

Jack Burke

Professor Lee

ENGL 1304

18 April 2019

### The Problem with Houston Flooding and Physical Infrastructure

I have spent the majority of my life residing in suburban San Antonio, Texas. When I was accepted into the University of Houston, my family was ecstatic for me to begin the rest of my life in such a beautiful and sprawling city. However, there was slight backlash in my decision due to the prior events of Hurricane Harvey and the devastation it left behind. I decided to conduct my own independent research as I found great interest in the impacts of Hurricane Harvey on local Houston communities. I uncovered dozens of individual accounts from survivors in the midst of the storm. Each personal account exemplified the positive attitude and mental toughness that every hurricane survivor carried. I felt a connection with these individuals who lost everything as they are not only fellow Texans, but human beings as well. I conducted a full archival research within the University of Houston library while utilizing the Special Collection series at the University of Houston library alongside hours of individual research to ask the question, “What is the solution to controlling Houston’s floods?”. I found that the relationship between flooding and physical infrastructure was detrimental to the flood control efforts. I intended to uncover the truth surrounding the dense physical infrastructure found in suburban/urban communities and the effects flooding can have on it. I chose to utilize scholarly sources and expert testimonies to prove how physical infrastructure negatively contributes to flooding in major cities through scholarly journals and archival materials from Special Collections at the University of Houston.

## Methods/Research Context

My experience throughout my archival research process has encouraged me to find out more about the history of floods in Houston and how to control them. I chose to use Brays Bayou as an element of my research due to the proximity it has to the University of Houston and the immediate effects it would present to University of Houston if another flood was to occur. Following my self-guided tour along Brays Bayou, I felt adequately prepared to continue my research. When visiting the Special Collections in search of more information of Brays Bayou and solutions that have arisen in the past, I was delighted to learn more than I was expecting. From 1974-1993, Brays Bayou featured little to no physical infrastructure with the exception of parks in certain areas. If I could determine that severe flooding has a higher probability of occurring in United States cities that feature more nonporous surfaces and infrastructure, I could publish my research for a more universal audience.



Figure 1. This is a photo I took while observing a bayou in Houston, Texas. It is hard to overlook the presence of concrete; a nonporous surface that does not absorb water.

## Research Results

After concluding my research, I reached the conclusion that all of the articles and publications I read focused around two major themes – recognizing that urban flooding was an issue and the innovation behind solving it. With that said, I have decided to organize my research in a way that is structured, yet easy to follow by any audience.

*The Problem: It's Bad, and Getting Worse*

The relationship between flooding and physical infrastructure began when urban development started among major cities in the United States. No regard was taken for the environment that the land was being built on which means current and future generations will suffer the consequences that follow. Building major cities such as Houston, Texas and New Orleans, Louisiana within major flood plains was a bad idea to begin with. With the rapid expansion of urbanism and the major downtown districts being constructed, the amount of pervious land was depleting exponentially. Author Ian Bogost claims that “In most of the United States, about 75 percent of its land area, less than 1 percent of the land is hardscape. In cities, up to 40 percent is impervious.” (par. 6). When the water hits this type of material, it must have some place to travel to, creating runoff which can ultimately create flooded roads and massive traffic buildup. To help offset the problem, Bogost believes good stormwater management programs need to be in place to ensure runoff is minimalized. Stormwater management programs must be monitored by a city’s flood control council with the funds coming from taxpayers. Author Dan Frosch described in his article how “On a ballot in Harris County is a \$2.5 billion bond backed by property taxes that could more than quadruple the annual funding available to help shield Houston and the surrounding cities from flooding.” (par. 2). The developmental mistakes made in the past must be funded from somewhere in order to minimize the effects. Frosch now believes it is up to the American citizens to become educated in such a critical and costly decision. National recognition of the problem should be enforced via educational resources and outlets so any member of any community can understand what is going on. The Center for Houston’s Future makes a major point to ensure all voters and Houstonians are on the

same page with their ‘A House United’ report. They forecast their future goals by stating in the context of the example provided, “The regional authority’s response to solving the drainage problem gains widespread public support through an emphasis on environmentally sound and cost-effective projects” (12). Placing recognition on the problem at hand is what all three sources intend to do through any means necessary.

