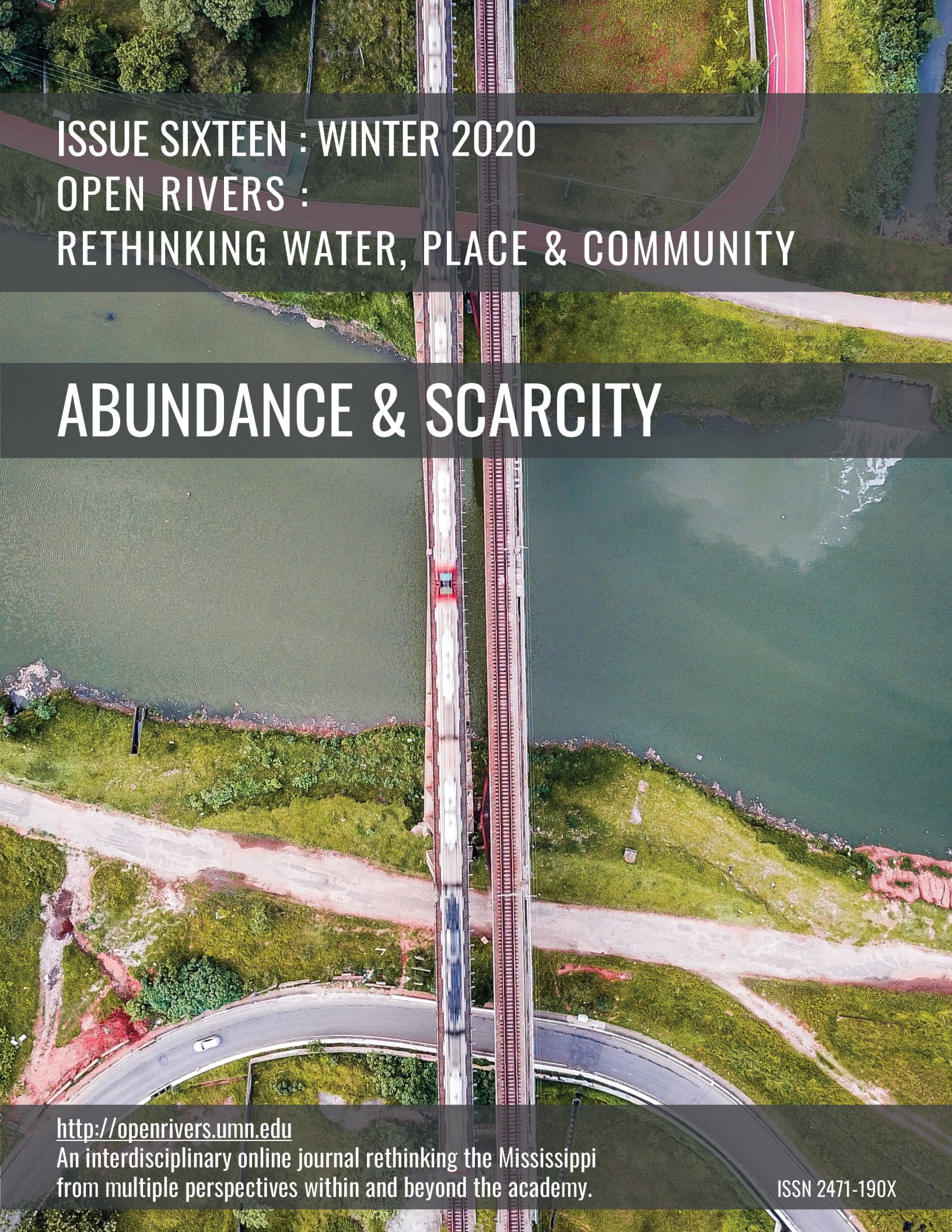

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Editorial Board

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FEATURE (PEER REVIEW)

ERODING MEMORIES AND ERECTING RISK ON THE AMITE RIVER

By Craig E. Colten

Editor's note: This feature article has been peer reviewed.

Baton Rouge, Louisiana owes its existence to the Mississippi River. The city is perched atop a terrace at the first upriver site that is immune from annual inundation. Ocean-going ships glide up the turbid waterway and converge with the barge loads of cargo pushed from the upstream hinterland. Refineries and grain elevators cluster along the riverfront where they receive and disperse commodities as part of a dynamic global commerce. This geographic situation helped establish Louisiana's capital and made it a river city.

Slab-on-grade house that flooded, Ascension Parish. August 2016. Image courtesy of the author.

Protected by natural elevation and massive levees, the metropolitan region has become complacent about the risk of regular flooding, and suburbs have sprawled outward from the old elevated riverfront core. Indeed, the combination of natural elevation and federal barriers have proven effective for Baton Rouge. Yet a massive flood in 2016 recalled a similar, but less destructive event in 1983, and several additional floods in the intervening years. The two major calamities had nothing to do with the Mississippi River. The much smaller Amite River and its tributaries, which flow from southern Mississippi across rural land and suburban communities to the east and southeast of the city, were responsible for these two destructive events. Several interrelated factors have dramatically increased risk to residents and businesses in this river basin. They include largely unchecked development into flood-prone areas, the increasing frequency of high-volume rainfall events, and rising sea levels that will alter the hydrology of these near-coastal communities.

