, submitted to *Journal of Infrastructure Systems, ASCE*.

21. **Mazumder, R. K.**, Enderami, S. A., and Sutley, E. J. (202X). A novel framework to study community-level social and physical impacts of hurricane-induced winds through synthetic scenario analysis, *Frontiers in Built Environment*.

22. Li, W., **Mazumder, R. K.**, and Li, Y. (202X). Topology-based Seismic Resilience Metrics for System-Level Performance Evaluation and Recovery Strategy of Water Distribution System, to be submitted to *Journal of Pipeline Systems Engineering and Practice, ASCE*.

Journal Manuscript (In-Preparation)

23. **Mazumder, R. K.**, Enderami, S. A., Loerzel, J., and Sutley, E. J. (202X). Racial Equity and Historical Housing Disparities Impact on Present-Day Community Disaster Resilience, to be submitted to *Journal of Infrastructures Systems, ASCE*.

24. **Mazumder, R. K.**, and Sutley, E. J. (202X). Modeling the Influence of Social Vulnerability, Building Functionality Restoration, Resources, and Vacancies on Household-Level Housing Recovery , to be submitted to *International Journal of Disaster Risk Reduction*.

25. Thompson, T., **Mazumder, R. K.**, Sutley, E. J., Reed, D., Lequesne, R., Li, J., Kirkham, W. (202X). Longitudinal Repair and Recovery in Rural Kansas after an EF4 Tornado, to be submitted to *Natural Hazards Review, ASCE*.

26. Enderami, S. A., Sutley, E. J., and **Mazumder, R. K.** (202X). Virtual Testbeds for Community Resilience Analysis: Step-by-Step Development Procedure, to be submitted to *Reliability Engineering and System Safety*.

27. **Mazumder, R. K.**, Rana, S., and Ansary, M. A. (202X). A Python-based Earthquake Risk Assessment Tool (EQRAT) for Predicting Physical and Socioeconomic Losses in Urabn Areas *International Journal of Disaster Risk Reduction*

Refereed Conference Articles

1. **Mazumder, R. K.**, Dumler, M., Enderami S. A., and Sutley, E. J. (2021). A Scenario-based Hurricane Analysis Framework for Community-level Building Damage Estimation, *6th American Association for Wind Engineering Workshop*, Clemson University, Clemson, SC, USA, May 12-14, 2021, 106-109.

2. **Mazumder, R. K.**, Salman, A. M., and Li, Y. (2021). Reliability Assessment of Oil and Gas Pipeline Systems at Burst Limit State Under Active Corrosion, *18th International Probabilistic Workshop*, May 12-14, 2021, Guimarães, Portugal, 653-660, doi:10.1007/978-3-030-73616-3-50

3. **Mazumder, R. K.**, Salman, A. M., Li, Y. and Yu, X. (2019). Reliability Assessment of Corroded Water Distribution Infrastructure, *ASCE UESI Pipelines 2019*, July 21-24, Nashville, TN, 343-353, doi:10.1061/9780784482490.036

4. **Mazumder, R. K.**, Salman, A. M., Li, Y. and Yu, X. (2019). Decision-making Framework for Water Distribution Systems using Fuzzy Inference and Centrality Analysis, *International Conference on Applications of Statistics and Probability in Civil Engineering*, May 26-30, Seoul, Korea, P-313, doi:10.22725/ICASP13.313

5. **Mazumder, R. K.**, Biswas, B.S.P., Helali, A. L. and Ansary, M. A. (2017). Ambient Vibration Analysis of Heritage Unreinforced Masonry Buildings in Bangladesh, *16th World Con. on Earthquake Engineering, Santiago Chile*, January 9-13, Paper N° 4176, www.wcee.nicee.org/wcee/article/WCEE2017-4176.pdf

6. **Mazumder, R. K.**, Dey, R., Uddin, S. and Bhuiyan, A. R. (2015). Structural Response Analysis of Reinforced Concrete Frame with Unreinforced Masonry Infill Walls, *Int. Conference on Recent Innovation in Civil Engineering for Sustainable Development*, Dec 11-13, DUET, Bangladesh, 564-569.

7. **Mazumder, R. K.** and Ansary, M. A. (2012). Application of Non-Destructive Testing Techniques for Structural Condition Assessment in Bangladesh, *1st Int. Conference on Advances in Civil Engineering*, 12-14 December, CUET, Chittagong, Bangladesh, ASEE 25.

8. **Mazumder, R. K.**, Ahmed, M. and Ansary, M. A. (2011). Seismic Risk Evaluation on Existing RC Frame Buildings for Northern Part of Sylhet City, Bangladesh, *Proc. of 10th Int. Symposium on New Technologies for Urban Safety of Mega Cities in Asia*, October 12-14, Chiang Mai, Thailand, 173-186.

