Case Study

Theorizing Hazard Mitigation Policy Adoption: Using Floodplain Property Buyout Program as an Example

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Abstract: The public policy innovation and adoption processes are dynamic and complex. This is no exception for the adoption of hazard mitigation policies by localities prone to natural hazards. This paper synthesizes theories about policy innovation and adoption, and literature about hazards mitigation, and proposes a theoretical framework for understanding the factors driving hazard mitigation policy adoption at the local level. Our goal is to identify the key elements and parameters of the hazard mitigation policy adoption construct as well as the relationship between them. Using the property buyout program as an example, we present case studies in the states of North Carolina and New Jersey to illustrate a proposed theoretical framework and outline the directions for future research. The case studies show promising evidence consistent with the proposed framework, covering five categories—hazard problem, social context, institutional capacity, cross-sector collaboration, and policy diffusion. In particular, as for institutional capacity, three aspects influence the uptake of buyouts, including individual capacity [e.g., geographic information system (GIS) and technical skills], organizational capacity (e.g., reducing the negative financial impact on the tax base of buyouts and encouraging an innovative culture of flood mitigation strategies), and system capacity (e.g., cooperation among local organizations). To further validate the framework, systematic research of localities with diverse characteristics of policy adopters and nonadopters is needed. **DOI: 10.1061/NHREFO.NHENG-1569.**

Practical Applications: Flood hazard mitigation is a policy issue with great significance for governments and thousands of flood-prone communities in the US. Local governments bear the primary responsibility of initiating actions for managing flood hazard. Our theorization exercise and the case studies on the property buyout program highlight the importance of several internal and external factors that influence decisions to pursue this hazard mitigation measure at the local level. For local floodplain managers, disaster resilience officers, and policy entrepreneurs, these findings offer pointers as to where they should focus their effort to maximize the possibility of success. Within the community, developing a comprehensive appreciation of the local flood hazard, GIS, and technical skills of local officials as well as cooperation between local organizations are essential in cultivating a culture that encourages innovative flood mitigation strategies. Externally, coordination and communication between the federal, state, and local levels, as well as learning and emulation of practices in peer communities are key for local success. In this regard, the training workshops and outreach programs of FEMA, FEMA regional offices, and its state counterparts are critical. These programs will elevate the issue on the local agenda, disseminate best practices, demystify the process, and incentivize more mitigation policy adoption.

Introduction

Floods are one of the most frequent hazards in the United States (FEMA 2017). Currently, 14.6 million properties have substantial flooding risks, and this number could increase to 16.2 million in 2050 across the country (First Street Foundation 2020). More than $47 billion in insurance claims have been paid out by the National Flood Insurance Program since 2000. Almost half of the frequently flooded houses (13,499) have received insurance payouts that exceed their market value (Moore 2016; Simon 2017). It is necessary to direct hazard mitigation efforts because every dollar invested in mitigation saves $6 in disaster recovery (National Institute of Building Sciences 2017).

Flood hazard mitigation is a policy issue with great significance for all levels of government and thousands of flood-prone communities in the US. Although the federal and state governments play a significant role, local governments bear the primary functional responsibility for hazard mitigation (FEMA n.d.-b). Following the Great Flood of 1993, for example, FEMA introduced the property buyout/acquisition program as a hazard mitigation tool aiming at reducing flood risk as well as avoiding repetitive property loss (FEMA 2020d). While the federal programs provide financial incentives to reduce the number of properties in high-flood-risk areas, local governments are in charge of the policy process of its adoption and implementation (Siders 2013).

The public policy adoption and implementation processes are dynamic and complex (Sabatier and Weible 2007). This is no exception for the adoption of hazard mitigation policies by localities prone to natural hazards. Despite the fact that the property buyout program has existed for some decades, both empirical research and theorization of its adoption and effectiveness have remained very limited.

This study synthesizes the literature about policy innovation and adoption theories and natural hazard policy adoption. We propose a theoretical framework for understanding the factors driving the buyout policy adoption at the local level. We then subsequently

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use two cases to illustrate the proposed framework and outline the directions for future research.

Policy Innovation and Adoption Process

Policy innovation is described as both a process and a result for a locality to adopt a new program or policy (Roberts 1992). This program or policy is new to the locality, but other localities took it up years ago (Walker 1969). Policy adoption is the phase wherein decision makers recognize an existing need, search for solutions, and decide to proceed with the implementation of the solution (Damanpour and Schneider 2006). Several scholars developed theoretical frameworks for policy innovation and adoption; however, each has limitations when applied to the natural hazard policy study.

Multiple Streams Framework

The multiple streams framework (MSF) (Kingdon 2014) interprets how national governments make policy in ambiguous situations. It is widely used to explain policy formation (Sabatier and Weible 2007). Three streams are recognized in the policy system, including the problem stream, the policy stream, and the politics stream. The other elements, such as policy windows and policy entrepreneurs, can also affect the agenda setting of policymaking (Sabatier and Weible 2007; Zahariadis 1992).

The problem stream includes data about various conditions that decision makers need to address. Indicators, focusing events, feedback, and problem load, draw policymakers' attention to problems (Sabatier and Weible 2007). The policy stream refers to a bundle of ideas regarding policy solutions. Policymakers decide to adopt a policy based on several criteria, such as resource adequacy and the level of network integration (Zahariadis 1992). The politics stream represents the broader political discourse of policymaking (e.g., political parties). This stream has three subcomponents: the national mood, party ideology, and administrative turnover influencing government officials to include or promote items on agendas (Sabatier and Weible 2007).

Although Kingdon's (2014) work addressed policymaking at the national level, the MSF can also be used in analyzing policy for the subnational and local levels (Henstra 2010). However, critics of Kingdon's MSF pointed out that the streams were analytically separated, while in fact they are often difficult to separate because of the same policy actors participating in proposing and solving problems (Cairney 2020; Knaggård 2016; Zahariadis 2007). The metaphorical language blurs the MSF and limits our ability to generalize from multiple cases. In addition, the information selection process of the MSF is imperfect. Policymakers often collect information from selected sources and new information is difficult to gather for them. Hence, it is easy for the presentation of information to be susceptible to bias and manipulation.