This article is a modest extract of an interdisciplinary research project that considers the historical responses to floods and the role of social memory in risk reduction as expressed in public policy in three parishes that shared in the 2016 devastation. These parishes coped with the 1983 flood, and their officials took some coordinated steps to minimize future flooding in the intervening years. However, mitigation moves slowly, and much slower than real estate development. Aiding and permitting growth and boosting parish tax bases has taken precedence over safety. A review of measures taken between the two major floods, a series of focus groups conducted with public officials, and a review of parish council actions following the 2016 flood inform this historical review, which seeks to uncover the influence of flood memories in flood mitigation and local planning, and ultimately the risks for residents in this basin.[1]

Attention to how effectively a society builds the memory of past floods into its risk reduction and planning efforts is particularly significant in both inland flood zones and coastal areas (Colten and Grismore 2018). McEwen and colleagues (2017) have examined the role of social memory in creating more sustainable flood resilience. They point out the importance of "active remembering" and "active forgetting" (McEwen et al. 2017, 20) in shaping public awareness with flood risk and how this translates into interaction with flood management. They argue that flood-resilient communities are built on active memories and knowledge of past events that inform flood management (McEwen et al. 2017, 15). This knowledge is not consistent across an impacted community and certain segments of society have greater recollection of flood events than others, while there is also uneven trust in the use of memory to shape public policy that ultimately affects all residents to some degree. This particular article focuses on how memories guided those shaping public policies and will not delve into the equally significant topics of social vulnerability and well-being.

Memory studies intersect with the voluminous literature on the importance of adaptive planning in coastal cities, although it is seldom mentioned (Leichenko and Thomas 2012; Solecki, Leichenko, and O'Brien 2011). A prominent theme in this literature is the potential impacts of major tropical weather events, especially hurricanes, and the steps that can be taken to lessen their devastation (Leichenko and Thomas 2012). Studies have focused on vulnerable shore counties or megacities (Cutter et al. 2007; Uitto 1998). While such settings are important concerns, they have neglected issues that are pertinent to places like the Amite River basin where suburbs of a mid-sized city are sprawling outward across a largely inland location with no actual coastal frontage. It is a location familiar with extreme tropical weather events but does not face direct assault from storm surges. With rising seas, however, coastal effects are creeping inland.

Baton Rouge and other riverfront cities well beyond the littoral will be facing greater and greater exposure to offshore forces. This emerging situation requires a fundamental reorientation of how communities address risk. Additionally, such locations tend to have policies and planning practices anchored in inland concepts, and revamping them to accommodate the slow landward creep of coastal influences likely will move slower than sea-level rise, particularly in coastal Louisiana. Finally, sea-level rise will impede the drainage of inland rivers, particularly those that drain into the Gulf of Mexico across the deltaic plains. Riparian flooding, associated with both tropical weather events and intensifying storms, will be exacerbated inland. Areas that once faced modest risk will confront higher flood stages as the shallow, near-sea-level lakes are subject to wind-driven "tilting" which may block river discharges and cause backwater flooding. Over time, these circumstances will render structural protections and mitigation policies geared solely toward inland riparian risks obsolete. Inland locations with no archived memories of dealing with coastal problems are beginning to face profound challenges due to changing environments in areas developed with little regard for coastal conditions. Inland rivers are connected to maritime environments in many ways, and this is particularly true in the Amite River basin, which is connected directly to the coast—even if that is not apparent to all who live there.

Solecki and colleagues (2011) make the pertinent point that disaster risk reduction and climate change adaptation are seldom aligned. This circumstance is even more pronounced in areas the public does not consider as coastal and therefore not exposed to the types of changes wrought by sea-level rise. The Amite River basin is a dramatic example of this incongruence. Local leaders have been attempting to reduce an inland risk, but increasingly must factor in adapting to climate change.

Amite River Basin and Risk

The Amite River is unimpressive compared to many larger waterways, although it is much appreciated locally. It flows from a portion of the Pleistocene Terrace in Mississippi that stands over 300 feet above sea level, passing through pine forests and dairy pastures. It was once a favorite retreat for sport fishing, tubing, and canoeing; however, commercial operations have heavily altered its hydrology by strip mining citronelle gravel deposits. Off-road vehicles now roar across the sand and gravel bars that choke the river's course. The Amite cuts through the "Grand Canyon" of Louisiana near Fluker's Bluff as it winds across the Florida Parishes headed to its confluence with its principal tributary—the Comite River. Just upstream from this junction, the floodplain widens and becomes more suburban than rural. Much of Baton Rouge and nearby communities, while protected by levees from Mississippi River floods, drain eastward into this basin, and as a consequence face greater flood risk from the Amite. The topographic gradient of the Amite tapers off below the confluence, and the combined flows meander over a low-lying floodplain for the final 55 miles to Lake Maurepas, which is connected to Lake Pontchartrain by a short bayou that winds through cypress swamps. Across the river's lowest section, suburban developments have been most extensive (Figure 1). The lower-most segment of the river is near sea level and is a transition zone between purely riparian conditions and an area that can be directly influenced by sea-level rise and storm-surge induced backwater flooding.

