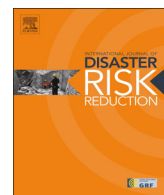


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Resilience in the social and physical realms: Lessons from the Gulf Coast

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ABSTRACT

The mounting frequency and scale of natural disasters, increasing urbanization, a growing reliance on interdependent technologies and infrastructure, and inflated expectations of emergency response interventions are responsible for greater disaster vulnerability and demonstrate the need to establish more resilient communities ahead of a disaster. The decisions of the private sector are among the reasons for increased vulnerability, for example through unsustainable or unsound real estate development.

One factor that is known to impact resilience is social capital, particularly as manifested in strong social networks. The built environment has been shown to influence social networks in multiple ways. Research has shown that walkable, mixed-use neighborhoods with a higher concentration of social gathering places and public space encourage the development of social capital and place attachment through an increase in social interaction. The built environment is a physical, social, and symbolic anchor for residents. Most importantly for resilience, it can be a support system for social networks. The private sector influences this relationship through real estate development decisions.

This paper examines how characteristics of the built environment that influence social networks contributed to greater resilience to Hurricane Katrina along the Mississippi Gulf Coast. Given that social networks increase community resilience to all types of disasters, that social networks are shown to be influenced by certain types of space, and that the built environment is a common intervention for urban planners, this paper explores the potential for creating cities that are more resilient by encouraging private development that fosters social networks.

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1. Introduction

In the years since Hurricane Katrina struck the U.S. Gulf of Mexico coast, tremendous progress has been made toward recovery given the enormous devastation. However, these gains have been uneven, illuminating

disparities in resilience, or a community's ability to rebound to a healthy state following a major disruption such as a disaster.

Resilience has been defined as a "...measure of the persistence of systems and their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables" [18]. Thus, when applied to disasters, resilience is an affected area's ability to rebound after a catastrophic event. For most communities, this would mean first the return of lifeline infrastructures such as utilities, food and water, and shelter.

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Longer term, this would mean the return of households and businesses and a return to self-sufficiency and effective governance. Most sources argue that resilience is achieved when resources and capabilities are drawn from within the community to bring these systems back online [27]. A community's adaptability to change or adaptive capacity is strongly related to resilience; collectively, individuals can influence resilience by affecting and responding to change in the system [37]. Reliance on one method or system can lead to instability, whereas flexibility and redundancies in a community allow for contingencies in case of a catastrophe, which is particularly evident in interdependent infrastructure systems such as the information technology and energy sectors [8]. One factor shown to influence community resilience is social capital, in particular the existence of strong social networks that can be engaged in the survival and recovery phases of a disaster.

At the community level, certain characteristics of the built environment influence and support social capital that in turn reduces disaster vulnerability and facilitates recovery. Social networks are the foundation of social capital and those networks with the greatest impact on resiliency are rooted in the built environment. The nature, strength, and quantity of these social ties are influenced by development patterns. Accordingly, planning and policy interventions that guide private real estate development can impact disaster resilience. In order to test this proposition, communities along the Gulf of Mexico Coast (Gulf Coast) of Mississippi have been analyzed to determine the impact of the built environment on relative levels of resilience after Hurricane Katrina.

There is significant evidence that formal and informal interpersonal ties within one's own neighborhood are invaluable for a positive quality of life. Within the literature from various disciplines, these social networks have been shown to positively impact health and well-being [5], access to employment opportunities [16] and financial resources [3]. Scholars have repeatedly shown that even in the most distressed conditions, social connections allow individuals and families to overcome their economic conditions, however grim [14,35,39].

Given these benefits for individuals and households, the benefits of social networks for disaster resilience are not surprising. Social networks reduce disaster vulnerability factors that are also contingent on socioeconomic status [9], assist in disaster mitigation and response activities [1], and increase knowledge of resources that facilitate preparedness [28]. In terms of membership in formal associations, research has demonstrated the positive impacts of community groups in disaster recovery efforts [29]. Essentially, disaster management activities at all phases of preparedness and recovery are supported by community leaders and social networks [23]. These benefits are well known enough that they have been institutionalized in emergency planning efforts, for example as a stated goal of the Resilient Washington State Initiative.

Face-to-face social interactions and community social connections by necessity occur in space. The built environment impacts the quality and quantity of social interaction one is likely to have. Therefore, the influence of the

built environment on social networks has also been visited by many scholars. William Hollingsworth Whyte and Jane Jacobs were early proponents of design that mixes social groups and promotes an active urban culture, including varied and functional streetscapes [20,40]. Both eschewed designs meant to exclude or inhibit activities. Fundamentally, the built environment and its deliberately structured spaces reflects and influences our social connections and communications [30]. Proponents of New Urbanism have examined the link between density, diversity, and design and sense of community, including social interconnectedness [36]. Place attachment, another link between physical and social realms, is based on our past interactions and the potential for future interactions between ourselves and our physical surroundings [25]. Disasters often disrupt the built environment and social networks alike. However, even when faced with a community in physical ruin, social ties generally are reinforced, with increased feelings of intimacy and solidarity [11].

In the U.S., development patterns have undergone several transformations since the inception of city planning as a profession. The earliest forms of city beautification and zoning were meant to promote community health. After World War II, planning tended to favor unrestricted motion in private automobiles, with less emphasis on public space and public life [33]. Indeed, this kind of automobile-dependent development has been empirically shown to be associated with reduced social ties within neighborhoods [13]. More recent trends in neo-traditional development return to a focus on human and environmental health and social capital, a movement that may have additional benefits in promoting disaster resilience and facilitating a more effective recovery.

In order to examine the relationship between elements of the built environment that foster social networks, and therefore in turn foster resilience, communities in coastal Mississippi that were in the direct path of Hurricane Katrina in 2005 were analyzed. Although other regions, including New Orleans, Louisiana, were also affected by Katrina, Mississippi was chosen as a case study area due to the more typical wind and storm surge damage that occurred. The effects of Katrina in New Orleans were much different in nature, stemming primarily from failure of the city's levee system rather than direct storm damage.

2. Analysis of post-Katrina resilience in coastal Mississippi

Touted as a family-friendly affordable getaway, the Mississippi Gulf Coast is associated with casinos and beaches for many. However, the area possesses a rich history and unique cultural and environmental resources. From humble beginnings, steady economic and population growth over more than three centuries has been disrupted by war and disaster (particularly hurricanes), imbuing residents with a resilient spirit.

As early as 1699, the Mississippi Gulf Coast was a strategic position contested for over a century by indigenous, French, Spanish, English, and U.S. interests. During the antebellum period, cities along the Mississippi Gulf Coast

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