Innovation and Diffusion Models in Policy Research

In the literature, there are two main explanations for a state's decision to adopt a new policy: internal determinants and diffusion models (Sabatier and Weible 2007). According to the internal determinants' model, the factors driving a jurisdiction's innovation include political, economic, or social features inside the state (Sabatier and Weible 2007; Walker 1969). The diffusion models, on the other hand, are intrinsically intergovernmental. These models claim that a state's policy adoption is influenced by other states' adoption. Two models of policy diffusion are most widely proposed in the literature, including the national interaction model and the regional diffusion model (Berry and Berry 2007). The national interaction model presumes that officials establish a national communication network among states so they can learn about policies from their colleagues (Gray 1973). The regional diffusion model stipulates that states' policy adoption is influenced by their neighbors. The policy actions for those states might have similar impacts because they share similar economic, social, and environmental issues (Kontokosta 2011).

There are three basic mechanisms for these models: learning, emulation, and competition between states (Boushey 2010; Maggetti and Gilardi 2016; Sabatier and Weible 2007). Policy learning is a critical path for policy change, which was highlighted by the Advocacy Coalition Framework (ACF) (Sabatier and Weible 2007). Learning demonstrates that decision-makers are able to pick up successesful practices from other governments. The difference between learning and imitation is that learning concentrates on the action and considers the effectiveness and consequences of policy adoption, whereas imitation concentrates on the actor without regard for the consequences. This indicates that policymakers simply copy the policies of other governments (Boushey 2010; Maggetti and Gilardi 2016; Sabatier and Weible 2007). Competition means that policymakers consider the economic impact of other governments' adoption (or lack thereof). The difference between learning and competition is that learning can generally occur throughout counties, but economic competition is usually limited to neighboring governments (Boushey 2010; Maggetti and Gilardi 2016; Sabatier and Weible 2007). However, some researchers maintained that policy adoptions cannot be explained solely by one of the internal determinants and policy diffusion (Sabatier and Weible 2007). The traditional diffusion framework is too sequential and driven by the demands of potential adopters, which is instrumental (Wainwright and Waring 2007).

Institutional Capacity

Institutional capacity has been considered as a fundamental precedent for policy innovation and adoption. This capacity refers to the ability of the entire institution to undertake a task, using formal tools (e.g., procedures, laws and regulations) and informal tools (e.g., values, norms, traditions) (Storbjörk and Hedrén 2011; van de Meene et al. 2009).

There are three dimensions of institutional capacity: individual, organizational, and systemic (Babu and Blom 2014; OECD 2006). Individual capacity, such as proactive performance, motivation, and ability, is fundamental to the success of any policy (Willems and Baumert 2003). Organizational management capacity comprises five aspects. The first is mandating, which identifies clear tasks that can drive the work of organizations to deal with a particular issue (e.g., hazards mitigation). The ability to allocate sufficient human and financial resources is also important. Adaptable culture, cooperation with other organizations, and leadership to achieve coherence influence policy decisions (Babu and Blom 2014; Storbjörk and Hedrén 2011). System capacity, also known as the enabling environment, includes three distinct levels: networking/cooperation capacity, regulatory framework, and social norms. Networking capacity is a key step for the success of any policy that can exist between organizations at the same institutional level (horizontal) or different levels (vertical) (Marin and Wellman 2011). Regulatory factors (laws, rules, and regulations) form a broader institutional context (World Bank 2003). The manner in which governments are selected, monitored, and changed, and the way in which political institutions make decisions on policy problems significantly impact governance (Babu and Blom 2014; Willems and Baumert 2003). Social norms, values, and practices are critical

because they can promote collaboration by public participation in public policy and can foster individual responsibility for the environment.

Natural Hazards Policy Adoption

Some recent studies have empirically researched the factors of natural hazard mitigation or adaptation policy at different levels based on both quantitative and qualitative methods. Because policy adoption is not a binary decision, the literature highlighted several elements that may impact the adoption process of natural hazard mitigation and adaptation policies.

A natural hazard is a geographical or meteorological event that will likely have a negative impact on the built environment (FEMA n.d.-a). Natural hazards with unique features (e.g., scope and suddenness) influence both policy adoption and innovation (Birkland 2016). Notably, localities with more severe natural hazard problems are more likely to adopt a disaster-related policy (Krause et al. 2019; Massey et al. 2014; Miao 2019; Shi et al. 2015). This is because natural hazards usually cause more public awareness and political momentum for mitigation or adaptation policy. Therefore, disasters serve as windows of opportunity for policy change (Birkland 2010).

Social context including sociodemographic and socioeconomic characteristics of localities is also a significant factor for natural hazard mitigation and adaptation decisions (Krause et al. 2019; Miao 2019). Specifically, researchers have studied various social context factors influencing disaster mitigation or climate adaptation policy adoption. Demographic factors include the aging population (Miao 2019), minority population (Krause et al. 2019), as well as population size (Kalafatis 2018; Mach et al. 2019). Others integrated economic factors into natural hazard policy adoption, such as agriculture economic proportion (Miao 2019), municipal expenditures per capita (Shi et al. 2015), education (Krause 2011), and income (Kalafatis 2018). These factors may be related to funding resources for policy adoption.

More studies are emerging to assess the influence of institutional capacity factors on hazard and climate change mitigation or adaptation policy adoption. Because it is difficult to quantify institutional capacity for mitigation and adaptation decision-making (Shi et al. 2015), scholars applied various research methods to study this topic. The definitions and scope of institutional capacity are inconsistent across different studies. Brody et al. (2009) suggested that organizational capacity (e.g., commitment to mitigate floods, financial and personnel resources, and data quality) had more of an effect on decisions of nonstructural flood mitigation strategies than structural ones, based on two ordinary least-squares (OLS) models. Bolson and Broad (2013) found that leadership could assist with resolving resource limitations as well as supporting innovative agency culture of climate change planning and policy based on quantitative and qualitative mixed methods. Linkous et al. (2019) distinguished seven categories of factors related to localities' adoption of transfer of development rights programs for growth management efforts based on logistic regressions.