Three parishes (the local version of counties) occupy Louisiana's lower portion of the basin and share higher flood risks. With a site about 200 miles upriver from the mouth of the Mississippi River, Baton Rougeans tend to consider themselves inland inhabitants. A drive to either of the nearest beaches on Grand Isle or Biloxi

takes about two hours, adding to the prevailing notion of isolation from coastal influences. East Baton Rouge (EBR) has the largest population of the three parishes and was home to more than 440,000 people in 2015. As the metropolitan hub, it has been exporting residents to the two suburban parishes since the 1960s. Livingston Parish more than doubled its population between 1980 and 2015 and now has over 133,000 residents. Ascension saw a similar doubling during that span to reach its 2015 population of more than 113,000. To shelter their burgeoning populations, Livingston Parish added nearly 32,000 housing units while Ascension's total climbed more than 26,000 between 1980 and 2015. Excluding Baton Rouge, that amounts to over 58,000 new housing units added from the eve of the 1983 flood until the year before the next calamity. The capital city saw over 56,000 units added, but not all were within reach of Amite River flooding.

Several related factors spurred the suburban surge during the 1970s and early 1980s. The overall urban population increase, tied in part to the growth of state government and the expanding petrochemical complex in the region, attracted residents and put pressure on Baton Rouge's housing stock. Controversy surrounding school desegregation in the 1970s prompted many residents to flee Baton Rouge for predominately white neighboring parishes that had efficient connections to the capital via newly completed

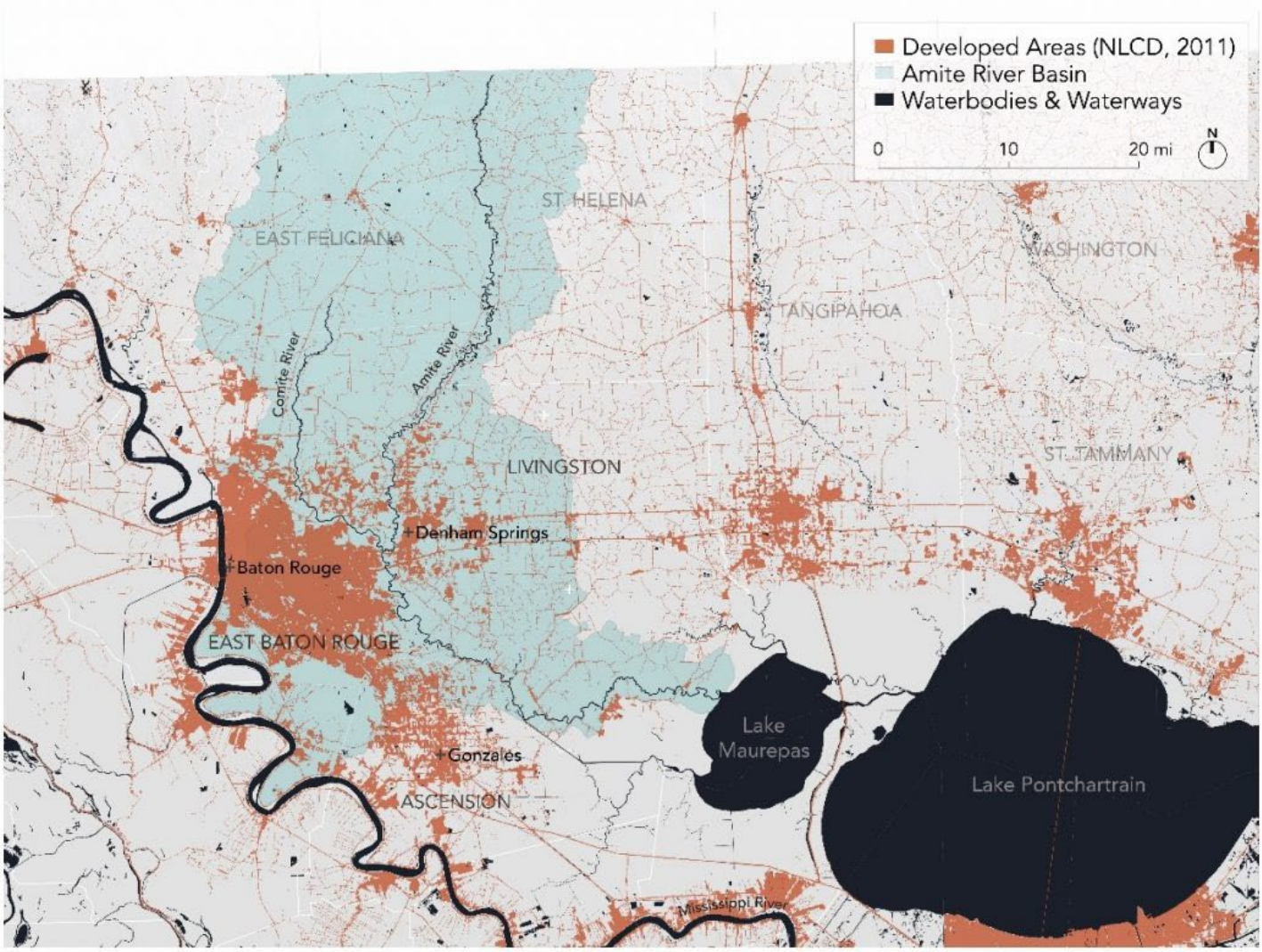

Figure 1. Amite River Basin. Graphics by Tanvi Shah, used with permission.

interstate highways. Additionally, less expensive real estate and lower parish taxes appealed to young families.

