



# 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 on a community (OSE). Frequent flooding can and does have severe and long-ranging impacts across all areas encapsulated by OSE, especially in socially vulnerable communities, which may face greater economic challenges recovering from flood events. New Orleans, Louisiana, is an example of an urban community with 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 risks during flood events can be compounded by multiple factors. Historically, inundation has contributed to both direct and indirect life loss. Hurricane Katrina, which made landfall in New Orleans on August 29, 2005, and flooded 80 percent of the city, resulted in up to 1,170 deaths. Several factors contribute to an individual's ability to survive inundation, including age, existing disease, water depth and velocity at structures and roadways, and a person's ability to evacuate safely.

Deaths from Hurricane Katrina, which are consistent with other flood-related life loss estimates, were most frequent among individuals aged 65 and older. Approximately 47 percent of Katrina's total deaths were attributed to acute and chronic diseases, and 33 percent were directly due to drowning. Communities that experience frequent, severe inundation are likely to face adverse health effects that impede their ability to evacuate efficiently or safely.

Education and age shape vulnerability to accessing, understanding, and reacting 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, such as 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 with 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). These groups are often located in disaster-prone areas, such as floodplains, and are exposed to greater health, financial, and livelihood threats from natural disasters.

Floodplains in urban areas may have greater impervious surfaces, which increase flooding intensity and frequency and exacerbate flood damage (Lotfata and Ambinakudige, 2019). A vulnerable community living outside a 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 those areas are economically or aesthetically attractive. Higher-income residents are also more capable of absorbing vulnerability to flooding through superior insurance and more resilient infrastructure (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 (HSDRRS) for southeast Louisiana. Over the past fifteen years, 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 HSDRRS as providing defense against a 1 percent AEP

storm surge for portions of Orleans, Jefferson, St. Bernard, St. Charles, and Plaquemines parishes (USACE, 2014). The HSDRRS successfully protected New Orleans from catastrophic flooding during Category 5 Hurricane Ida in 2021.

Pre-existing housing inequalities extend the recovery time of lower-income residents, as these groups often have limited access to capital or savings and 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 compared to higher-income homeowners. This reduces the ability of lower-income residents to resettle in the areas from which they were displaced. Especially following the catastrophic flooding caused by Hurricanes Katrina and Rita, depopulation of the most economically disadvantaged New Orleans neighborhoods occurred and continues today. Some sections of the city remain fallow. It has taken numerous neighborhoods decades to repair, and the lingering damage has become a cottage industry of tourism, with visitors exploring blighted areas (Laska et al., 2018).

Following a catastrophic flood, population displacement may last weeks to months and, in some cases, may become permanent (Rendell, 2011). Households fragment as individuals evacuate. Extended families are often at high risk of dissolution and physical displacement, and post-evacuation housing assistance disproportionately affects the most vulnerable (Rendell, 2011). Even when a family's home is undamaged, widespread community damage, including the loss of public services and local jobs, places significant strain on the social cohesion of the community. A community's support systems, culture, history, and local identity are at risk of being lost permanently. Additionally, social and psychological research supports a strong correlation between socio-economic status and psychological vulnerability (Rusca et al., 2021). This includes disproportionate trauma due to repeated flood exposure and greater stress caused by post-disaster job loss. The tourism sector in New Orleans lost 22,900 jobs following Hurricane Katrina (Gotham, 2017). Salaried professionals are often able to maintain jobs and income during flood events by working remotely, while lower-paid workers in the service sector are more likely to be unpaid (Rusca et al., 2021).

With repeated flooding, businesses leave, and new businesses are reluctant to establish themselves in high-risk areas. This creates food deserts and limits access to basic amenities such as hospitals, schools, police and fire stations, power plants, and public transportation. A community that experiences significant and repeated flooding may resemble New Orleans East. Job opportunities are limited, and crime may increase due to poverty, geographic and social isolation, and displacement. Blight rises as residents and industry relocate and nature reclaims abandoned spaces. For example, NASA, Boeing, Chrysler, and Folgers were located in New Orleans East in the 1960s but left after the catastrophic flooding caused by Hurricane Betsy in 1965 (Broom, 2020). Floodwaters rose 20 feet in 2 minutes and overtopped 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 high-risk flood zones. The Lower Ninth Ward and New Orleans East, two of the city's lowest elevation areas, 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 lacking adequate transportation, must cross the Industrial

Canal or travel into Chalmette to access food. The community has one laundromat, which is currently out of service.