*The Solution: The Nation’s ‘Great Hidden Challenge’*

In order to identify something as a ‘problem’, validation from a credible source is recommended. Shiqiang Du and his research team concluded that areas with impervious surfaces would require extra attention as they influence flood processes. Du claims “In general, impermeable surfaces increase can affect hydrological processes and increase peak discharge.” (1458). Du provides dozens of graphs and infographics outlining his data. Once the problem is addressed, it is time to think of viable solutions. The National Oceanic and Atmospheric Administration (NOAA) outlines solutions by first detailing all eight of the solutions presented with introductions outlining their purpose and positive/negative effects. The second section discusses considerations for planning and implementation, which states “Green infrastructure practices can be effective in reducing flooding impacts in communities but, to increase the success of practices, planning and maintenance must be in order.” (8). Finally, the article finishes with rough estimations of potential costs for implementations. The article is designed for audiences who are serious about city developers seeking greener alternatives for the future of their respective cities.

## **Literature Review**

In his *Atlantic* article, Ian Bogost, a professor of Media Studies, explores the more scientific side of solving the flooding problem Houston encounters in his article “Houston’s

Flood Is a Design Problem”. Bogost explains how Houston faces two major issues that impede its ability to naturally control rainfall; the large quantities of rain that make contact with the city and the impermeable surfaces to cover troubled areas. On the other hand, author Dan Frosch of *The Wall Street Journal* discusses the massive \$2.5 billion bond that is “backed by property taxes that could more than quadruple the annual funding available to help shield Houston and the surrounding cities from flooding.” (par. 2). The author includes first-hand accounts from survivors of Hurricane Harvey regarding their thoughts of investing in flood prevention for future infrastructure project. Frosch makes it clear that while it will not solve the flooding issue within Houston, it is the first step to create a safe future.

Solving Houston’s flooding problem requires a large majority of Houstonians to recognize the flooding as an evolving issue. In the article “A House United” found in the Terry Tarlton Hershey Papers Collections in the University of Houston Special Collections, the Center for Houston’s Future addressed important environmental issues to help create long-term goals formulated by Houston legislatures. In 2005, the Center for Houston’s Future released their annual report detailing the problems they wish to address the following year. The article presents a unique outlook on how to address such issue and publish a distinct section titled ‘A House United’. “A House United” discusses the probability of a tropic storm causing havoc across Houston and the immediate effects without flood funding. After reading “A House United”, it’s clear to see that the Center for Houston’s Future aims to control the infrastructure problems now, which will allow them to focus their funds on improving the quality of life issues later in the future. This serves as an important source due to the prominence the Center for Houston’s Future holds within their community as well as the amount of power they hold legislatively.

When considering the next steps to take as a community, countless research has been poured into locating the ideal solution. Researcher Shiqiang Du alongside his team of researchers aimed to determine the impact of impervious surfaces within urban areas by constructing models of flood-prone areas. Du et al.'s research concludes, "The above findings suggest that cities should consider an increase in flood discharge under future impermeable surface scenarios when designing new and reinforcing existing flood defense facilities." (1458). Du et al. suggest that impermeable surfaces require special attention when constructing flood defense systems. Similarly, the National Oceanic and Atmospheric Administration (NOAA) explains how green infrastructure is that solution to Houston's current flooding crisis. NOAA thoroughly explains three solid ideas for the future when planning environmentally-friendly infrastructure including "porous pavement, blue roofs, porous asphalt, and green roofs." (6). Alongside pictures of each idea presented, NOAA presents detailed explanations to ensure every idea is capable of being implemented in real-life scenarios.

## **Research Results**

After concluding my research, I reached the conclusion that all of the articles and publications I read focused around two major themes – recognizing that urban flooding was an issue and the innovation behind solving it. With that said, I have decided to organize my research in a way that is structured, yet easy to follow by any audience.

### *The Problem: It's Bad, and Getting Worse*

The relationship between flooding and physical infrastructure began when urban development started among major cities in the United States. No regard was taken for the environment that the land was being built on which means current and future generations will suffer the consequences that follow. Building major cities such as Houston, Texas and New

