



Pearl River Basin, Mississippi, Federal Flood Risk Management Project

Appendix P – Flood Risk and Other Social Effects: Community Impacts from Repeated Flooding and Flood Protection



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The need goes further than numbers in understanding the regional and localized economic impacts that result from a community experiencing inundation as well as other social effects of on a community (OSE). Frequent flooding of communities can and does have severe and long-ranging impacts across all areas encapsulated by OSE, especially to EJ communities who may have more economic challenges recovering from flood events. New Orleans, Louisiana is an example of an urban community that has a history of repeated and catastrophic riverine and hurricane flood events and the resulting stressors from those events over decades. While the impacts of frequent flooding occur across the nation, the following examples are place based.

Life and safety risk during flood events can be compounded by multiple factors. Historically, inundation has played a role in both direct and indirect life loss. Hurricane Katrina, which made landfall in New Orleans on August 29th, 2005, and flooded 80 percent of the city, resulted in up to 1,170 deaths. There are several factors that contribute to an individual's ability to survive inundation, some of which include age, existing disease, depths and velocities at structures and roadways, and a person's ability to evacuate safely.

Deaths from Hurricane Katrina, which are consistent with other life loss estimates from flooding, were most frequent among those that were 65 and older. Approximately 47 percent of Katrina's total deaths are attributed to acute and chronic diseases and 33 percent were directly from drowning. Communities that experience frequent severe inundation are likely to have adverse health effects that do not allow them to evacuate efficiently or safely.

Education and age shape vulnerability to access, understand, and react to warnings (Laska et al., 2018). Elderly residents are more vulnerable and are more likely to remain during and after a flood. Flooding directly impacts infrastructure like highways that impede evacuation. Transportation, including public transportation, is disrupted and prevents access to essential services and employment.

Socio-political and economic inequalities within a community prior to a flood affect the ability of different societal groups to cope and recover from the aftermath. Housing inequalities intersect with socio-economic and racial factors, with lower income and marginalized groups often renting or owning homes that are less likely to withstand extreme flood events (Laska et al., 2018). Marginalized groups are often located in disaster-prone areas like floodplains and are exposed to greater health, financial, and livelihood threats from natural disasters. Floodplains in urban areas may have greater impervious surfaces that increases flooding intensity, frequency, and exacerbates flood damage (Lotfata and Ambinakudige, 2019). A vulnerable community living in a non-flood zone may be cut off from a flood zone where they work. In contrast, higher income residents tend to occupy higher and safer ground, although they may prefer more hazardous locations if the location is economically and aesthetically attractive. Higher income residents are also able to absorb vulnerability to flooding with superior insurance and infrastructure that is more resilient to flood damage (Lotfata and Ambinakudige, 2019). However, following Hurricane Katrina, Congress authorized and funded the U.S. Army Corps of Engineers to design and construct the \$14.6 billion Hurricane and Storm Damage Risk Reduction System for southeast Louisiana. Over the past fifteen years, the USACE has strengthened the levees, floodwalls, gated structures, and pump stations that form the 133-mile Greater New Orleans perimeter system, as well as improved

approximately 70 miles of interior risk reduction structures. In 2014, FEMA certified the current Hurricane and Storm Damage Risk Reduction System (HSDRRS) as providing defense against a 1 percent AEP storm surge for portions of Orleans, Jefferson, St. Bernard, St. Charles, and Plaquemines parishes (United States Army Corps of Engineers 2014). HSDRRS has been a success in protecting New Orleans from catastrophic flooding during Category 5 Hurricane Ida in 2021.

Pre-existing housing inequalities extend the recovery time of lower income residents because these social groups have limited access to capital, savings, and hold inadequate or no flood insurance. They are more likely to receive lower settlement amounts from insurance companies following flood damage (Rusca et al., 2021). Renters and those residing in public housing are less likely to receive insurance payouts sufficient to rebuild than are higher income homeowners. This reduces the ability of lower income residents to resettle in the area from which they were displaced. Especially after the catastrophic flooding of Hurricanes Katrina and Rita, depopulation of the most economically disadvantaged New Orleans neighborhoods occurred and persists in the present. Some sections of the city remain fallow to this day. It has taken numerous neighborhoods decades to repair, and the lingering damages and devastation has become a cottage industry of tourism for visitors to explore blighted areas (Laska et al., 2018).