Meanwhile, some studies cited policy diffusion as a key driver to natural hazards mitigation planning. Miao (2019) found that geographic proximity influenced the decisions of states' adaptation planning. States tended to adopt adaptation policies when their neighbors engaged in the planning process. However, Massey et al. (2014) noted that "progress in countries" on adaptation did not serve as an impetus for other countries' policy adoption.

In summary, one critical shortcoming of the hazards mitigation policy adoption literature is the lack of a holistic examination of the complex relationships between adoption of specific policies, political and governmental environment, geographic characteristics, and regulatory approaches (Linkous et al. 2019). Natural hazards policy adoption quantitative studies need to be supplemented with qualitative case studies, which provides a richer contextual understanding of localities' policy adoption. Additionally, there is limited research on the factors influencing the adoption of the property buyout policy. So far, only one study is directly associated with the property buyout policy adoption (Mach et al. 2019).

Theorizing Hazard Mitigation Policy Adoption

Drawing from policy theories as well as literature on natural hazard policy adoption, we can begin to theorize hazard mitigation policy adoption (Fig. 1). Our goal is to identify the key elements and parameters of the hazard mitigation policy adoption construct as well as the relationship between them.

A locality's decision to pursue hazard mitigation policies (e.g., to mitigate flood risk) is expected to be driven by a set of internal and external factors. The internal factors are conditions inherent to a locality, including problem identification, institutional capacity, and social and economic context. Problem identification captures the severity of natural hazard risk (e.g., flood risk) in a locality, including hazard exposure, disaster impact, and previous experience with disaster events. Much research has confirmed that if communities had more serious problems caused by natural hazards, public officials would tend to adopt more hazard mitigation policies (Krause et al. 2019; Massey et al. 2014; Miao 2019; Shi et al. 2015; Zahran et al. 2008). Social and economic contexts reflect the basic community attributes of the county. Socioeconomic and demographic factors, such as income, population, and education, are important for the local government's buyout decisions and citizens' innovative ability to participate in the buyout voluntarily (Flanagan et al. 2011; Gaynor and Wilson 2020; Krause et al. 2019; Mach et al. 2019; Miao 2019). Institutional capacity refers to three levels of capacity, including individual professional capacity, organizational management capacity, and system capacity (Babu and Blom 2014; OECD 2006). The capacity at different levels influences the decision-making of local governments from their officials, their organizations, and system aspects. Individual professional capacity can be an intermediate mechanism for governance to make policy interventions (Willems and Baumert 2003). For example, the technical skill of floodplain managers in a community is critical in helping the public and officials appreciate the flood risk through collecting, simulating, visualizing, and communicating flood risk data. Organizational management capacity (e.g., financial impact of buyouts and leadership) reflects the degree to which governments support innovation and achieve consensus in policy adoption (Babu and Blom 2014; Brody et al. 2009; Storbjörk and Hedrén 2011). System capacity refers to interdepartmental cooperation or cooperation between local governments and other stakeholders, which can also affect policy adoption of flood mitigation (Marin and Wellman 2011).

The external factors are precedents outside a community that could influence its willingness and/or ability to adopt the program. This category includes vertical system capacity and policy diffusion. The factors of cross-sector engagement and collaboration outside the county's administrative border are external factors that influence the buyout policy adoption and innovation. It comprises local governments' collaboration with upper-level governments, private sectors, nongovernmental organizations (NGOs), and so on (Marin and Wellman 2011; World Bank 2003). Communication and the transfer of funds between hierarchical layers that are part of

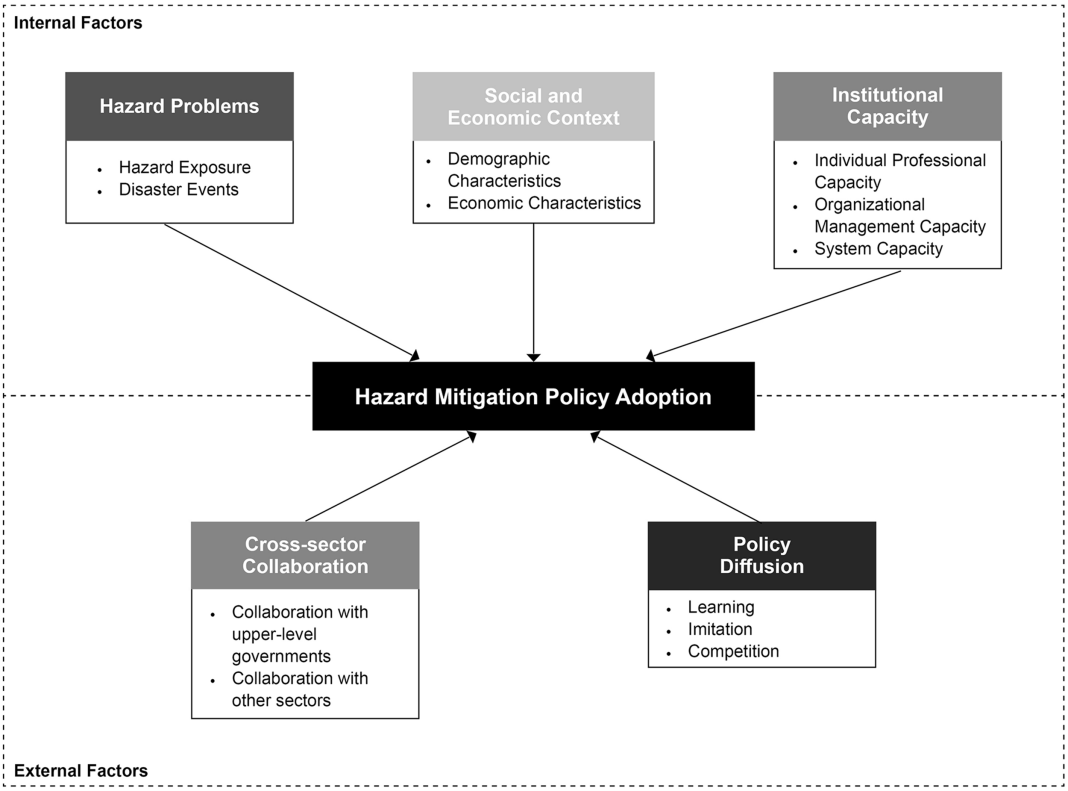

Fig. 1. Property buyout program adoption conceptual framework.

vertical networking capacity affect the property buyout decision of governments. The factors of policy diffusion are developed based on three mechanisms: learning, imitation, and economic competition (Boushey 2010; Maggetti and Gilardi 2016; Sabatier and Weible 2007). A locality can learn or imitate the buyout approach from the other localities, which can ease the policy decision-making process based on better information. Economic competition can prompt a locality to adopt a policy.