Conference Articles (Accepted)

9. Rahimi, M., **Mazumder, R. K.**, Nofal, O. M., Padgettd, J. E., Rosenheim, N., Darestanif, Y. M., Sutley, E. J., , and van de Lindt, J. W. (2022). Coastal community resilience assessment using hybrid natural-physical-social performance matrices: a case study for Galveston Island, *13th Int. Conference on Structural Safety and Reliability 2021-2022*, June 22-24, Shanghai, China.

10. **Mazumder, R. K.**, Enderami S. A., and Sutley, E. J. (2022). A Scenario-based Hurricane Analysis Framework for Community-level Building Damage Estimation, *14th Americas Conference on Wind Engineering*, May 17-19, 2022, Lubbock, Texas.

11. Enderami S. A., **Mazumder, R. K.**, and Sutley, E. J. (2022). Framework for Incorporating Community Social Vulnerability in the Assessment of the Hurricane-Induced Wind Risk to Residential Buildings, *14th Americas Conference on Wind Engineering*, May 17-19, 2022, Lubbock, Texas.

12. **Mazumder, R. K.**, and Sutley, E. J. (2022). Seismic Functionality Analysis of Buildings Integrating Essential Utilities and Road Accessibility, *the 12th National Conference on Earthquake Engineering (12NCEE)*, Salt Lake City, Utah, June 27-July 1, 2022.

Poster Presentations

13. **Mazumder, R. K.**, Salman, A. M., Li, Y., and Yu, X. (2021). Risk-Informed Asset Management Decision Support Model for Interdependent Water and Road Infrastructures, ASCE UESI Pipelines 2021, August 3-6, Virtual.

14. **Mazumder, R. K.**, Salman, A. M., Li, Y., and Yu, X. (2020). Seismic Damage and Renewal Cost Analysis of Buried Water Pipelines: A Python-based Computational Framework, ASCE UESI Pipelines 2020, August 10-13, Virtual. **[the Best Poster of Pipelines 2020]**.

15. **Mazumder, R. K.**, Salman, A. M., Li, Y., and Yu, X. (2018). Risk and Resilience of Aging Water Distribution Systems, Structures Congress 2018, April 19-21, Fort Worth, TX, USA.

Data Publication

1. **Mazumder, R. K.**, Sutley, E. J., and Dumler, M. (2021). Data Report on Local Perceptions on Building Safety and Building Performance after the 2019 EF4 Linwood Tornado, *DesignSafe-CI*, doi:10.17603/ds2-hkcv-xp72

2. **Mazumder, R. K.**, Sutley, E. J., and Dumler, M. (2021). Data Report on Household Impact and Recovery Assessment: A longitudinal Investigation after the 2019 EF4 Linwood, Kansas Tornado, *DesignSafe-CI*, doi:10.17603/ds2-87ne-d742

3. Wang, T, Dumler, M., **Mazumder, R. K.**, and Sutley, E. J. (2021). Tornado Risk Perception of University of Kansas Campus Community, *DesignSafe-CI*, doi:10.17603/ds2-dw38-z509

4. Sutley, E. J., Dumler, M., **Mazumder, R. K.**, Lequesne, R., Li, J., Kirkham, W., Reed, D., Kim, J., and Thompson, T. (2021). One-year Post-tornado Repair Progress: Wave 3, in StEER - 28 May 2019 Linwood, KS EF4 Tornado Field Assessment, *DesignSafe-CI*, doi:0.17603/ds2-5ysj-a554

Research Proposal and Grants

The University of Kansas:

1. Title: Development of Community Disaster Resilience Analysis Tool by Integrating Functionality of Buildings and Critical Infrastructures Systems, Sponsor: **Coalition for Disaster Resilient Infrastructure**, Role: PI, **submitted**.

2. Title: Foundations of holistic resilience analyses and socially equitable decision making for interdependent critical infrastructures, Sponsor: **Kansas NSF EPSCoR**, amount: **$5M**, Role: Contributor.

3. Title: Analyzing Capabilities and Potentials of Machine Learning and Artificial Intelligence for Risk Assessment and Management of Structures, Sponsor: **ASCE/SEI Special Project**, amount: **$10,000**, Role: Co-PI.

4. Title: Household Impact and Recovery Data, Instruments and Protocols: A longitudinal investigation after the May 28, 2019 EF4 Linwood, Kansas Tornado, Sponsor: Natural Hazards Center Weather-Ready Research, supported by **National Science Foundation (NSF)**, amount: **$2,500**, Role: PI.

5. Title: Tornado Risk Perception Data, Instruments and Protocols: Survey of Contractors and KU Campus Community, Sponsor: Natural Hazards Center Weather-Ready Research, supported by **NSF**, amount: **$1,250**, Role: PI.

