

**RESEARCH BRIEF SERIES**  
**MITIGATION MATTERS**

*FEMA defines mitigation as the effort to reduce loss of life and property by lessening the impact of disasters. Effective mitigation requires that we all understand local risks and invest in long-term planning to reduce risks and enhance community well-being.*

**ZONING FOR FLOOD RISK REDUCTION IN FIVE VIRGINIA COMMUNITIES:  
OPPORTUNITIES TO IMPROVE FLOOD HAZARD MAPPING AND MUNICIPAL PRACTICE**

**SUMMARY**

Local governments use floodplain zoning ordinances to regulate land development in flood-prone areas throughout the United States. In theory, floodplain zoning should be a powerful tool to mitigate flood vulnerability and increase flood resilience. Flood damage and losses, however, have continued to increase in recent years, leading to important questions about the effectiveness of current floodplain zoning practices.

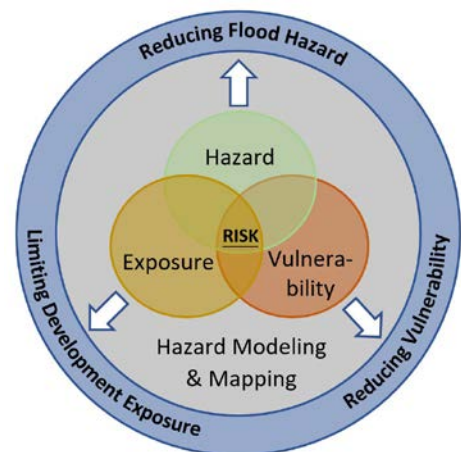
This study was designed to answer the following questions: How do communities designate their floodplain districts? What zoning measures are currently in place to reduce flood risk? And, what are the standards of these measures? Using qualitative content analysis, I analyzed the floodplain ordinances of five local governments in Virginia: Arlington County, Fairfax County, Roanoke County, the City of Norfolk, and the City of Roanoke.

I developed the Flood Risk Reduction Framework to describe what I identified as the three main approaches to flood risk reduction in municipal floodplain zoning ordinances. These approaches are: (1) Reducing flood hazard by passing regulations to preserve natural functions of floodplains and restrict encroachment by developers; (2) Limiting development exposure by adopting measures to curb development in hazard prone areas or remove existing at-risk development from hazardous areas; and (3) Reducing development vulnerability and protecting people in place by adopting stricter building codes or building



*Flooded Road near Roanoke, Virginia*

sea walls or levees. Next, I used this framework to categorize and evaluate the floodplain zoning laws in each municipality in my study.



*Flood Risk Reduction Framework*

## KEY FINDINGS

- Municipal floodplain zoning ordinances risk largely focus on reducing development vulnerability, most often by setting building elevation requirements in building codes. Few measures focus on limiting future flood exposure by restricting development in the floodplains.
- Local flood zoning relies on the Federal Emergency Management Agency's (FEMA) flood hazard maps for floodplain delineations. These maps are often outdated and lack consistent and reliable floodplain boundary and elevation data.
- Local governments mostly use rely on FEMA's 1% flood maps as the basis for floodplain designation. Some communities, however, also use 0.02% floodplain and community-defined floodplains to ensure that their ordinances have higher standard measures for flood risk reduction.
- Municipalities frequently impose more stringent elevation requirements when permitting development in the floodplains on developers than what is required by the National Flood Insurance Program (NFIP) standards. Several municipalities codified additional land use restrictions in the floodplains to curb the flood exposure.

## POLICY IMPLICATIONS

- Flood hazard maps will serve local flood hazard mitigation better if they consistently provide floodplain boundary and flood elevation data. Partnerships between FEMA and states like North Carolina could serve as a model for flood hazard mapping. By leveraging local expertise and resources, states can enhance the currency and accuracy of FEMA maps at the community scale.

- Communities with high flood hazards should actively explore land use measures that will reduce their long-term flood exposure. Adopting development restrictions in flood hazard areas may create political backlash or legal obstacles. In communities with these concerns, municipal governments should start by restricting development in special floodplains that are frequently flooded, or which exhibit other important environmental and ecological values.
- We should challenge the efficacy of using 1% flood as the basis for floodplain regulations. Flood hazard maps that depict granular floodplains will enable communities to adopt targeted flood risk reduction measures. As such, communities will likely garner broad support to introduce restrictive codes to limit flood exposure, especially in extremely vulnerable areas.



Overflowing James River in Virginia

## AUDIENCE

The target audience for this research includes federal, state, and local policymakers focused on flood hazard mitigation, as well as researchers interested in flood hazard mapping and policy development.

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