In the context of hazard mitigation policy adoption, this proposed framework presents several advances to the original MSF and policy innovation and diffusion theories. First, the stream concepts of MSF are largely metaphorical. In our proposed framework, these metaphorical concepts are operationalized to specific measures and factors that are more conducive to understanding different elements of the policy adoption process. Second, natural hazards constitute a policy domain with unique characteristics. Natural hazards' features—hazard exposure, disaster impact, and a community's previous experience with disaster events—are proven factors that could trigger government responses and policy change (Birkland 2016). Both MSF and policy innovation and diffusion theories have problem-related content, which includes a bundle of environmental conditions and social characteristics in a community, such as government budget deficits, disasters, and inflation (Fowler 2020; Sabatier and Weible 2007). In comparison, our proposed framework includes a designated category to capture the salient influence of natural hazards on hazard policy adoption.

Third, our proposed framework highlights the importance of policy entrepreneurship in hazard mitigation policy adoption (Ridde 2009; Zohlnhöfer and Rüb 2016). This includes internal institutional capacity as well as external cross-sector engagement and collaboration. One of the most widely noted challenges of natural hazards policy adoption at the local level is that such an issue does not normally receive sustained attention from the officials and the public, especially in areas where hazardous events are less frequent. Policy entrepreneurs are vital in advancing and maintaining natural hazards on the local policy agenda, as well as devising and formulating pertaining rules and regulations. Last, our proposed framework stipulates that policy diffusion of natural hazard mitigation programs could happen between neighboring localities. For example, FEMA in the US provides a variety of grants incentivizing local governments to adopt hazard mitigation programs. These funding opportunities, along with FEMA's rules and technical requirements pertaining to these federal grants, present a scenario where learning, imitation, and competition could take place between localities in the policy domain of natural hazard mitigation.

Property Buyout Program

General History

The property buyout program in the US can trace its origins to the relocation of the entire downtown area from the Kickapoo River floodplain to the higher grounds in Soldiers Grove, Wisconsin, in 1978 (Greer and Binder 2016). Following the Great Flood in 1993, the focus of federal hazard mitigation policies shifted from structural to nonstructural measures (e.g., property buyout/acquisition program) (Congressional Research Service 2010). Revised and newly enacted legislation in the 1990s encouraged restrictions on the human occupation of floodplains (Burby et al. 1999). Consequently, the number of buyout projects increased significantly (Fig. 2) (FEMA 2020c). FEMA purchased and funded 47,099 voluntary properties across the country from 1989 to 2020 (FEMA 2020c). Since 2000, FEMA has invested approximately $843 million in property buyout programs in 44 states, benefiting more than 1,000 communities (FEMA 2020c; Siders 2018). The number of FEMA-approved buyout projects in a state ranges from

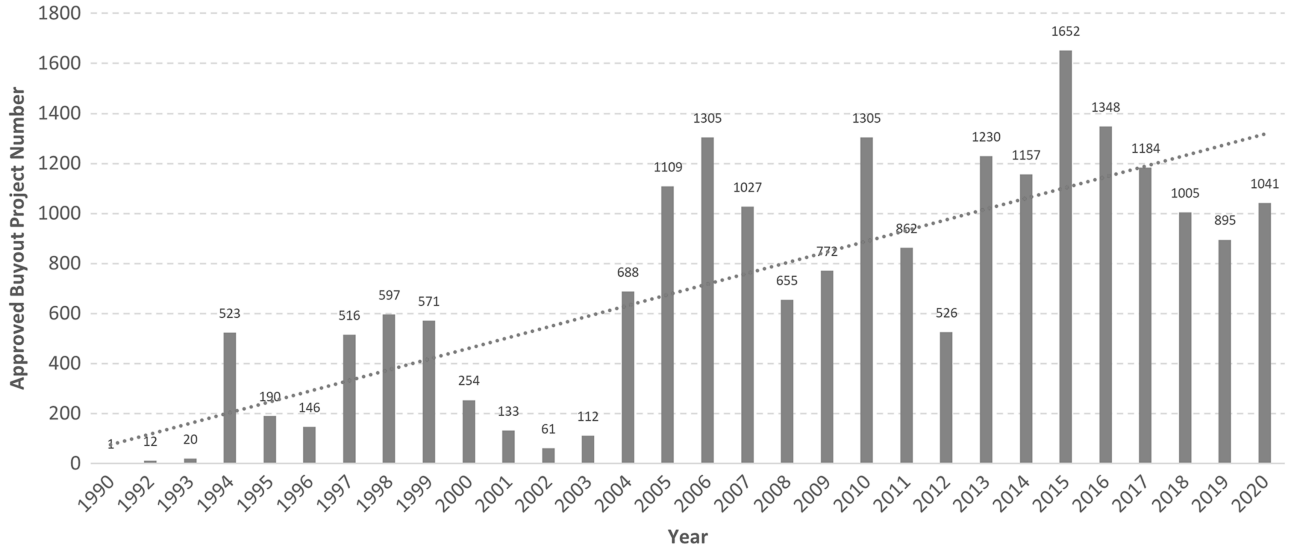

Fig. 2. Approved FEMA property buyout projects organized by year. (Data from FEMA 2020c.)

2 to 2,852 (FEMA 2020c). Four states, including Texas (2,852), North Carolina (1,899), Iowa (1,608), and Pennsylvania (1,073), have the most approved buyout projects so far.

Buyout Process

The process of a buyout project is lengthy and complicated. It could take up to 13–35 months to complete. There are five phases of the buyout process, including policy adoption, funding application and appraisal, relocation, demolition, and open space management (44 CFR Part 80). In this process, many different stakeholders get involved, including different departments of governments at the local, state, and federal levels, property owners, certified appraisers, and landscape designers (44 CFR § 80.5).