Repeat floods stand at the center of any discussion of flood memories and mitigation. When properties suffer damage multiple times, the memories accumulate. In theory, the repository of experience should influence decision making. In the Amite River basin, high-water risks have not deterred development. Nearly half of East Baton Rouge Parish is in the Federal Emergency Management Agency (FEMA) designated 100-year floodplain, yet some 80 percent of the rapidly growing suburban community of Central, at the convergence of the Amite and Comite Rivers, is so designated. Downstream, about 70 percent of Ascension Parish is in the high-risk zone. Livingston Parish has some rural and elevated territory, but also has grown into the flood zone. Some of the worst impacts of both the 1983 and 2016 floods occurred in the parish seat of Denham Springs. The FEMA flood zones are material delineations of flood risk—based on previous hydrologic and meteorological conditions. They represent one form of flood memory, albeit one commonly contested and challenged at the local level for inhibiting potential development. For decades, public officials have noted the tendency for residential growth to intrude on land that was avoided historically as flood prone (East Baton Rouge Parish Planning Commission 1983; Flood Control Project Evaluation Committee 1985; Governor's Interagency Task Force on Flood Protection and Mitigation 1990; Figure 2). Formal demarcation of flood zones has not prevented development nor provided adequate safety for residents.

Figure 2. Catholic church in French Settlement. This structure is in the oldest part of the community that is on higher ground and did not flood. New development has proceed into lower areas of the parish. Image courtesy of the author.

Flooding in the Amite River basin is far from a rare occurrence and should be a vital part of local flood memories. Between 1973 and 2016, the river rose at least a foot above its 29-foot flood stage 34 times (Figure 3). Four times during that span, floods occurred twice within a single calendar year. Prior to 2016, the flood of record was the 1983 event. Over a three-day span in April that year, much of southwest Mississippi and southeast Louisiana experienced 8–12 inches of rainfall, and this precipitation swelled the Amite and Comite to record levels. The Amite crested at just over 41 feet at Denham Springs, while the Comite reached 29.7 at Joor Road (USACE 1983, 3; USGS 1996). The river waters inundated over 357,000 acres, with about 6,800 acres of that area devoted to residential and commercial land uses. Damage estimates for urban properties exceeded $114 million. It was a devastating event for the three main riverside parishes. Yet, a local floodplain manager characterized the event as nothing new, only more costly due to poor follow through on previous flood mitigation plans (Emmer 1986).

Memories of the 1983 Flood in Public Policy

Even before the 1983 tragedy, Louisiana's legislature passed a flood control act (Louisiana State Legislature 1982) calling for "long-term solutions to flood problems and protecting existing developments in flood prone areas without encouraging further development in those areas" (Joint Legislative Committee 1985). While this act recognized prior floods, local governments did little to embed memories of the 1983 flood into policies, such as well-known procedures that include zoning, restricting development in recently inundated areas, and relocation. Efforts in the