Case Western Reserve University (participated in preparing the following proposals):

1. Title: Multi-Level Resilience-Based Transportation Asset Management Framework using Bayesian Network, Sponsor: National Center for Transportation Infrastructure Durability and Life-Extension at Washington State University, supported by **the U.S. Department of Transportation**, amount: **$125,000**.
2. Title: A First Step Toward a Longitudinal Study of Homeowners' Proactive Actions for Managing Wildfire Risks, Quick Response Grant, Sponsor: Natural Hazards Center supported by **NSF**, amount: **$3,000**.
3. Title: NSF Research Experiences for Undergraduates (NSF REU).

Chittagong University of Engineering and Technology:

1. Title: Structural Safety Assessment of Existing Buildings at CUET Campus - Phase I and II, Sponsor: **University Grants Commission of Bangladesh, Scientific Grant - 2014-15**, amount: **$3,800**, Role: Co-PI.
2. Title: Seismic Risk Assessment of Important Building in Chittagong City, Sponsor: **University Grants Commission of Bangladesh, Scientific Grant - 2014**, amount: **$1,600**, Role: Co-PI.
3. Title: Seismic Safety Assessment of Govt Primary School Buildings in Chittagong, Sponsor: **University Grants Commission of Bangladesh, Scientific Grant - 2015**, amount: **$1,800**, Role: Co-PI.

Teaching Experience

Case Western Reserve University Fall 2017 - Summer 2020

Teaching Assistant

ECIV 426	Probabilistic Analysis
ECIV 324	Timber and Masonry Design
ECIV 310	Strength of Materials
ENGR 200	Statics

Chittagong University of Engineering and Technology Spring 2013 - Summer 2016

Lecturer/Assistant Professor

EQE 6108	Dynamics of Structures and Vibration Control
EQE 6110	Performance-Based Seismic Design of Structures
EQE 6111	Assessment and Strengthening of Existing Structures
Training	Structural Analysis and Design of RC Buildings

Major Responsibilities: Course instruction; Preparing lecture notes, homework problems and solutions; Grading homework and exams; Holding office hours; Mentoring graduate students

Supervising and Mentoring Activities

The University of Kansas: mentoring three graduate students, and one undergraduate
Case Western Reserve University: mentoring one PhD student
Chittagong University of Engineering and Technology: mentored five graduate students
Major Responsibilities:

- Helping students to acquire technical skills in structural modelling, community resilience analysis, data analysis, statistical modelling, structural reliability analysis, non-destructive testing, field investigation, etc.
- Helping students with technical writing
- Reviewing conference and journal manuscript prepared by the students

Technical Activities and Service

Editorship

• **Associate Editor**, Journal of Pipeline Systems Engineering and Practice, ASCE (since March 2021)

Peer reviewer for:

• Journal of Structural Safety; • Journal of Structural Engineering; • Journal of Sustainable Cities and Society;
• Journal of Water Resources Planning and Management; • Journal of Pipeline Systems Engineering and Practice;
• Journal of Testing and Evaluation; • International Journal of Disaster Risk Reduction; • PLOS One; • Energies
• ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering.

Professional Membership

• Associate Member, American Society of Civil Engineers (ASCE)
• Member, Earthquake Engineering Research Institute (EERI)
• Member, American Water Works Association (AWWA)
• Member, International Association of Life Cycle Civil Engineering (IALCCE)
• Member, Institute of Engineers, Bangladesh (IEB)

Committee Service in Professional Society:

• Member, ASCE-UESI Younger Member Engagement Committee
• Member, ASCE-UESI Technical Committee on Seismic Design of Buried Pipelines
• Member, ASCE-SEI Technical Council on Life-Cycle Performance, Safety, Reliability and Risk of Structural Systems
• Member, ASCE Ohio Infrastructure Report Card Committee 2021

Certificate and Fellowship Courses:

• UNIV 400C Future Faculty Preparation, Case Western Reserve University
• Didactics in University Teaching, UNESCO-IHE, CUET, Bangladesh
• Rapid Response Mapping in Disasters, UNOSAT, Geneva, Switzerland
• Seismology and Seismic Hazard Assessment, GFZ, Potsdam, Germany
• Earthquake Risk Mitigation, IIT Roorkee, India
• Machine Learning, e-Learning through Coursera by Stanford University
• Python Data Structure, e-Learning through Coursera by University of Michigan

Volunteer and leadership activities:

• Vice-President (2018 - 2019), Graduate Student Council, Case Western Reserve University
• Vice-President (2018-2020), North American Chapter, Erasmus Mundus Students and Alumni Association
• President (2017) and Vice-President (2015-17), South Asian Chapter, Erasmus Mundus Students and Alumni Association