Environmental quality (EQ) and health impacts from consistent flood events are another concern. In 2005, news outlets reported outbreaks of “Katrina cough” due to mold and dust exposure. EPA data from 2006 indicated that sediment left behind by floodwaters included fuel components, metals, pesticides, and other dangerous chemicals (Roach, 2005). Toxic contaminants can cause health problems, nervous system damage, and cancer. Children playing in contaminated soil were exposed to lead. Lead exposure in developing brains is linked to lower IQ, reduced high school graduation rates, and increased delinquency. A USEPA (2006) report showed elevated lead levels in New Orleans soils. Pre-Katrina, an estimated 50 percent of children in inner-city New Orleans had blood lead levels above 10 micrograms per deciliter. The crisis worsened as lead paint washed into the soil from homes. Additionally, old lead pipes continue to contribute lead to the water supply in many residences.

Gentrification is a possible outcome in flood-prone communities. While it may bring increased tax revenue, higher housing values, reduced blight, and improved amenities, it can also displace socioeconomically vulnerable residents. After Katrina, areas with greater structural damage were more likely to gentrify (van Holm and Wyczalkowski, 2018). The likelihood of gentrification increases with damage but decreases when flooding affects a larger share of a neighborhood. This suggests that the cost of rebuilding did not deter developers but shifted their focus to less damaged areas such as Bywater, rather than the Lower Ninth Ward.

Disaster capitalism may include land grabs, evictions, or the elimination of public housing, preventing residents from returning. Private investors may convert residences into short-term rentals, reducing housing stock and raising prices. As housing prices rise, more long-term residents are displaced. In 2006 and 2007, many homes in the Lower Ninth Ward were bulldozed instead of rebuilt, contributing to population decline (Gotham, 2017). Only an estimated 37 percent of Black homeowners in the Lower Ninth Ward are believed to have returned post-Katrina (Gotham et al., 2017).

The Socially Vulnerable framework involves developing tools and strategies to eliminate unfair, unjust, and inequitable conditions. It also aims to dismantle biases that result in differential exposure and unequal risk reduction (Glenn and Rainy, 2007). Importantly, socially vulnerable includes ensuring that communities have a voice in decisions affecting their health, environment, and quality of life. Since Hurricane Katrina, significant investments have been made in rebuilding the levee system and developing risk communication strategies to assure residents and businesses that flood risk has been reduced (Gotham et al., 2017). In the United States, flood risk perception is shaped by factors such as levee height, floodwall performance, base elevations, flood insurance history, and local zoning ordinances. However, there is limited research on how communities facing repeated flooding perceive that risk, and it is essential that their voices are included in policy-making. How do residents feel about living under constant flood threat? How do they feel after enduring the nation’s most catastrophic natural disaster in nearly two decades?

Understanding public risk perception plays a significant role in shaping land-use regulations, informing insurance and mitigation decisions, raising awareness, and planning emergency responses (Gotham et al., 2017).

Fields et al. (2017) propose a “living with water” framework that integrates green and water-conserving infrastructure with structural systems. One example is the Lafitte Greenway in New Orleans, a three-mile linear park in flood-prone neighborhoods that supports recreation and captures floodwater. Additional green infrastructure includes pump upgrades, bioswales, rain barrels, and landscape features that reduce storm damage.

Access to green space is vital for post-disaster recovery, promoting physical activity, mental health, social ties, and community cohesion (Rung et al., 2011). In 2008, the Crescent City Park project received \$31.2 million from the Hurricane Katrina Long-Term Community Recovery Program and HUD. Construction began in 2010 by USACE and the Port of New Orleans. Today, the park spans 1.4 miles along the Mississippi River and features picnic areas, walking paths, and 20 acres of indigenous plants. Other active green spaces include City Park, Audubon Park, and the Mississippi River levee trail. While abandoned lots remain an issue, these spaces provide opportunities for community gathering and recreation.

New Orleans' art and music scenes continue to thrive. After four years and \$27 million in repairs, the Mahalia Jackson Theater for the Performing Arts was the first major venue to reopen post-Katrina and remains successful. Tourism, a \$5.5 billion industry employing 85,000 people, saw significant setbacks after Katrina, with only 3.7 million visitors and \$2.9 billion in spending in 2006 (Gotham, 2017). By 2021, tourism had rebounded, generating \$6.7 billion in spending. Charity Hospital, destroyed in Katrina, was replaced in 2015 with the \$1.1 billion University Medical Center, New Orleans' only Level 1 trauma center and a safety net for many disadvantaged residents. However, concerns persist that the new facility was not built for the population once served by Charity Hospital, and trust must be rebuilt with former patients.