How Pre-Disaster Development Policies Shape Housing Vulnerability and Damage: Study of Florida, Lee County

Khandker Tarin Tahsin, Nishat Tusnime, Erin Witt, Sara Hamideh Ph.D

Background

- Hurricane Ian struck Southwest Florida with winds up to 155 mph and a 15 ft storm surge on 28th September 2022 [2, 4]
- Lee and Collier counties were the hardest hit, incurring over $9 billion damages and losing 5,109 residential buildings beyond repair [2, 4]
- Critical infrastructure, including roads and the Sanibel Causeway, was severely damaged, stranding many residents [3]
- Of the 149 deaths in Florida, 72 occurred in Lee County [4]

Research Questions

1. What are the intended effects of pre-disaster development policies on disaster vulnerability and exposure in Lee County?
2. How do pre-disaster development policies affect the actual housing vulnerability and exposure in Lee county?
3. What is the connection between the intended effects of pre-disaster development policies and post-disaster housing damage in Lee County?

Data and Methods

- Reviewed forty-one policy, planning, regulation, and funding documents for Lee County from 2000 to 2022 and systematically coded the policy documents using Atlast.ti searching for different types of tools, such as funding, regular planning, emergency/disaster planning, and development restrictions. Also searched for housing outcomes such as retrofit, buyout/relocate, and hazard protection.
- In Atlas. ti using co-occurrence and other tools, overlaps between development tool and housing outcomes were identified which helped determine their impact on vulnerability and exposure, and identity the mechanism through which the effect would occur.
- To identify and assess the effects of development policy on actual vulnerability and exposure before Hurricane Ian we collected data from secondary resources such as Shimberg Center for Housing Studies, the Centers for Disease Control and Prevention, and the Census Bureau, looking for specific vulnerability such as elderly population, minority population, housing type and cost burden.
- From March 7 to 15, 2024, 984 houses in Sanibel, Fort Myers, and Fort Myers Beach were surveyed and 220 were identified as damaged.
- The physical damage assessment survey data was then analyzed focusing on household type, occupancy status, and extent of damage.

Type of Document
- Act/Bill
- Announcement
- Development Plan
- Disaster-Related Plan
- General Policy
- Law
- Legislation
- Map
- Rule/Code/Regulation/ Ordinance
- Spending Program/Plan
- Study/Report

Qualitative Coding

Pre Disaster Development Policy
- Funding Tools
- Regular Plan Tools
- Emergency/Disaster Plan Tools
- Development Restrictions Tool

Intended Effect
- Hazard Protection
- Retrofit
- Buyout/Relocate

References

Applications of Development Policies for Reducing Vulnerability and Exposure

- From the code co-occurrences analysis a pattern of reduction in vulnerability and exposure was noticed.
- A much larger number of policy tools have targeted vulnerability reduction compared to exposure reduction (451 cases for vulnerability v/s 164 cases for exposure)
- The instances of policy tools targeted hazard protection outcome was much larger compared to retrofit and buyout.
- For reducing vulnerability and exposure, the most commonly used tool is development restriction (421), followed by funding tools (135).
- Land development codes (one type of development restriction tool) is the most commonly used tool used for hazard protection
- Public funds (one type of funding tool) is the highest contributor for both hazard protection outcome and also retrofit. While Grants (one type of funding tool) was the most commonly used tool for buyouts/relocate

Intended Effect \ Dev. Policy	Funding Tool	Regular Plan Tool	Disaster/ Emergency Plan Tool	Development Restriction Tool
Buyout/ Relocate	11	5	1	6
Retrofit	33	3	8	8
Hazard Protection	91	87	74	407

