COASTAL COMMUNITY HAZARD MITIGATION AND COMMUNITY RATING SYSTEM OF NFIP

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Introduction

Storm force flooding continues to be a major concern in the hurricane season and causes considerable loss to the coastal communities. National Flood Insurance Program (NFIP) provides recovery resources for the flood disaster and dissuades uneconomic uses from locating in flood hazard area. In order to motivate flood insurance purchase and promote increased flood hazard mitigation, the Community Rating System (CRS) that is a part of NFIP, credits 18 community floodplain management activities. However, CRS has been marked by a lack of active participation since its inception limiting its potential effectiveness. As of January 2008, 1080 communities, representing only 5% of all the NFIP communities have enrolled in CRS. Little empirical evidence exists to shed light on what factors influence the establishment of local hazard mitigation projects. To fill this gap, we propose to analyze flood hazard mitigation projects in 37 North Carolina coastal counties between 2002 and 2008. Specifically, we will examine the influence of physical, risk, and socioeconomic factors on coastal community hazard mitigation decisions as reflected in the CRS score. Ultimately, our project will forge a better understanding of community decision making, as related to natural hazards.

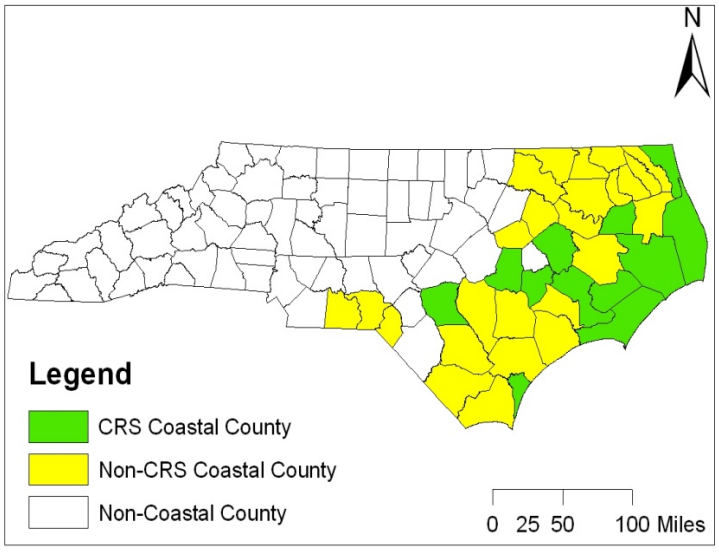

Figure 1. Research area (Highlighted Counties)

Flood Mitigation and Community Rating System

FEMA estimates that flood damage is reduced by nearly $1 billion a year as a result of NFIP floodplain management regulations for new construction. Prior studies, however, highlight areas of potential improvement in the program. First, community participation does not necessarily imply that individual property owners will opt to purchase flood insurance. According to FEMA, only 2.5 million of the nearly 10 million households in flood-prone areas had purchased flood insurance by 1995 (Kunreuther 1996). Second, Flood Insurance Rate Maps (FIRMs) are not updated frequently. Thus, the risk designation conveyed by FIRMs can produce severe underestimates of flood risk in some areas (Michel-Kerjan and Kousky 2008). Third, FEMA offers Pre-FIRM properties reduced premium rates at 30 to 40 percent of the full-risk premium. PricewaterhouseCoopers (1999) concludes that the premiums of some Pre-FIRM properties are much less than what would be required to cover payouts, partly due to repetitive losses for particular parcels.

In order to motivate flood insurance purchase and promote increased flood hazard mitigation, the CRS credits 18 community floodplain management activities in four broad categories: (1) public information; (2) flood mapping and regulation; (3) flood damage reduction; and (4) flood preparedness. FEMA classifies the portfolio of community