According to FEMA's buyout guidance (44 CFR Part 80), a local government (subapplicant/subgrantee) can apply for federal funds through the state government (applicant/grantee) regarding the property buyout program (44 CFR § 80.5, 44 CFR Part 80). Property owners are voluntarily participating in the buyout program. FEMA reviews the applications in terms of the rules abidance, benefit-cost analysis (BCA), and environmental and cultural resources effects (44 CFR Part 80). If the grant application is approved, the property owner will have a kickoff/information meeting with a grant coordinator to know the buyout process and timeline (Harris County Flood Control District 2017). In the appraisal process, buyout program administrators make offers to property owners based on the market value of the property (44 CFR Part 80). When funding is available, the local government will assign a purchase agent to the homeowner (44 CFR Part 80). In the relocation process, the local government will assign a relocation agent who will examine the property owner's eligibility for relocation assistance and estimate the amount of moving allowance for the property owner. Then local governments will demolish the purchased property (44 CFR Part 80). Under FEMA's deed restrictions, the property site must be maintained as open space forever, protecting the function of the natural floodplain (FEMA 2015). In summary, property buyout in floodplains is a multistep process that involves many stakeholders at all levels of government. As a result, the buyout adoption and implementation can be influenced by various factors, including both factors internal to the community as well as factors external to the community.

Case Studies

To illustrate the presented conceptual framework, we looked at localities in North Carolina and New Jersey where property buyout programs have been implemented. The FEMA property buyout database indicates that there have been more than 1,000 property buyout projects with various levels of success in North Carolina and New Jersey. We collected information about these buyout projects from web pages, published journal articles, reports, and news articles. Through analyzing and synthesizing the collected information, our goal is to examine the proposed framework of hazard mitigation policy adoption and identify the elements, if any, that are not captured by the framework.

Floodplain Property Buyout Projects in North Carolina

North Carolina is very successful in its adoption and implementation of the property buyout policy. From 1996 to 2020, FEMA approved 1,899 property buyout projects in the state (FEMA 2020c). Kinston, Greenville, Rocky Mount, Goldsboro, and Grifton are the five municipalities that have the largest number (1,034 in total) of approved buyout projects in North Carolina. As shown in Fig. 3, these five cities form a circle of clustered points. The property buyout policy adoption in North Carolina was influenced by hazard problem severity, social context, institutional capacity, and policy diffusion factors. The explanation of each factor category is as follows.

Internal Factor: Hazard Problems

North Carolina suffered from some of the worst flooding events in the US. The state has more than 482.80 km (300 mi) of Atlantic coastline with an average of 137.16 km (54 in.) of rainfall every year, the highest peaks east of the Rocky Mountains with 40.64 km (16 in.) of snowfall, and 17 major river basins with flat topography allowing floodwater to reach many homes (North Carolina Flood Insurance n.d.). Hurricanes and tropical storms have plagued the state over the past 30 years, causing a great amount of flooding damage (NOAA National Centers for Environmental Information 2021; FEMA n.d.-c) (Table 1).

Fig. 4 plots the number of buyout projects in the state from 1996 to 2018 and the major tropical storms and hurricanes during this period. The vast majority of the approved buyout projects in the

Fig. 3. FEMA-approved property buyout projects in North Carolina. (Map by authors using ArcGIS, powered by Esri.)

Table 1. Major flood events in North Carolina

Storm	Year	Damage/costs (in billions) [Consumer Price Index (CPI) adjusted]	FEMA disaster counties	Deaths
Florence	2018	$24.7	28	53
Matthew	2016	$11.0	45	49
Isabel	2003	$7.8	26	55
Floyd	1999	$10.3	66	77
Fran	1996	$8.5	100	37

Sources: Data from NOAA National Centers for Environmental Information (2021); FEMA (n.d.-a).

state took place in 2004 (511) and in 2007 (412). In the years before 2004, the buyout project numbers stayed fairly low and stable. During this period, seven hurricanes and three tropical storms visited the state. Thus, the extreme disasters triggered the adoption of the property buyout policy at the local level in North Carolina.

Internal Factor: Social and Economic Context

The top five cities that have the most FEMA-approved buyout projects in North Carolina all have a larger population of Black residents, higher poverty rates, and lower median household

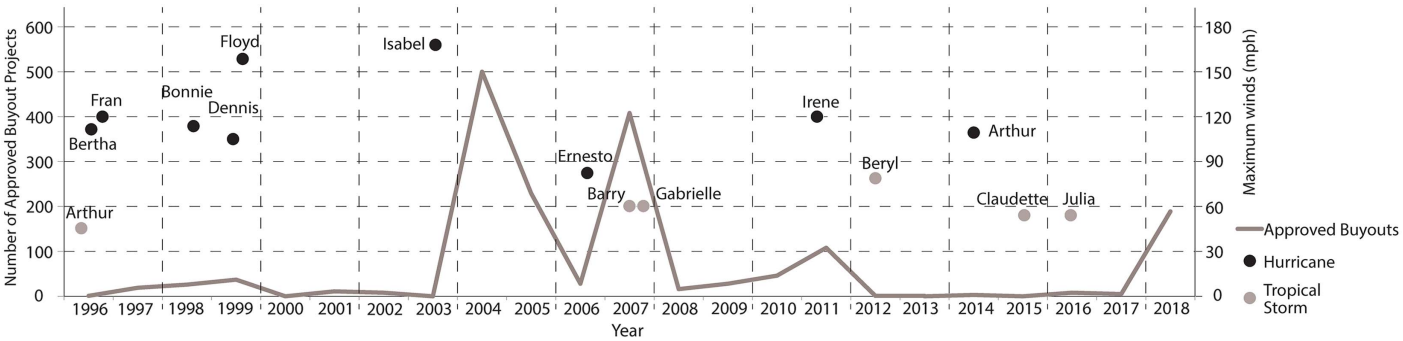

Fig. 4. Hurricanes, tropical storms, and the amounts of approved property buyout project from 1996 to 2018 in North Carolina.

