**The impact of Socio-Hydrological Parameters on Community Response to Flooding: A Cluster Analysis Study**

Introduction: Flooding is a common and costly natural disaster in the United States. While traditionally, the risk of flooding was considered to be a linear function of hydrological hazard, recent research suggests that the risk of flooding is a result of complex interactions between hazard, exposure, and vulnerability. In order to comprehend these complex interactions, socio-hydrological models have been developed, which incorporate socio-hydro parameters such as forgetfulness, anxiousness, and activeness, to estimate the risk of flooding. By using these parameters, it is possible to understand how and why communities respond differently to hydrological disasters.

Objectives: The main objective of this study is to use cluster analysis to identify clusters of communities that respond similarly to flooding events. The goal is to see if these prototypical clusters of communities show correlations with the frequency/magnitude of flooding, elevation from mean sea level, trend of housing price, and other social demographics.

Methods: This study will be conducted for 436 census tracts along the Long Island Sound and Hudson River Estuary. The socio-hydrological model developed by Barendrecht et al. (2019) will be used and calibrated using the DDS algorithm (Tolson & Shoemaker, 2007). The time series of annual maximum storm surge and precipitation from 1970 to 2021 will be used as inputs for the socio-hydrological model. The model will be validated using publicly available datasets from US census, FEMA, Zillow, and NHGIS. The output of the model, the socio-hydro parameters, will then be subjected to cluster analysis. The choice of clustering method (k-means, k-medoids, or hierarchical) will be decided based on the suitability of the data. The number of clusters will be determined based on the silhouette plot and within sum of the square vs number of clusters plot. After completing the cluster analysis, a set of statistical tests will be conducted to get clear insights into each cluster.

References:

Barendrecht, M. H., Viglione, A., Kreibich, H., Merz, B., Vorogushyn, S., & Blöschl, G. (2019). The value of empirical data for estimating the parameters of a sociohydrological flood risk model. Water Resources Research, 55(2), 1312-1336.

Tolson, B. A., & Shoemaker, C. A. (2007). Dynamically dimensioned search algorithm for computationally efficient watershed model calibration. Water Resources Research, 43(1).