flood management practices on a ten point scale, reflecting the overall level of mitigation. The CRS classification determines premium discounts for insurance purchases under the NFIP. Discounts range from five to 45 percent. Since rates are adjusted to reflect risk, CRS attempts to control for adverse selection. By offering CRS credit for flood risk data updates, information on flood hazard may become more accurate over time, leading to better delineation the flood hazard areas within a community. Credits for flood damage reduction include the acquisition, relocation, or retrofitting of existing high-risk structures, which could prevent repetitive losses. In an analysis of 832 large scale flooding events in Texas between 1997 and 2001, Zahran et al (2008) find evidence that community hazard mitigation projects promoted by CRS result in significantly lower loss of human life. Limiting its potential effectiveness, however, CRS has been marked by a lack of active participation since its inception. As of January 2008, 1080 communities, represents only 5% of all the NFIP communities, had enrolled in CRS. Of the 469 NFIP communities in North Carolina, only 75 (slightly over 15%) have a CRS score that is less than 10 (implying that they have initiated activities to improve awareness and reduce risk and applied for credit). The main objective of this study is to provide some empirical evidence related to community decisions involving flood risk mitigation projects. We examine patterns in CRS scores across a panel of North Carolina communities to test a number of hypotheses that previous researches have offered to explain why relatively few local governments adopt hazard mitigation.

Methods

We will analyze flood hazard mitigation projects, as reflected in the CRS score and mitigation credit points, in 37 coastal counties of North Carolina between 2002 and 2008. A summary of the variables to be used in the proposed analysis is presented in Table 1. The dependent variable, annual CRS score (or annual mitigation credit points), comes from Insurance Services Office, Incorporated (ISO). The 14 explanatory variables are organized under three broad categories: environmental risk, economic, social. An ordered probit model will be used for a major portion of the analysis. The parameter vector and associated standard errors are obtained by Maximum Likelihood Estimation (MLE). We are interested in the influence of every factor on community hazard mitigation decisions as reflected in CRS scores. Total mitigation points (available CRS points range from zero to 4500) can be modeled as a non-negative integer, or count data, process. We will employ a model that takes the following general linear form: $y_i = f(x_i', \beta, \varepsilon_i)$. For each specification, unknown parameters (β) and standard errors will be estimated using MLE. Marginal effects will be obtained as transformations of the estimated parameters. Two models (one for CRS score and one for total mitigation points) provide different ways to examine the same data and look for convergent validity.

Broader Impact

While dynamics of weather play an important role in recent growth of damaging floods in the US (Pielke and Downton 2000), intensive development in the floodplain and extensive population growth in low lying coastal areas have increased human beings' exposure to flood hazards. Many mitigation measures including programs to inform people about potential hazards, plans that promote disaster preparedness, regulations designed to limit vulnerability though building or other standards, projects that reduce the likelihood or extent of hazard, and flood insurance, have elements of local public goods, in that they provide benefits for an entire community and agents in the community are not excluded once they have been made available. As such, local governments can play a critical role in flood hazard mitigation (Prater and Lindell 2000). NFIP aims to mitigate loss from flood hazard by planning and providing insurance coverage for businesses and households. Prior studies, however, highlight numerous shortfalls of the program (Kunreuther 1996, Chivers and Flores 2002, Michel-Kerjan and Kousky 2008, PricewaterhouseCoopers 1999, Wharton 2008). The NFIP would likely be more effective if there were higher CRS participation among flood prone communities. We test a number of hypotheses that previous researches have offered to uncover the factors which motivate local hazard management initiatives that improve the CRS classification. Through an improved understanding of factors that motivate hazard mitigation, state governments and FEMA can better design policies that encourage participation in CRS or similar programs in order to provide for better protection from natural hazards.

Variable Name	*Descriptions*
Dependent Variable	
CRS Scores or Total Points	Annual CRS class or total points
Environment and Risk Variables	
Flood Events	The total number of flood events in previous year in a County area.
Property Damage	Annual property damage caused by flood
Fatality and Injury	Annual number of death and injury caused by flood
SHFA Parcel	The percentage of community parcels in 100-year flood zone
Dam	The total number of dams with flood control purpose in a community
Economic Variables	
Annual Premium	Total flood insurance premium
NFIP Policies	The number of flood insurance policies
Premium Reduction	Total flood insurance premium reduction
Property Tax Revenue	Annual property tax in a County
Medium Household Income	The indicator of household annual earning
Social Variables	
Population	Total number of person residing
65 and over	Total number of the people who are 65 years or older
Housing Units	Total number of housing units
Education	In-state undergraduate or higher degree student enrollment during the fall term in North Carolina both public and private institutions

Table 1. Variable Descriptions and Data Source

References

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