Following a catastrophic flood, population displacement can last weeks to months and in some cases may be permanent (Rendell, 2011). Households fragment as individuals evacuate. Extended families are often at the highest risk of dissolution and physical displacement from flooding with post evacuation housing assistance impacting the most vulnerable (Rendell, 2011). Even when a family's home is not damaged, widespread community damage, including the loss of public services and local jobs, exerts a strong pressure on the social cohesion of the community. A community's support system, culture, history, and situated reality is at risk of being lost permanently. In addition, social and psychological research supports a strong correlation between socio-economic status and psychological vulnerability (Rusca et al., 2021). This includes disproportionate trauma of exposure to repeated flood stress and greater stress due to job loss in its aftermath. The tourism sector in New Orleans post Katrina lost 22,900 jobs (Gotham, 2017). Salaried professionals are often able to maintain jobs and a paycheck throughout a flood event while working remotely, while lower paid works in the service sector are more likely to be unpaid (Rusca et al., 2021).

With repeated flooding, businesses leave, and new business are reluctant to establish in a high-risk area. This creates food deserts and a lack of basic amenities like hospitals, schools, police and fire stations, electrical plants, and public transportation. A community that experiences significant and repeated flooding might look a lot like New Orleans East. Job opportunities and availability are limited. Crime increases post-flood due to factors like poverty, geographic and social isolation, and population displacement. Blight increases as residents and industry relocate and the wilderness takes over. For example, NASA, Boeing, Chrysler, and Folgers were located in New Orleans East in the 1960s, but left after the catastrophic flooding of Hurricane Betsy in 1965 (Broom, 2020). Flood waters rose 20 feet in 2 minutes and storm surge overtopped the levees, flooding 160,000 homes (Broom, 2020).

In 1968, Congress spurred repopulation by creating the National Flood Insurance Program, which allowed people to buy flood insurance at low rates, even in especially dangerous flood zones. The Lower Ninth Ward and New Orleans East are two of the lowest elevation areas in New Orleans and have suffered some of the most disproportionate impacts from numerous flood events. There are no major grocery stores in the Lower Ninth Ward. Residents, many of whom lack adequate transportation, must cross the Industrial Canal, which bisects the community from the rest of the city, or across the parish line into Chalmette. There is one laundromat to serve the entire community and it is currently out of service.

EQ and health impacts from consistent flood events are another concern. News outlets in 2005 reported that there were outbreaks of ‘Katrina cough’ among many residents due to mold and dust circulation after returning to flooded areas. According to data released by the EPA in 2006, sediments left from Katrina’s flood waters included fuel components, metals, pesticides, and many other dangerous chemicals (Roach, 2005). Toxic contaminants can cause health problems, nervous system damage, and cancer. Children playing outside in dirt were exposed to lead in the soil. Lead burden in a developing brain is linked to lower IQ, lower high school graduation rates, and increased delinquency (Roach, 2005). A report by the USEPA (2006) indicated elevated lead levels in New Orleans soils. Pre-Katrina, an estimated 50 percent of children living in inner-city New Orleans had blood-lead levels above the guidelines of 10 micrograms per deciliter. This crisis only worsened as lead paint from New Orleans homes was washed into the soil. There is also a city-wide problem of old lead pipes that are unable to be identified and contribute lead to the water supply of many residences.

Gentrification is a possible outcome of flood prone communities. While gentrification may have positive impacts on a community, like increased tax base, housing values, reduced blight, reduced crime, and increased amenities, this process can and does adversely impact the most socio-economically vulnerable in those communities. After Katrina, neighborhoods with a high degree of physical building damage were more likely to have gentrified decades after the storm (van Holm and Wyczalkowski, 2018). The likelihood of gentrification increases at a decreasing rate as flood damage affects a larger share of parcels in a census tract (van Holm and Wyczalkowski, 2018). This indicates that the cost of rebuilding after the storm did not deter developers, but more significant damage may have redirected their efforts to less damaged neighbors like the Bywater (in contrast to the Lower Ninth Ward). Disaster capitalism following a flood may include land grabs, evictions, or eradication of public housing that prevent residents from returning. Private companies and individuals with capital to turn former residences into for-profit short-term rentals purchase available housing, which reduces assets for community members and raises home prices. Housing prices continue to skyrocket while long-term residents of New Orleans are displaced to other areas near and far. More residents are forced to rent and there is an affordable housing shortage. During 2006 and 2007, many of the flooded homes in the Lower Ninth Ward were bulldozed rather than repopulated, resulting in a decline in the neighborhood’s population (Gotham, 2017). Only an estimated 37 percent of Black residents who were historically homeowners in the Lower Ninth Ward returned after Hurricane Katrina and are living there now, which is a considerable reduction of homeowners prior to 2005 (Gotham et al., 2017).

