NC STATE UNIVERSITY College of Natural Resources

"Mapping the Margins":

Flood Risk and Governance in North Carolina Extraterritorial Jurisdictions

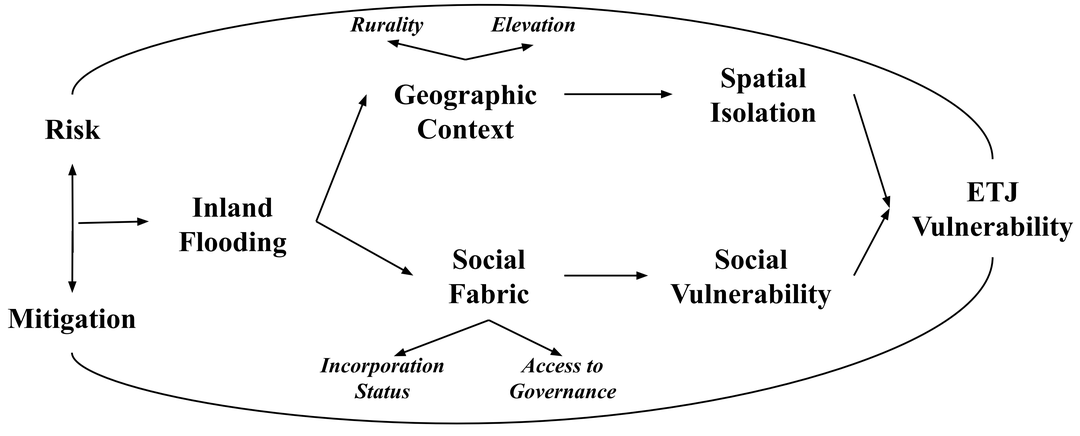
Tira L Beckham; Jeff Essic; Rasul Mowatt; Louie Rivers, III; Madhusudan Katti; Jennifer Richmond-Bryant

Introduction

- Social vulnerability indicators like race and income are strong predictors of flood vulnerability, especially in communities that are spatially segregated from the resources of urban city centers (Rasch, 2017).
- We examine the intersection of social and flood vulnerability in communities that are spatially and procedurally isolated from municipal resources through an analysis of North Carolina ETJ communities.
- Extraterritorial Jurisdictions (ETJs) are unincorporated land masses within 1-3 miles that are used by municipalities to expand their jurisdiction without the need for annexation for future economic development and urban planning goals (G.S. 160D-202, 2019).
- The absence of formalized governance in ETJ communities may limit the implementation of climate adaptation measures and infrastructure (Anderson, 2008; Moore et al., 2022; Pemberton, 2022).
- ETJ communities often face compounding vulnerabilities as a result of their incorporation and governance status (Cutter et al., 2016; Frazier et al., 2013; Homsy & Warner, 2015, Tate et al., 2021):
  - Limited access to resources (knowledge, disaster funding, planning)
  - Infrastructure and flood risk management
  - Access to decision-makers
  - Social vulnerability

Theoretical Framework - Hazards of Place Model

- Cutter's Hazard's of Place model will be used to integrate aspects of social vulnerability into flood risk management and planning in ETJ communities that may be overlooked in broader planning efforts by municipal and county governments (1996, 2013)
- This includes traditional indicators of social vulnerability (income, race, age), as well as more technical aspects of climate vulnerability such as access to and knowledge of recovery resources, access to political power,etc. (Cutter et al., 2000, 2016; Emrich & Cutter, 2011; Joakim, 2009)



Methods

- North Carolina Flood Risk Information System (FRIS) 1% flood zone layer data were paired with social vulnerability data from the American Community Survey (ACS) using to assess the place vulnerability of Extraterritorial Jurisdictions in North Carolina
- Univariate and multivariate regression models were conducted to evaluate the relationship between increased land area within a jurisdiction that overlaps with a 1% flood zone area, ETJ status, and socioeconomic factors
- Average elevation was included as a covariate to accommodate spatial autocorrelation of flood data
- All analyses were conducted in R statistical analysis software; significace as evaluated at the 0.05 level.

Univariate Regression of Percent Area within a Flood Zone

	All Jurisdictions	***Rural Jurisdictions***	***Urban Jurisdictions***
	Pr(>|z|)	*Pr(>|z|)*	*Pr(>|z|)*
ETJ Status	3.38e-05 ***	0.000117 ***	0.814
Percent Non-White Population	0.000715 ***	0.0777 .	0.000112 ***
Percent Persons in Poverty	2.84e-09 ***	0.0198 *	0.00522 **
*independently tested			

Results

- Flood hazard area overlap is found to have a significant relationship with ETJ status, indicating that ETJs may have a greater likelihood of having high percentages of land area within a flood zone.
- Even after accounting for the potential effects of spatial autocorrelation through the inclusion of elevation as a covariate, ETJ status and community racial composition remain significant predictors of flood risk. This suggests that ETJ communities, particularly those with high proportions of non-white individuals, may bear a disproportionate burden of flood risk, especially those in rural land areas.