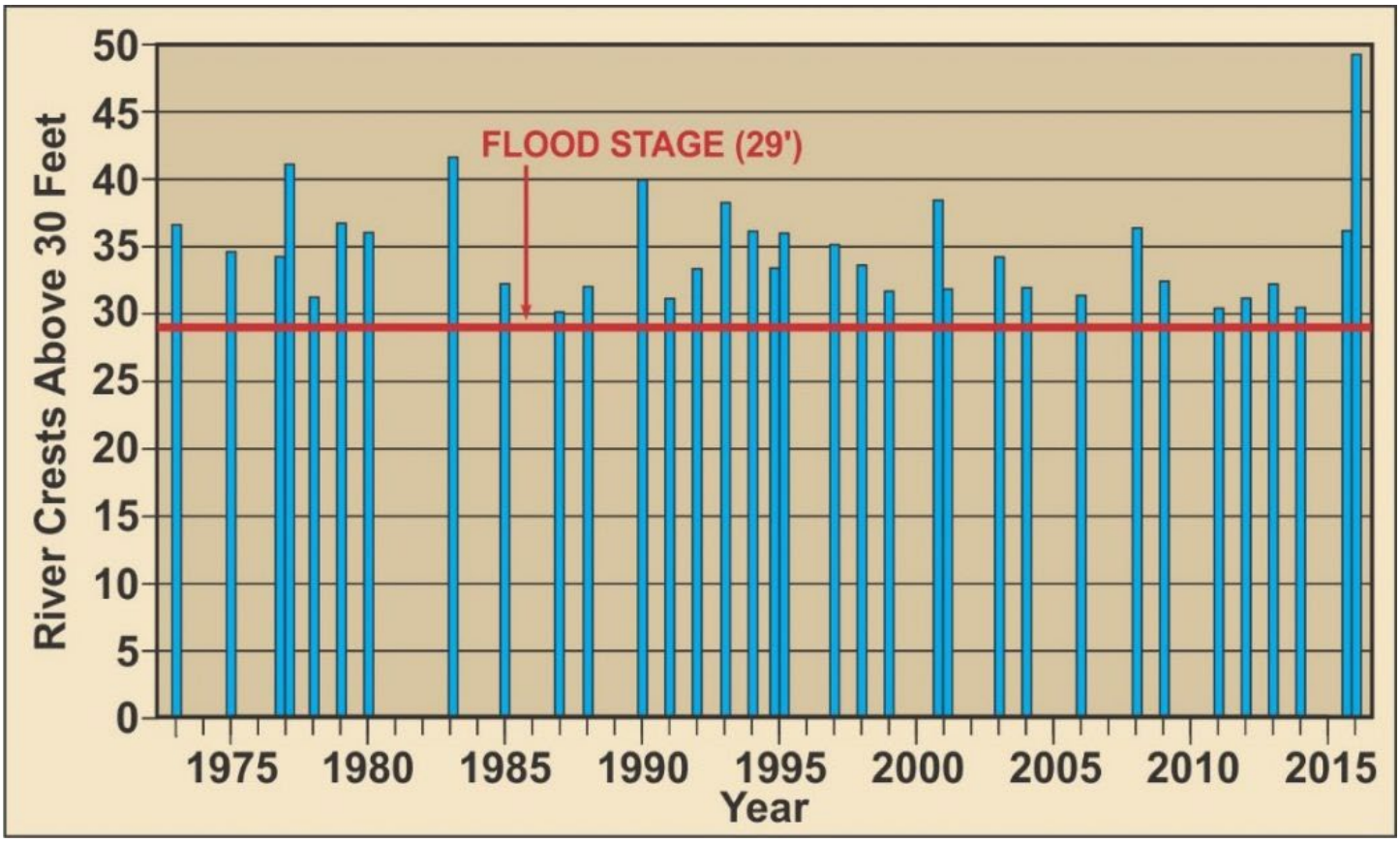

Figure 3. Amite River Stages at least one foot above flood stage at Denham Springs, 1973-2016. Source: U.S. Geological Survey, graphic by Mary Lee Eggers.

post-1983-flood period fell exclusively into risk reduction with no heed to an emerging concern with the land loss crisis at the state level—which was associated with sea-level rise and climate change (CRCL 1989).

All too commonly, locations must endure extreme hazardous events to motivate public action to reduce risk. This was certainly the case after the 1983 flood. A spate of studies, recommendations, and project adoptions provided the appearance of a vigorous response to the record inundation. Despite an initial sense of urgency, mobilizing to assess, design, and fund mitigation and to enact land-use guidelines moved at a very deliberate pace—which was especially true in suburban areas where government was seen as an intrusion on private property rights. Critics of the slow-moving response charged that, "short-sighted planning is unfortunate because the flood victims will pay for the agency's inadequate flood damage reduction planning as well as having to pay for the project" (Emmer 1986, 134). A vocal critic of local planning efforts declared that structural projects with high price tags and limited geographic scope, rather than land-use restrictions, were more politically viable, and that East Baton Rouge Parish officials had "flood amnesia" (Dunne 1987b). In addition, according to the focus group participants of this project, many homeowners in Livingston Parish were younger at the time and willing to take on rebuilding. Thus, their efforts to recover and remain in place tended to eclipse the fear of future inundations. These actions typified what McEwen and colleagues (2017) refer to as active forgetting. In addition, all public policies were directed towards inland, riparian, not coastal threats.

At one of the multiple scales of public policy, the state launched a flood control program to assist localities in funding programs to reduce flood damage (Joint Legislative Committee 1985, I-2). It provided funds for channel modification, stormwater detention, levees, and canals, as well as relocation assistance for impacted residents. The program specifically excluded funding projects that would encourage additional development in flood-prone areas. It offered a commitment to mitigation and even helping families move out of harm's way. Yet, with a cap of $100,000 per construction project, the state effort would have minimal impacts (Louisiana Department of Transportation and Development n.d.). As with the 1982 state legislation, it recognized the need to discourage development in flood-prone areas, but offered little actual deterrence.

One of the most ambitious risk reduction plans after the 1983 flood was a proposal to construct a diversion canal to re-route a portion of the Comite's floodwaters westward into the Mississippi River. Progress on this proposal moved slowly. Frustration with the protracted process emerged as early as 1987, when Governor Edwin Edwards criticized the U. S. Army Corps of Engineers (the Corps) for making little headway on the diversion project and declared the state would take over the flood control efforts (Dunne 1987a). Nonetheless, there was still nothing to show when a 1990 flood briefly rekindled flood memories and the sense of urgency.

That same year the Corps released its environmental impact statement on the diversion. Army engineers estimated that the diversion would lower flood crests by as much as five feet on the lower Amite River and potentially reduce damage in Denham Springs by 80 percent. Moving through its formal protocol, the Corps declared that the Comite River Diversion was the most economically feasible option and would be superior to various nonstructural options or a reservoir. The environmental impact statement pointed out that residential and commercial development would continue even without the diversion. It also declared that the diversion's impacts would be felt most directly on farm and forest land—not urban areas (USACE 1990, 16, 124). These observations acknowledged that land-use restrictions would be unlikely to impede development.

Also in 1990, a task force formed by the governor endorsed the Comite River Diversion as feasible and affordable with a federal 50/50 cost share. The task force considered a host of other options and supported local regulations in line with the National Flood Insurance Program (NFIP) and advocated voluntary relocation as the "method of choice" for reducing flood hazards in high-risk areas—rather than rebuilding on site (Governor's Interagency Task Force on Flood Protection and Mitigation 1990, 13). The options it recommended would place most costs on localities and the federal treasury while allowing cost sharing for the diversion plan. Still in 1990, there was no tangible progress on the structure's actual construction, although proponents of the diversion optimistically predicted that work might begin on the $62 million project as early as 1996 (Baton Rouge Advocate 1990).