The EJ framework involves developing tools and strategies to eliminate unfair, unjust, and inequitable decisions and conditions. It also attempts to deconstruct the biases that produce differential exposure and disparate risk reduction (Glenn and Rainy, 2007). Importantly, EJ also includes the ability of communities to have a voice in the decision-making process that impacts their health, environment, and quality of life such as economic growth and development of communities. Since Hurricane Katrina, considerable investments have been made to rebuild the New Orleans levee system and develop risk communication strategies to assure residents and businesses that flood risk has been reduced (Gotham et al., 2017). In the United States, perceptions of flood risk and risk reduction are based on several measures, including the height of levees and floodwalls, base elevation of a structure, history of repetitive flooding, repetitive flood insurance claims, hydraulic intensities of different water sources, and local zoning ordinances related to water management (Gotham et al., 2017). There is, however, a dearth of literature regarding how communities at risk of repeated flooding view this risk and it is essential that the voices of the most vulnerable are heard when shaping policies. How do residents feel about the communities in which they reside given an omnipresent flood threat? How do they feel in the aftermath of the most catastrophic natural disaster to occur in the United States after nearly two decades? Understanding the basis and determinant of public risk perception can play a large role in shaping the content and form of land-use planning regulations, help in the formulation and implementation of politics that affect insurance purchase and risk mitigation decisions, assist in developing risk awareness-raising campaigns, and inform emergency plans including evacuation (Gotham et al., 2017)

Fields et al., (2017) cite a new living with water framework that emphasizes green and water conservation use infrastructure acting in concert with structural engineering systems. An example of this in New Orleans is the Lafitte Greenway, which is a green infrastructure project that transformed a three-mile corridor of underused public land into a linear park running through flood prone neighborhoods. This corridor is routinely used for walking, bicycling, and youth sports events, while simultaneously providing for capture of floodwater. Other green infrastructure constructed around flood prone areas of New Orleans include updating pumps, building bioswales, installing rain capturing devices in yards, and larger landscape elements to reduce storm damage.

Access to green space and parks are important for community cohesion, especially after post flood events. They promote social interaction, physical activity, bolster mental health to retreat from post-disaster stressors, and strengthen neighborhood social ties (Rung et al., 2011). In 2008, the Crescent City Park project was awarded \$31.2 million as part of the Hurricane and Katrina Long-Term Community Recovery Program and the U.S. Department of Housing and Urban Development. Construction began in late 2010 by the USACE and the Port of New Orleans. Today, the park spans 1.4 miles along the Mississippi River waterfront in an area that was formerly blighted. It includes picnic areas, walking paths, and 20 acres of indigenous plant landscaping. Other green spaces actively used by residents include the expansive City Park, which includes a 10-acre botanical garden, Audubon Park, and walking paths along the Mississippi River levees. There is still room for improvement with the amount of abandoned and re-wilded lots interspersed around the city, but these are examples of a spaces for residents to gather and recreate.

Art and music, for which New Orleans is internationally recognized, is thriving. After four years and \$27 million in repairs and renovations, the Mahalia Jackson theater for the performing arts was the first major theater in the city to open after Katrina and continues to prosper today. Tourism is the lifeblood of New Orleans, a \$5.5 billion industry, drawing approximately 9 million visitors per year before Katrina and providing 40 percent of the city's tax revenue and employing 85,000 people (Gotham, 2017). After Katrina, visitor numbers dropped to 3.7 million in 2006, with \$2.9 billion in visitor spending (Gotham, 2017). Prior to the Covid-19 pandemic in 2019, which saw a historic 53 million visitors to Louisiana (a flood prone state as a whole), tourism recovery in New Orleans was quicker than expected with \$6.7 billion in tourism spent 2021. Critical infrastructure was also re-instated to a degree. The public Charity Hospital was destroyed in Katrina and has been replaced in 2015 with a \$1.1 billion University Medical Center, the only level 1 trauma center in New Orleans and a safety net for many disadvantaged residents. However, there is a perception that U.M.C was not built for the population that Charity Hospital served and there needs to be trust built with the community members who formerly relied on it.