Table 2. Social context of five cities with buyout policy adoption in North Carolina

Location	Population	Black population (%)	Bachelor's degree or higher (%)	Median household income	Poverty rate (%)	Number of FEMA-approved buyout projects
Kinston	20,041	66.2	17.6	$33,066	27.8	344
Greenville	93,400	39.3	37.7	$40,875	30.2	240
Rocky Mount	53,922	63.6	20.3	$40,633	19.2	193
Goldsboro	34,186	52.3	20.3	$34,083	26.1	144
Grifton	3,428	42.0	13.0	$34,977	25.5	113
North Carolina	10,488,084	22.2	31.3	$52,602	13.6	1,901

Sources: Data from US Census Bureau (2020); FEMA (2020c).

income than those for North Carolina as a whole (US Census Bureau 2020; FEMA 2020c) (Table 2). For example, Kinston's Black population is 66.2%, which is approximately three times that of the state (22.2%). The percentage of people who obtained bachelor's degrees or higher in Kinston is 17.6%, almost half of the state average. In Kinston, median household income ($33,066) is the lowest and the poverty rate (27.8%) is the second-highest among the five cities. This means Kinston is the most vulnerable locality with the highest number of FEMA-approved buyout projects (346). Cities with larger populations tend to have more buyouts. But the education attainment factor cannot explain the buyout policy adoption among five cities directly. Multivariate analysis will be needed to explore nomothetic causal relationships between sociodemographic/socioeconomic factors and the property buyout policy adoption at the local level in the future.

Internal Factor: Institutional Capacity

Institutional capacity factors at the individual, organizational, and systematic levels influenced the adoption of property buyout policy adoption in North Carolina. In terms of individual factors, local floodplain officials with some appropriate technical skills can understand spatial data and better address problems in planning and implementing floodplain management programs. For example, the City of Kinston has the largest number of FEMA-approved property buyout projects (346) in North Carolina from 1997 to 2020 (UNCIE 2016a; FEMA 2020a). Local officials who were working on hazard mitigation grant program acquisition and management used geographic information system (GIS) to show the 100- and 500-year floodplains virtually so they could figure out the potential damage of properties and make plans for buyouts (McCann 2006; FEMA 2020a). Moreover, GIS can help reflect the flood risk and illustrate the benefits of buyouts for residents as an educational tool. Based on the understanding of the outcomes of buyouts through GIS, most homeowners who participated in the buyout in Kinston chose to relocate to the same city after Hurricane Fran hit in September 1996 (FEMA 2020a). Through this, local governments minimized the negative effects of the acquisitions and relocations on its tax base in Kinston.

At the organizational capacity level, funding and financial impact on localities regarding buyout policy adoption also affect local governments' decisions. For instance, Mecklenburg County made the decision of buyouts based on whether they had enough budget in 1999 (DeAngelis 1999). Moreover, if residents who participated in the buyouts moved outside the community, it would decrease the local tax base and leave local governments to pay for the maintenance of vacant lands (Salvesen and BenDor 2018). This negative financial consequence may also influence the local government's decisions on the buyout policy adoption. Therefore, it is necessary to consider incentives and strategies for residents to relocate within the community. In North Carolina, Rocky Mount, Kinston, and Greenville all provided sufficient housing options within their jurisdictions to help retain residents (Salvesen et al. 2018). Another example is that the local government in the City of Whiteville adopted the buyout because they provided incentives to residents who stayed in the same city after Hurricane Florence in 2018 (Wagner 2019). These incentives prevented population losses in the city, which allowed the local government to continue to receive the same amount of state shares of sales tax based on its population. In addition, leadership also plays a role in the decision of buyout at the local level. Besides the previous individual professional skill factors making the property buyout projects successful in Kinston, local public officials of Kinston committed to proactively integrating floodplain management approaches into the community to reduce flood risks (UNCIE 2016a; Press 1996; Short n.d.). Its exclusive mitigation strategy was the property buyout program, which planned to remove residents from the floodplain to higher ground. As a result, Kinston restored floodplain functions along the Neuse River. Through 2019, Kinston purchased 1,600 homes and kept 73% of the floodplain as open space in the city (Short n.d.).

With regard to institutional systematic capacity factor, the network and regulatory frameworks among different stakeholders in a locality play an important role in the buyout policy adoption and implementation process. Cooperation between local governments and the private sector improves coordination and manages personnel and resources. For example, the local government in Rocky Mount hired a consulting firm with previous working knowledge on the buyouts to supplement the personnel capacity of the urban planners (UNCIE 2016b).

External Factor: Cross-Sector Engagement and Collaboration

Network capacity of organizations and regulatory frameworks beyond locality boundaries influenced the property buyout policy adoption in North Carolina. The vertical communication and coordination among all levels of government impact the property buyout policy adoption. On average, 75% of property buyout projects are paid by FEMA. The remaining 25% are the responsibility of state and/or local government (FEMA 2016). In 1999, given that Hurricane Floyd damaged approximately 4,000 housing units in Rocky Mount, 446 homes were bought by the local government, which was the largest number of homes bought out at that time in North Carolina. The buyout policy adoption and implementation process was swift because the state government provided two funds, the State Acquisition and Relocation Funds (SARF) and the Crisis Housing Assistance Fund (CHAF), to supplement the FEMA Hazard Mitigation Grant Program (HMGP) and raise the possibility of buyouts in Rocky Mount (UNCIE 2016b).

Horizontal cooperation among local governments beyond boundaries is also an important foundation for buyout policy adoption. For example, Edgecombe County, Nash County, and Rocky Mount City communicated and cooperated with each other on buyout applications for FEMA HMGP by designating personnel and collecting resources after Hurricane Floyd in 1999 (UNCIE 2016b).

External Factor: Policy Diffusion

Policy diffusion including learning, imitation, and economic competition factors can also explain the property buyout policy adoption in the cases of North Carolina. The clustered spatial pattern of buyout projects in North Carolina can be explained by the policy diffusion learning factor. For instance, the city staff of Rocky Mount visited their neighbors, Greenville and Goldsboro, to learn how to manage a buyout process after Hurricane Fran in 1996 (UNCIE 2016b). In addition, local officials in Kinston communicated with the officials from Grand Forks, North Dakota, to imitate their buyout process because Grand Forks experienced severe flooding in 1997 (UNCIE 2016a).