A follow-up engineering report offered a less-than-optimistic view of the diversion's benefits. It concluded that its flood-reduction benefits would be most beneficial in the Comite River basin—not the lower Amite. The authors concluded that parish-based projects to improve drainage in East Baton Rouge and Livingston would accelerate drainage into the waterway and exacerbate flooding in the lower basin (Harza Engineering 1995, 2). Given this forecast, the report recommended revisiting a flood retention reservoir option on the Amite.

Progress on the diversion continued to stretch out over the years. In 2000, the Corps completed its design for the Comite River Diversion, and tax-averse local voters demonstrated a persistence of flood memories when they approved a millage to provide matching funds for the structure.

Figure 4. Slab-on-grade house that flooded, Ascension Parish. August 2016. Image courtesy of the author.

Work finally began on the first component in 2003—two decades after the flood that inspired it (ARBDWCD 2015). Yet, only the first isolated component was ever finished, and the incomplete diversion offered no relief to residents who endured the record rainfall and tragic flooding in August 2016.

Meanwhile during the 1990s, the parishes continued independent efforts to reduce riparian flood risk. East Baton Rouge and Livingston focused on drainage, while Ascension pushed ahead with a levee to fend off water coming from upstream and pumps to push the excess flow across the lower basin's low-gradient topography. They also enacted policies in alignment with the NFIP so that residents would be eligible for federal flood insurance, but did not enact policies that went beyond the bare-bones FEMA standards. Despite its flaws, such as paying for flooded homeowners to rebuild in place and allowing local governments to reduce the size of the flood zones through challenges to the flood maps, the NFIP functions as a type of risk reduction (Horn and Brown 2018; Klein and Zellmer 2014). Ascension Parish adopted ordinances and codes in the 1990s to enable its residents to participate in the NFIP and use fill to raise new houses above the base flood elevation (Figures 4 & 5). East Baton Rouge and Livingston parishes made similar policy adjustments (Ascension Parish Focus Group 2018; East Baton Rouge Parish Focus Group 2018; Livingston Parish Focus Group 2018; Moree 2012). Each parish recognized the need to adopt a standard based on the most recent record event and enacted ordinances that required homeowners whose properties suffered substantial damage to rebuild at least a foot above the highest measured flood (Ascension Parish Focus Group 2018; East Baton Rouge Parish Focus Group 2018; Livingston

Figure 5. House constructed on fill, Ascension Parish, August 2016. Image courtesy of the author.

Parish Focus Group 2018). With an eye toward increasing property tax revenues, the policies allowed development and construction, but imposed no effective restrictions on expanding suburbs. As a consequence, property taxes soared between 1980 and 2015. For the two smaller parishes that were aggressively expanding into the floodplain, their assessors saw revenue rise by more than 90 percent.

Since its inception in 1981, the Amite River Basin Commission supported basin-wide approaches and advocated for multi-parish participation. With the release of FEMA's first set of Flood Insurance Rating Maps in the 1980s, flood zones became cartographically visible. FEMA updated those maps in 2005, and with support from the commission, the parishes participated in the federal insurance program—mostly in line with the basic FEMA standards. The basin commission also advocated for ordinances to regulate the use of fill to raise houses above the base flood elevation. This practice allows construction in the 100-year floodplain, but displaces floodwater and risk to other locations. Divergent local priorities limited implementation of mitigation policies. In 2015, only EBR had an ordinance that mandated developers offset fill with flood-retention basins (ARBDWCD 2015, 4-5). Despite its encouragement, the commission had no regulatory authority within the basin and had to rely on the individual parishes to manage risk reduction. The parishes operated within their geopolitical boundaries; consequently, their approaches focused on internal benefits, namely allowing development to continue in the floodplain with minimal mitigation. Due in part to these practices, repetitive flood losses have been a chronic problem in the basin (CHART 2009). As of 2015, 75 percent of the repetitive flood loss claims were filed by individuals with property in the 100-year flood plain (ARBDWCD 2015, 4-6). Despite reminders, homeowners, with the assistance of the NFIP to rebuild on site, continued to live and buy new homes in high-risk areas with little discouragement from local policies. Insurance encouraged active forgetting, as has been the case in other locations (Klein and Zellmer 2014).

After the 2016 Flood

Encouraging Immediate Return

The 2016 flood brought temporary chaos to the Amite River basin. Historic rainfall dumped up to 30 inches on a portion of the basin over the course of five days and the Amite crested over 46 feet at Denham Springs. The most rapid rise of the river occurred overnight on August 14 and caught many people unaware. Some were able to evacuate, but many awoke with water in their homes, only to discover that high water covered evacuation routes. Some 5,000 evacuees sought temporary shelter. The flooding caused more than a dozen fatalities and over $8 billion in damages. FEMA initially tabulated over 135,000 houses damaged, with 50,000 enduring major damage. Some 75 percent of the housing stock in Livingston Parish and about a third in Ascension suffered damage (Colten 2017; Figure 4). In the immediate aftermath, the state requested $4 billion in disaster aid to fund recovery efforts. The scope of this calamity far exceeded the 1983 event, when only 5,400 homes received the major damage classification (USACE 1983). Not only was the flood water higher by five feet, but the number of houses in flood-prone territory was also much larger. This was not a natural disaster, but one shaped by inadequate archiving of flood memories and decisions to develop in the flood zone (O'Keefe, Westgate, and Wisner 1976; Steinberg 2000; White 1945).

