COMPLEX SYSTEMS, COMPUTING, EDUCATION, ENERGY, ENVIRONMENT, INFRASTRUCTURE *FRONTIERS*

Hanadi S. Rifai, Ph.D., P.E., F. ASCE

Ph.D. – William Marsh Rice University
John and Rebecca Moores Professor
Associate Dean, Research and Facilities
Director, Environmental Engineering Graduate Program
Director, Hurricane Resilience Research Institute (HuRRI)

Selected Publications

1. Kiaghadi, A., H. S. Rifai, and W. Liaw, Assessing COVID-19 risk, vulnerability and infection prevalence in communities, Plos One, https://doi.org/10.1371/journal.pone.0241166.

2. Sobel, R. S. A. Kiaghadi and H. S. Rifai, Modeling water quality impacts from hurricanes and extreme weather events in urban coastal systems using Sentinel-2 spectral data, Environ. Monit. Assess, 192(5): 307, doi: 10.1007/s10661-020-08291-5, 2020.

3. Lee, R., N. Parker, A. Hallett, D. Kao, M. Modelska, H. S. Rifai, E. Soltero, and D. O'Connor, Stakeholder Perspectives and Sustainability of an Integrated Care Model for the Prevention and Management of Obesity: the Childhood Obesity Research Demonstration (CORD) project, Translational Behavioral Medicine, 10.1093/tbm/ibaa058, 2020.

4. Kiaghadi, A., A. Govindarajan, R. Sobel, and H. S. Rifai, Environmental Damage Associated with Severe Hydrologic Events: A LiDAR-based Geospatial Modeling Approach, Natural Hazards, 103: 2711–2729, 2020.

5. Abdulla, B., A. Kiaghadi, H. S. Rifai, B. Birgisson, Characterization of Vulnerability of Road Networks to Fluvial Flooding using SIS Network Diffusion Model, Journal of Infrastructure Preservation and Resilience, 1: 6, 13, 2020.

6. Lee, R. E., D. Kao, N. H. Parker, A. M. Hallett, C. Y. Kochi, M. J. Modelska, H. S. Rifai and D. P. O'Connor, Evaluating Sustainability in the Childhood Obesity Research Demonstration Project: the Model and Process, Archives of Public Health, 78 (13), https://doi.org/10.1186/s13690-020-0397-2, 2020.

7. Kiaghadi, A., and H. S. Rifai, Physical and Chemical Quality of Floodwaters in Houston Following Hurricane Harvey, Environ. Sci. Technol., 5 (39): 4832-4840, 2019.

8. Kiaghadi, A., and H. S. Rifai, Natural Attenuation of Indicator Bacteria in Coastal Streams and Estuarine Environments, Science of the Total Environment, 677: 230-240, 2019.

Dr. Rifai is an Environmental Engineer conducting research on fate and transport of pollutants in the environment. She is interested in understanding environmental systems and how they can be altered, managed or remediated to enhance their resiliency and sustainability. Her research on the health of bays and estuaries has focused on pathogenic pollutants and bioaccumulative chemicals including polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans and polychlorinated biphenyls. Recently, Dr. Rifai's research aims to understand community risks associated with chemical and biological pollutants emanating from environmental and industrial infrastructure in the wake of natural disasters. She has published extensively on compound flooding and cascading consequences of extreme events including impacts from COVID-19 on public health, especially disadvantaged communities.

CHEMICAL AND BIOLOGICAL POLLUTION AND SEDIMENT TRANSPORT AND DEPOSITION AFTER EXTREME EVENTS EMANATING FROM ENVIRONMENTAL AND INDUSTRIAL INFRASTRUCTURE

Dr. Rifai's group couples hydrodynamic models with environmental fate and transport models and infrastructure failure probability estimates to project the impact of extreme events on the health of communities due to spills and leaks from industrial facilities, wastewater treatment plants, hazardous waste sites and other sources of pollution in urban and coastal environments. Chemical and petrochemical storage tanks, for example, can capsize or be uplifted and transported along flowing floodwaters. Upon encountering an obstruction, these tanks can rupture and release their contents into flooded areas affecting air, soil, and water quality and nearby populations and their homes. When floodwaters recede, pollutants are transported into waterways where they cause further damage to the natural environment. Developing an in-depth understanding of vulnerabilities in built and natural environments is studied in the Rifai group and translated into actional adaptive strategies to achieve resilience and sustainability.
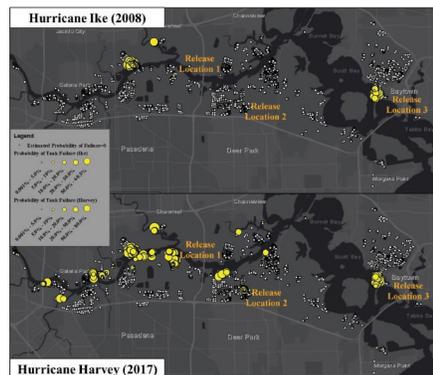
Modeled probabilities of failure of storage tanks in the Houston Ship Channel during Hurricane Ike (top) and Harvey
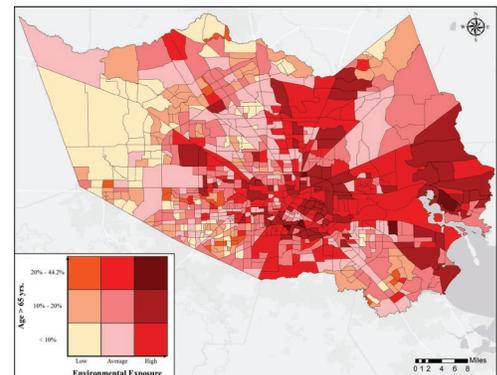
Vulnerability to COVID-19 in Harris County based on age was correlated to environmental exposure