Floodplain Property Buyout Projects in New Jersey

The property buyout projects in New Jersey are different from those in North Carolina. The New Jersey state government has a unique program to manage buyouts named the Blue Acres floodplain acquisition program. In the aftermath of Hurricane Sandy, the Department of Environmental Protection's Blue Acres program purchased 967 properties with a total of $375 million from FEMA HMGP and the Department of Housing and Urban Development (HUD) Community Development Block Grant Disaster Recovery (CDBG-DR) funds (Auciello 2019). The *Hurricane Sandy Rebuilding Strategy* emphasizes property buyout as a policy focus to reduce the risk of future repetitive flooding losses (Hurricane Sandy Rebuilding Task Force 2013). The buyout projects in New Jersey were unique from the similar programs in other states because the property purchasing processes were completed in a few weeks, whereas other states often need months or years to complete them.

Internal Factor: Hazard Problems

New Jersey is a coastal state, and its coastlines border the Atlantic Ocean. Seventeen of New Jersey's 21 counties cover 2,883.94 km (1,792 mi) of coastline (Hess et al. 2019). In New Jersey, there are 738.15 km^2 (285 mi^2) of land within 1.52 m (5 ft) above the high tide line (Climate Central 2014). Researchers estimate that currently 62,000–86,000 homes and commercial properties are located in areas with a 1-in-30 likelihood of storm or flood (Hess et al. 2019). Thus, it is no surprise that major floods have occurred recently and the state has a long history of dealing with repetitive flood loss.

Hurricane Sandy as a focusing event was the main impetus for the property buyout policy in the state. Hurricane Sandy made landfall near Atlantic City in New Jersey on October 29, 2012, with strong winds and heavy rainfall, flooding most areas of the state. It caused an economic loss of $29.5 billion (2012 USD) (Strauss et al. 2021). A total of 346,000 homes were damaged, and 37 people died (FEMA 2020b). It was the most destructive natural hazard that has ever hit New Jersey.

The Blue Acres program originally started in 1995 to oversee property buyout in the state, but its role expanded immensely after Hurricane Sandy in 2012 (State of New Jersey 2014). Blue Acres made offers on 690 homes in only 2 years (FEMA 2020b). The state government also conducted buyout-related legislation after Hurricane Sandy. For example, Bill A928 allocated "at least $100 million from Garden State Green Acres Preservation Trust Fund for coastal and inland Blue Acres land acquisition projects in flood-prone areas" (BillTrack50 n.d.).

Internal Factor: Social and Economic Context

In contrast to the buyout cases in North Carolina, sociodemographic and socioeconomic factors might not influence the buyout policy adoption as strongly in New Jersey. Fifteen cities or towns in nine counties in the state adopted and implemented the property buyout program (US Census Bureau 2020) (Table 3). The percentage of Black residents in 11 cities and towns is lower than that for New Jersey as a whole (15.1%). The percentage of people who obtained bachelor's degrees or higher in 11 cities and towns is lower than the average value of New Jersey (39.7%). In eight cities and towns, median household income is lower than that for all of New Jersey ($82,545). Poverty rates in 11 cities and towns are lower than that for New Jersey in its entirety (9.2%). Even though more than half of cities and towns that adopted buyouts have similar characteristics, we need to conduct a quantitative analysis to prove the relationship between them.

Internal Factor: Institutional Capacity

Three levels of institutional capacity factors (individual, organizational, and systematic) played a significant role in the property buyout policy adoption and implementation in New Jersey. Professional skills assisted officials in hastening the buyout adoption and implementation process. LiDAR was used in mapping systems developed by New Jersey state officials. They created digital elevation models quickly and accurately based on capturing topographic

Table 3. Social context of 15 localities with buyout policy adoption in New Jersey

Location	Population	Black population (%)	Bachelor's degree or higher (%)	Median household income	Poverty rate (%)
Downe Town	1,107	2.0	14.0	$52,321	10.2
East Brunswick Town	47,819	3.0	56.0	$115,445	6.1
Lawrence Town	32,614	11.0	55.5	$103,690	6.0
Linden City	42,222	29.0	22.7	$73,386	8.3
Manville Borough	10,230	9.0	18.1	$69,625	11.1
Newark City	281,999	47.0	14.1	$40,235	25.2
New Milford Borough	16,545	4.0	44.3	$94,344	7.0
Ocean Town	26,709	9.0	45.6	$94,284	6.3
Old Bridge Town	65,591	6.0	38.3	$94,037	9.0
Pleasantville City	20,301	38.0	13.2	$40,991	23.2
Pompton Lakes Borough	11,029	1.0	38.0	$102,371	7.1
Rahway City	29,543	27.0	30.3	$78,946	6.2
Sayreville Borough	44,292	11.0	34.4	$81,883	7.0
South River Borough	16,001	6.0	25.4	$78,162	7.2
Woodbridge Town	100,157	8.0	35.8	$96,633	6.7
New Jersey	8,882,190	15.1	39.7	$82,545	9.2

Source: Data from US Census Bureau (2020).

information, which helped evaluate the buyout project application. Officials saved not only 2 or 3 months of each application by using these mapping systems, but also saved $1,000 for each property (FEMA 2020b).

The innovative agency culture of the organizational capacity factor was key for the success of buyouts in New Jersey. Given that FEMA's HMGP eligibility required historical and environmental reviews of properties which were lengthy, the acquisition process might have been delayed and homeowners might have had to wait for help for more than 2 years as in other states. The dashboard survey method employed by the Blue Acres team dramatically decreased the number of properties that needed extensive reviews in order to accelerate the application process of buyouts. The team used this approach to take preliminary site surveys and minimize the number of properties that needed detailed evaluation before the buyout application process began. For instance, homes that had been built less than 50 years prior to Hurricane Sandy could be excluded from the review (FEMA 2020b).

In terms of systematic capacity factors, partnership and teamwork that foster dialogue and let people think collectively were crucial for the buyout adoption and implementation process in New Jersey. To reduce red tape and speed up the acquisition process, Blue Acres worked with experienced appraisers, environmental hazard inspectors, as well as GIS and other real estate experts (FEMA 2020b).