One of the first responses was to expunge the new flood as part of the public policies that

incorporated flood memory. At the time of the flood, parish policies stated that homes suffering major damage had to be raised a foot above the record flood as determined by federal agencies. The parish councils in East Baton Rouge and Ascension promptly deleted the 2016 event as the flood of record and retained the 1983 event as the benchmark (Ascension Parish Council 2016; Hardy 2016). They declared the 2016 flood was too extreme to be used as standard for redevelopment, and thus removed a major event from official flood memory and consequently lowered safety standards. Until FEMA updates its maps and incorporates the recent flood events, the flood zones remain fixed and form the basis for flood insurance. The local policy adjustment allowed many residents to avoid the expense of elevating their houses and thereby encouraged their return to areas proven to be susceptible to flooding. These decisions are the most direct evidence of a deliberate attempt to actively "forget" the record flood in the interest of restoring as much of the tax base as quickly as possible. Officials feared a mass exodus that would have triggered plummeting real estate values and sales tax revenues. Such a revenue drop would severely undermine parish infrastructure rebuilding and ongoing support for schools and other parish institutions. To further augment a return to damaged homes, the parishes temporarily waived ordinances that prohibited residing in mobile homes or travel trailers on residential lots, and they waived permit fees tied to rebuilding (Ascension Parish Council 2016b; East Baton Rouge Parish Council 2016; Livingston Parish Council 2016). These temporary policy waivers enabled residents to remain in place as they restored their primary dwellings.

Among the three parishes, flood insurance subscriptions increased between August 2016 and December 2018. The percentage of homeowners purchasing FEMA-backed flood insurance policies increased between 51 and 70 percent. East Baton Rouge saw the percentage increase from 13 to 22 percent, Livingston rose from 23 to 39 percent, and Ascension increased from 24 to 37 percent (Mosbrucker 2019). This points toward flood memory retention, for the time being.

Improving Drainage in the Upper Basin

Another key response to restore residential confidence in local flood control was a concerted effort in EBR and Livingston parishes to unclog drainage ways. Numerous concrete-lined drainage ditches in East Baton Rouge were obstructed with debris at the time of the August downpour and caused flood waters to back up into neighborhoods and houses. Parish drainage systems in Livingston Parish received criticism for similar reasons. The upstream parishes undertook swift action to clean out the canals and ditches that would hasten the flow of future runoff (East Baton Rouge Parish 2018; Grueskin 2019; Jacobsen 2017). Livingston also invested a huge portion of federal disaster funds to clear snags in the Tickfaw River—a waterway in the eastern portion of the parish that is not part of Amite basin (Livingston Parish Council 2017). As it focused on drainage, the parish lost its ability to participate in FEMA's Community Rating System after the federal agency questioned its permitting construction in flood zones (Kennedy 2019). Nonetheless, the parish has worked with FEMA to offer an optional buyout or home elevation program for residents who have endured multiple floods (Fambrough 2018). Additionally, the parish council began discussing fill restrictions in 2019 (Mitchell 2019a). These most recent efforts reflect some enduring recollection of past flooding.

Concern with adequate drainage sparked one of the biggest controversies following the flood. Local officials claimed that solid concrete barriers set atop the middle of the interstate highway crossing Livingston Parish functioned as a dam, impeded the flow of excess river water, and exacerbated flooding upstream from the highway. This resulted in a lawsuit against the state department of transportation (Hardy 2017a).

East Baton Rouge Parish is pushing for rules that will require preserving low-lying wetlands as open space in new subdivisions as flood retention areas (Hardy 2019). Additionally, EBR has launched a major stormwater drainage study. It focuses on drainage—which ultimately seeks to send runoff downstream—and not safe development practices (East Baton Rouge Parish 2018). A recent U. S. Army Corps of Engineers evaluation indicates augmented drainage will not adversely impact lower basin parishes (Mitchell 2019b). The parish's efforts are being aided by federal funding of the Comite River Diversion now projected for completion in 2021 (Stole 2018). That structure will redirect a portion of the upstream flow away from Ascension Parish—a modest nod to inter-parish cooperation. Its report also calls for cooperation among all parishes that rely on the Amite to transport storm runoff (East Baton Rouge Parish 2018). The plan is in the second of three phases; however, until it is completed, it will not guide policy changes. Approval of subdivisions in risky areas continues as the study moves forward.

Downstream Responses

The urge to restore drainage capacity offered hope to upstream residents, but posed a very different situation for downstream Ascension Parish. It is situated on the coastal plain with a nearly invisible gradient, which minimizes stream velocity through the lower course to Lake Maurepas. More water, arriving there faster, increases flood risks. Ascension relies in part on a diversion canal built in the 1950s to accommodate any surges from upstream. The canal bypasses natural meanders and follows a direct path toward the lake. Local observers noted the canal had not been properly maintained and was not operating at its design capacity in 2016 (Hardy 2017b). Ascension also has pump stations to aid in the removal of local floodwaters and a modest levee system to protect some developed areas above the diversion canal. The August 2016 flood overwhelmed these mitigation systems.