Intended Effect on Housing — Pre Disaster Development. Policy

- Development Restriction
- Regular Plan
- Funding
- Emergency/ Disaster Plan
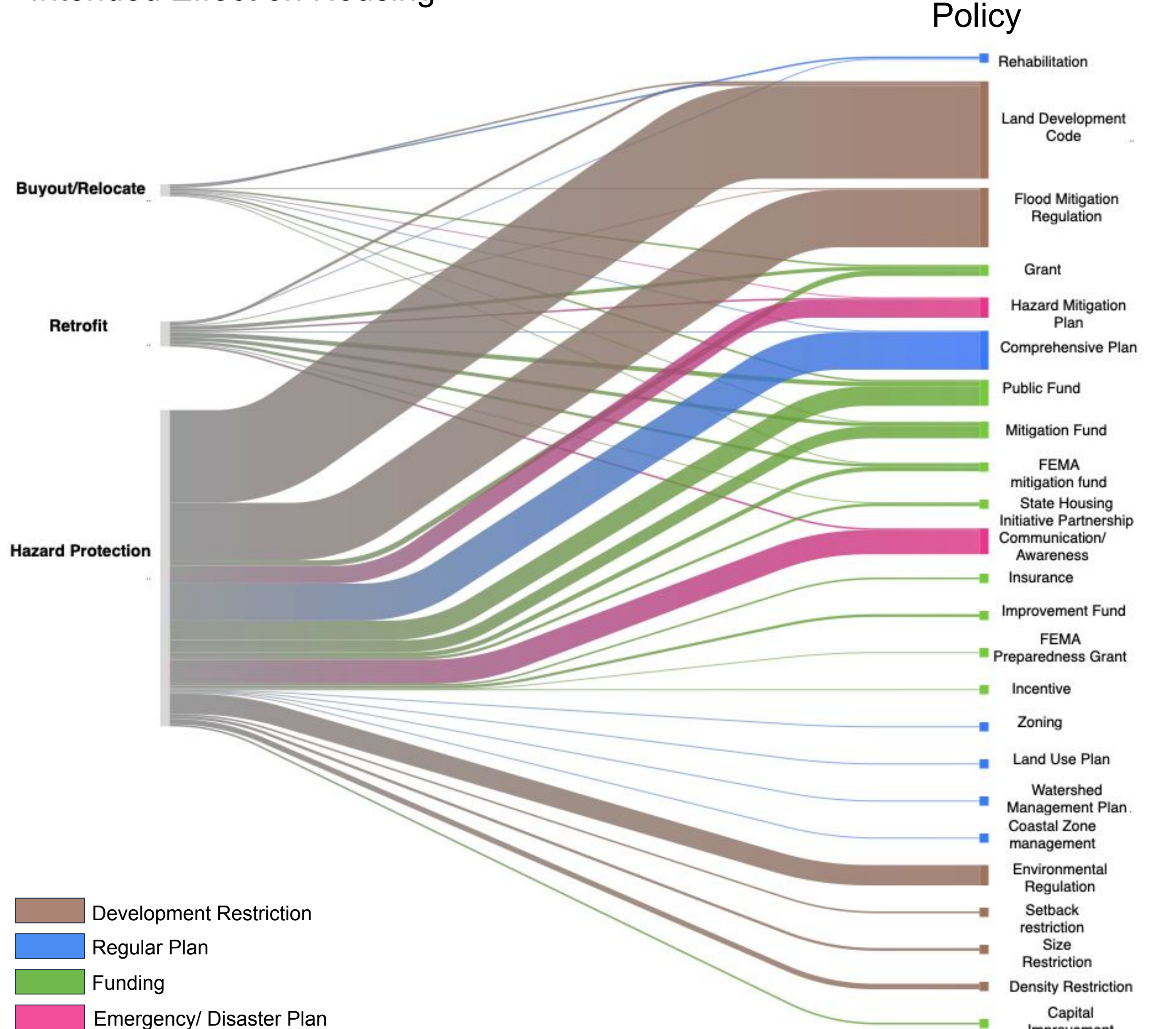
Pre Hurricane Ian Vulnerabilities