External Factor: Cross-Sector Engagement and Collaboration

In terms of external institutional capacity factors, collaborative efforts among different levels of governments were important in ensuring that buyout adoption and implementation processes were handled well. One of the biggest obstacles for local governments to adopt the property buyout policy was the preparation of the required BCA. FEMA used it to demonstrate the cost-effectiveness of the buyout projects. This BCA preparation can often take longer than several years (Weber 2019). In New Jersey, after Hurricane Sandy, at the beginning of the buyout policy adoption process Blue Acres team members relocated to the joint field office in order to collaborate with FEMA and the New Jersey Office of Emergency Management (OEM) to increase work efficiency. Governments only spent 2 weeks reviewing the submission and approving the projects (FEMA 2020b).

External Factor: Policy Diffusion

Because the property buyout policy is voluntary both for local governments and residents, learning about the property buyout program in other states prompted local governments in New Jersey to incorporate the policy into the agenda. This was the case in Morris County, which implemented the first-of-its-kind county program in New Jersey. After Tropical Storm Irene (2011), Jennifer McCulloch, who was a coordinator of the flood mitigation program, studied flood mitigation strategies across the country. She found that the buyout policy could resolve flooding issues permanently and was cost-effective. Then she reached out and persuaded elected officials of the county to adopt and participate in the buyout program (McCulloch n.d.). As of June 12, 2020, Morris County had 78 grants for housing acquisition and expended $8.8 million on buyouts in seven towns (Morris County, NJ 2020). So far, Blue Acres has already assisted the local governments of nine counties, which has encouraged other jurisdictions in the state to learn about or imitate buyouts (The Associated Press 2019).

Discussion

The buyout projects in the state of North Carolina and New Jersey provide evidence that is overall consistent with the proposed theoretical framework for hazard mitigation policy adoption at the local level. Specifically, all localities in these two states adopting buyouts have problems with flooding that drove them to take up the flood mitigation policy. With regard to social context factors, the results of North Carolina suggest that a high percentage of Black residents, poverty rates as well as low median household income affect local governments' decisions to adopt the policy. However, sociodemographic and socioeconomic elements did not have the same effect on the buyout policy adoption in New Jersey. The percentage of African American population was not a factor in New Jersey. Instead, the level of education attainment (e.g., the low percentage of people with bachelor's degrees or higher) might have influenced the uptake of buyouts. Although the literature has recognized race, income, and population of localities as essential indicators influencing policy decisions (Gabbe et al. 2021; Hui et al. 2019; Krause 2011), their importance is not clear in our case studies. This is an area that will require further research.

In addition, institutional capacity factors played a significant role in both North Carolina and New Jersey cases of buyout adoption. Individual capacity (e.g., technical skills), organizational capacity (e.g., financial and leadership), and system capacity (e.g., cooperation with other experts within the jurisdiction) affected local governments' decisions to adopt the buyout policy. As for the external factors, collaboration with upper-level governments and sectors outside of the jurisdiction can assist the adoption process of buyouts for local governments. In particular, state governments in both North Carolina and New Jersey assisted local governments to adopt buyouts. They helped with funding issues and technique issues, respectively. Policy diffusion, such as learning and imitation, can also trigger the uptake of buyouts. In North Carolina, neighboring cities learned or imitated buyouts from each other. Learning was also a significant element in the adoption process of the property buyout in New Jersey. However, the time duration of the buyout adoption in New Jersey is shorter than that in North Carolina. In New Jersey, Blue Acres only spent 2 years from the adoption of the buyout program to the implementation. On the other hand, it took almost 5 or 8 years for the localities in North Carolina to adopt the property buyout program. This suggests that the preexisting institutional capacity and early collaborations between various experts can certainly expedite the adoption of the property buyout program.

In summary, the proposed framework for hazard mitigation adoption at the local level does a fine job in capturing and explaining the factors influencing the buyout program adoptions in North Carolina and New Jersey. Nevertheless, we are fully aware of the limitations of the current study. Although our case studies described the factors that go into the buyout policy adoption, they were not able to explore the interrelationships between the different internal and external factors. Consequently, we cannot draw definitive conclusions about the net contribution of any particular factor (e.g., vertical and horizontal policy diffusion). To further explore the relationships between specific predictors and the buyout adoption, we need systematic quantitative and qualitative research that includes more cases of communities with varying degrees of success with the buyout program, including the ones who did not participate in this program, as well as varying hazards vulnerability and socioeconomic contexts. As an initial attempt to do this, we are currently conducting a survey of communities in Virginia. Using this survey and the interviews we are doing with local officials in Virginia, we hope to address the limitations of the current study.

Conclusions

We drew on theories of policy innovation and adoption, as well as hazard mitigation literature to propose a conceptual framework for hazard mitigation policy adoption at local levels. We used property buyout projects in the states of North Carolina and New Jersey to illustrate the proposed framework. A locality's buyout decision is driven by a set of internal factors and external influences. Our case studies highlight that hazard problem is an important precedent of a locality's buyout decision. In the process of a locality's buyout policy adoption, the case studies highlight the importance of institutional capacity at the individual, organizational, and systematic levels. In terms of individual professional capacity, public officials with GIS and other technical skills are important for flood risk mapping, modeling, communication, and community outreach. At the organizational management capacity level, reducing the negative financial impact on the tax base of buyouts and encouraging an innovative culture of flood mitigation strategies stimulate the adoption of buyouts. Horizontal cooperation among local organizations also facilitates policy adoption. Some external factors can also explain why some localities considered and adopted buyouts, for example, coordination among federal, state, and local levels, as well as learning and imitation mechanisms of policy diffusion.

Although the case studies presented in this paper show evidence consistent with the conceptual framework that we proposed for hazard mitigation policy adoption, they by no means suggest validation of the framework. Systematic research of localities with various characteristics of adopters and nonadopters (e.g., communities with flood hazards, but without buyout projects) is needed in the future. Currently, we are conducting a systematic evaluation of floodplain property buyout programs. We are also doing a survey of local floodplain managers who have intimate knowledge about these buyout projects. With these data, we hope to provide evidence in support of the proposed framework and/or identify the missing pieces in the framework.

Data Availability Statement

All data that support the findings of this study are available from the corresponding author upon reasonable request.

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