Ascension has allowed developers to use fill to raise new developments above the base flood elevation (Figure 5). The focus group pointed out that only subdivisions developed prior to 2007 experienced damage from the flood (Ascension Parish Focus Group 2018). In June 2017, the parish council opted to defer discussion of an ordinance limiting the use of fill (Ascension Parish Council 2017). In 2019, the parish revisited fill restrictions and passed an ordinance that limits development in the 100-year floodplain and requires elevating structures higher than the minimal base flood elevation and using means other than fill. The parish president promptly vetoed the act and called for further study (Mitchell 2019a, 2019d). The parish council eventually approved a compromise that only limits fill as the exclusive means of raising houses in the lowest areas of the parish (Mitchell 2019c). Thus fill remains an option in much of the parish and one that is preferable to developers, but one that displaces floodwaters to other areas. The parish has increased the capacity required for flood retention ponds in new subdivisions (for 25-year storms), but the existing drainage system is not designed to handle that level of storm runoff (Ascension Parish Focus Group 2018). This imperils those subdivisions not adequately raised and creates a mismatch between drainage and retention systems.

Ascension Parish also has hired an engineering firm to design an extension of its levee system to provide additional protection. This action met with opposition and a threatened lawsuit to block it by upstream Livingston Parish. Officials there claimed the levee would back up future floodwaters into their jurisdiction. Such inter-parish conflicts reflect the internal orientation of policymaking, despite calls by the river basin authority to implement a basin-wide plan (Jacobsen 2017). A rapprochement has emerged between Ascension and Livingston that will allow Ascension to proceed with design plans for its levee (Mitchell 2019c).

Absence of Climate Change Adaptation

East Baton Rouge has embarked on an examination of its drainage system in the wake of the 2016 floods and intends to use its findings to guide further policy adjustments. At the request of citizens, the parish has committed to taking climate change into account in its future planning. This is the one explicit example of merging risk reduction and climate change adaptation expressed at the local level (East Baton Rouge Parish 2018).

In 2007 Louisiana produced its first Master Plan for a Sustainable Coast (CPRA 2007). At five-year intervals, it updates this document filled with assessments of sea-level rise and the related land loss. It presents bold plans for coastal restoration and represents a catalog of concerns and responses to changing environmental conditions associated with climate change—even if that terminology is soft-peddled (CPRA 2012, 2017). Plans include marsh restoration, levees, sediment diversions, and rebuilding barrier islands primarily for parishes directly in contact with the coast. The state's planning touches on the lower Amite River basin wetlands which are adjacent to Lake Maurepas, but does not extend further inland (CPRA 2012, 2017). A second state agency has also launched an ambitious campaign to develop adaptive strategies for "future environments" (LA SAFE 2019). Its efforts to date also fail to extend inland. Both programs are remarkable in a state heavily tied to the petrochemical industry with leaders who are reluctant to speak the words "climate change," yet they retain a tight focus on coastal land loss and make no attempt to expand to consider all impacts of climate change.

Memory Eclipsed

A tragedy occurred in the Amite River basin in August 2016—slightly more than three decades after the previous record flood. The calamitous result was not solely the consequence of an abnormal rainstorm, although meteorology and hydrology contributed. As forewarned in 1985, expansion of development into flood-prone areas placed people and property in harm's way. Public policies enabled this expansion and were equally culpable in what was not a natural disaster, but a disaster rooted in human decisions and actions. Fundamental to this was the eclipse of flood memories, or active forgetting, in public policies that enabled aggressive development in risky areas across three parishes.

Participants in the focus groups convened in 2018 were largely unfamiliar with the impacts of the 1983 flood and the steps taken in the intervening years. The shallow depth of flood memory is not unexpected and is not a criticism of relatively young professionals or others who arrived to the region in recent years. Nonetheless, professional capacity is handicapped by the lack of institutional awareness of the previous worst flood tragedy in the area's history and the absence of tools to

perpetuate knowledge of that event and adaptations implemented in its wake.

Following the 2016 tragedy, studies primarily addressed the flood risk as one of drainage, not development, and as an inland riparian problem and not a littoral issue tied up with sea-level rise and climate change. Despite calls for inter-parish cooperation and basin-scale mitigation, local governance remains the geopolitical framework. Within that context, it has taken more than two years for parish governments to begin seriously addressing policies that will influence land use and development. In the meantime, homeowners have increased their reliance on flood insurance—at least for now. The slow movement toward policy adjustment might be a factor in increased flood insurance purchases, but it also presents an opportunity to infuse inland policies with coastal concerns and simultaneously reduce risk for fluvial and littoral hazards. There is still time to actively remember the 2016 flood in local policy.

Perpetuating flood memories is increasingly pertinent in both coastal and near coastal locations around the world. Riparian risk reduction alone offers diminishing protection. Blending climate change adaptation with disaster risk reduction offers one way to ensure a higher degree of safety both along the shore and inland from the coast.

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Footnotes

[1] As part of an interdisciplinary team, I conducted three focus groups with officials from the three impacted parishes: Ascension, East Baton Rouge, and Livingston. Local officials with responsibilities in flood management, drainage, public works, planning, and hazard mitigation were invited to attend a gathering to discuss flood memories and policy adjustments since the 1983 flood. I prepared a list of questions, secured university Institutional Review Board (IRB) approval, and carried out the recorded focus groups in May and June 2018. Observations about the focus groups stem from a review of the transcripts which did not identify individual speakers. My observations do not reflect official public policy for the respective parishes.

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