Vulnerability Indicators	County	State	National
Cost-Burdened HH (Owner) [5]	47.4%	46.0%	40.2%
Cost-burdened HH (Renter) [5]	65.8%	68.9%	68.5%
Pop Aged 17 and younger [5]	16.9%	19.3%	21.7%
Pop Aged 65 and Older [5]	29.3%	21.5%	17.3%
Rental Housing Units [5]	26.0%	32.80%	34.8%
Minority Pop: [5] Black or African American Hispanic or Latino	10.2% 24.3%	17.7% 27.1%	14.4% 19.1%
Pop age 5+ who speak English "less than well" [5]	11.5%	12.3%	8.4%
Mobile Home [5]	8.40%	8.20%	5.60%

- Despiste development policies targeting vulnerability and exposure in Lee county, we see higher levels of vulnerability in certain areas compared to State and National values
- High % of housing cost-burdened renters and owners indicates significant housing affordability issues, particularly for owner of households, compared to the national rates
- Higher % of mobile homes in a hurricane prone areas combined with higher social vulnerability rates with respect to elderly population and limited english fluency, presents challenges for many households in Lee county in the face of Hurricane

Post Hurricane Ian Housing Damage Distribution
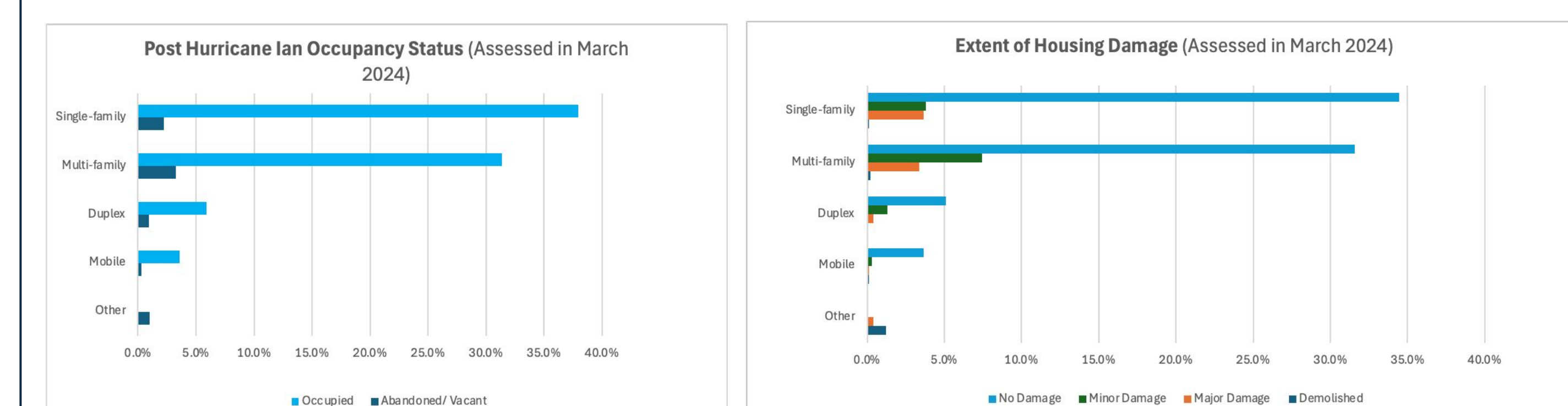
- 984 households were surveyed and 3.27% of the Multi-family housing and 2.25% of single family housing were vacant/abandoned
- The majority of single-family and multi-family homes surveyed showed no physical damage. However, 3.7% of single-family homes and 3.4% of multi-family homes experienced major damage. Additionally, 0.4% severely damaged and 1.2% demolished houses could not be classified by housing type.

Synthesis

- Development policies have an overall intended effect of reducing vulnerability and exposure through hazard protection, buyouts/relocate, and retrofitting. However, stronger effects like buyout/relocate and retrofitting are less commonly observed compared to the more basic approach of hazard protection.
- Lee County's actual vulnerability remained high before Hurricane Ian due to unaffordable housing, high % elderly population, and high % of mobile homes.
- The extent of damage in certain housing types was greater which indicates a weak effect of the policy goals on actual outcomes.