Orleans, Louisiana within major flood plains was a bad idea to begin with. With the rapid expansion of urbanism and the major downtown districts being constructed, the amount of pervious land was depleting exponentially. Author Ian Bogost claims that “In most of the United States, about 75 percent of its land area, less than 1 percent of the land is hardscape. In cities, up to 40 percent is impervious.” (par. 6). When the water hits this type of material, it must have some place to travel to which creates runoff that ultimately leads to flooded roads and massive traffic buildup. To help offset the problem, Bogost believes good stormwater management programs need to be in place to ensure runoff is minimalized. Stormwater management programs must be monitored by a city’s flood control council with the funds coming from taxpayers. Author Dan Frosch described in his article how “On a ballot in Harris County is a \$2.5 billion bond backed by property taxes that could more than quadruple the annual funding available to help shield Houston and the surrounding cities from flooding.” (par. 2). The developmental mistakes made in the past must be funded from somewhere in order to minimize the effects. Frosch now believes it is up to the American citizens to become educated in such a critical and costly decision. National recognition of the problem should be enforced via educational resources and outlets so any member of any community can understand what is going on. The Center for Houston’s Future makes a major point to ensure all voters and Houstonians are on the same page with their ‘A House United’ report. They forecast their future goals by stating in the context of the example provided, “The regional authority’s response to solving the drainage problem gains widespread public support through an emphasis on environmentally sound and cost-effective projects” (12). Placing recognition on the problem at hand is what all three sources intend to do through any means necessary.

*The Solution: The Nation’s ‘Great Hidden Challenge’*

Researchers around the nation share the collective vision that Houston's flood issue is one that progressively gets worse over time. In order to identify this as a 'problem', validation from a credible source is highly recommended. Shiqiang Du and his research team concluded that areas with impervious surfaces would require extra attention as they influence flood processes. Du et al. claim "In general, impermeable surfaces increase can affect hydrological processes and increase peak discharge." (1458). Du et. al provide dozens of graphs and infographics outlining his data. Once the problem is addressed, it is time to think of viable solutions. The National Oceanic and Atmospheric Administration (NOAA) outlines solutions by first detailing all eight of the solutions presented with introductions outlining their purpose and positive/negative effects. The second section discusses considerations for planning and implementation, which states "Green infrastructure practices can be effective in reducing flooding impacts in communities but, to increase the success of practices, planning and maintenance must be in order." (8). Finally, the article finishes with rough estimations of potential costs for implementations. The article is designed for audiences who are serious about city developers seeking greener alternatives for the future of their respective cities.

### **Implications**

Prior to conducting my flood research completed by dozens of prominent engineers and environmental scientists, I was uneducated on how much is being done within the United States to help offset the effects of the poor city development. The technology that is being created within the US looks destined to change the way researchers analyze floods in the future. There are also millions upon millions of dollars funneled into the creation of widening bayous and research so floods can be handled in a more efficient and safe manner. I have since discovered that the only thing prohibiting cities like Houston from advancing within its flood control efforts



are the American citizens themselves. If these cities seek immediate change, it appears wise to educate the public with an abundance of knowledge regarding flood safety. Without all members of every community on board, no forward progress can be made in the efforts to regulate flooding in flood-prone areas. Houston is coming up with resolutions but consistent pushback from taxpayers is leading to a standstill. It's time to understand that our options will continue to become limited unless we rationalize with flood experts and reached a common goal.

## Works Cited

- Bogost, Ian. "Houston's Flood Is a Design Problem." *The Atlantic*, Atlantic Media Company, 29 Aug. 2017, [www.theatlantic.com/technology/archive/2017/08/why-cities-flood/538251/](http://www.theatlantic.com/technology/archive/2017/08/why-cities-flood/538251/).
- Frosch, Dan. "After Harvey, Houston Hopes to Boost Flood Defenses With \$2.5 Billion Bond." *The Wall Street Journal*, Dow Jones & Company, 5 Aug. 2018, [www.wsj.com/articles/after-harvey-houston-hopes-to-boost-flood-defenses-with-2-5-billion-bond-1533470402](http://www.wsj.com/articles/after-harvey-houston-hopes-to-boost-flood-defenses-with-2-5-billion-bond-1533470402).
- Du, Shiqiang, Peijun Shi, Anton Rompaey, and Jiahong Wen. "Quantifying the Impact of Impervious Surface Location on Flood Peak Discharge in Urban Areas." *Natural Hazards* 76.3 (2015): 1457-471. Web.
- Du, Shiqiang, et al. "Quantifying the Impact of Impervious Surface Location on Flood Peak Discharge in Urban Areas." *Natural Hazards*, vol. 76, no. 3, Apr. 2015, pp. 1457–1471. *EBSCOhost*, doi:10.1007/s11069-014-1463-2.
- Center for Houston's Future, approximately 2005. Terry Tarlton Hershey Papers, Box 2, Folder 14, University of Houston Libraries Special Collections. [https://findingaids.lib.uh.edu/repositories/2/archival\\_objects/294737](https://findingaids.lib.uh.edu/repositories/2/archival_objects/294737) Accessed April 01, 2019.