

Master's thesis

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The Fate of Riverine Communities In a Decentralized Flood Governance

The case of Sharpsburg Borough, PA, USA

Master's thesis in Urban Ecological Planning

Supervisor: Rolee Aranya

June 2022

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Abstract

Flooding used to be the major threat of natural disasters in the world between 1970 and 2005, and it continued to be the largest number of reported natural disasters in 2019 (Ritchie, H. and Roser, M., 2014). Pennsylvania ranks in the top five states for inland flooding threats, where 430,000 people live in flood-prone areas. The threats are projected to increase by 40% in the coming nearly 30 years (States at Risk, 2015). Among those, riverine borough communities are highly vulnerable due to the high possibility of inundation from rivers, creeks, and storms. Sharpsburg is one of the riverine borough¹ found in Allegheny County, south-western PA. It has about 3446 inhabitants living in a structure built before 1965 along the Allegheny River, where 34 % of the structure is found in the flood plain (Sharpsburg Community vision plan, 2019).

However, the existing decentralized approach to managing water in Allegheny County may currently represent a barrier to making the kinds of changes that will be necessary to protect places like Sharpsburg. Allegheny County is one of the most politically fragmented areas in the United States, with 130 municipalities located within less than 2,000 km², and these local governments are able to make their own independent decisions about land use and flood management concerns. Research shows that adaptive flood governance: a self-organizing process of a social-ecological system that changes form as systems undergo periods of crises and stability, became an effective approach to coping with uncertainty and realizing resilience to flooding (Chaffin & Gunderson 2016, p. 83). In this project, Sharpsburg's flood governance challenges will be assessed. In addition, methods for public and private stakeholders to address flooding vulnerability through an adaptive governance system will be analyzed. In this study, it is shown that a top-down government that relies more on national solutions that lack details about the local context could have a negative impact on the community due to uninformed risk and a lack of contextualized solutions. The empirical data shows that, for a small municipality like Sharpsburg with scarce resources, an uncoordinated and reactive flood management strategy would hamper self-organization; however, the recommended adaptive governance framework could help the borough to self-organize through a defined structure of cooperation among stakeholders and be adaptive to uncertain future events. These can help turn the fate of Sharpsburg towards resilience and sustainability.

¹ Borough is an administrative unit of small town. Throughout the paper, the term Borough, Neighborhood and Municipality are used interchangeably.

Table of Contents

ACKNOWLEDGMENT.....	I
ABSTRACT.....	II
LIST OF FIGURES.....	V
LIST OF TABLES.....	VI
ACRONYMS.....	VI
CHAPTER ONE.....	1
1. INTRODUCTION.....	1
1.1. RESEARCH PROBLEM.....	3
1.2. RESEARCH AREA.....	4
1.3. RESEARCH QUESTION.....	4
1.3.1. <i>The main question</i>	5
1.3.2. <i>Specific research questions</i>	5
1.4. SECTION OF THE THESIS.....	5
CHAPTER TWO.....	7
2. THEORY AND THEORETICAL FRAMEWORK.....	7
2.1. FLOOD RISK.....	7
2.2. EXISTING KNOWLEDGE.....	8
2.3 COMMUNITY RESILIENCE.....	10
2.4 FLOOD RISK GOVERNANCE.....	10
2.4.1 <i>Good governance</i>	12
2.4.2 <i>Adaptive governance</i>	13
2.5 CRITIQUES ABOUT ADAPTIVE GOVERNANCE.....	15
2.6 THEORETICAL FRAMEWORK.....	17
CHAPTER THREE.....	21
3. METHODOLOGY.....	21
3.1. CASE STUDY METHOD.....	23
3.2. DATA.....	24
3.3. OBSERVATION.....	25
3.4. STAKEHOLDER MAPPING.....	26
3.5. INTERVIEW.....	27
3.6. ONLINE SURVEY.....	28
3.7. DATA ANALYSIS.....	29
3.8. RESEARCH LIMITATIONS.....	29
3.9. ETHICAL DILEMMAS.....	30
CHAPTER FOUR.....	31
4. CONTEXT OF THE RESEARCH.....	31
4.1. CONTEXT OF THE CASE.....	31
4.1.1. <i>Sharpsburg</i>	31
4.1.2. <i>Terrain and its impact</i>	33
4.1.3. <i>Previous flood events and challenges</i>	33
4.1.4. <i>Future flood risk in Sharpsburg</i>	37
4.1.5. <i>Policy and institutional context</i>	39
CHAPTER FIVE.....	48

5. CASE PRESENTATION AND ANALYSIS.....	48
5.1. PREPAREDNESS PLAN BEFORE A FLOOD EVENT	48
5.1.1. Vulnerability issue.....	49
5.1.2. Political ideology	50
Dynamic pressures	53
5.1.3. Societal lack of awareness and training.....	53
5.1.4. Rapid Urbanization & poor governance	57
5.1.5. Institution structure, responsible, and capacity	62
5.1.6. Civil society actors (VOAD) preparedness.....	67
5.2. DURING FLOOD.....	68
5.2.1. Previous flood hazard response experiences	70
5.3. POST-FLOOD RECONSTRUCTION EFFORT	73
5.3.1. Fragile livelihoods & unsafe location.....	73
5.3.2. Restoring the normal activity	73
5.3.3. Experience exchange	74
CHAPTER SIX	76
6. FINDING AND IMPLICATION	76
6.1 Findings.....	76
6.1.1. Step 1: Define the challenges.....	77
6.1.2. Step 2: define and prioritize the actions.....	80
Enabling	83
Plan	85
Invest:.....	86
Controlling flood plain management	86
Response and recovery	86
6.1.3. Step three.....	88
Implementation	88
Monitoring the result	89
6.2. IMPLICATION TO PRACTICE.....	89
6.3. IMPLICATION TO THEORY.....	90
7. REFERENCE	92
APPENDIXES	100

List of figures

Figure 1: Conceptual Model (source: Eshuis and Gerrits, 2021).....	15
Figure 2: Three critical steps for diagnosing the fit-for-purpose of governance mechanisms: (1) identifying the purpose of governance, (2) mapping the context, and (3) evaluating the outcome of governance mechanisms. (source : (Jeroen R. et al., 2012)	17
Figure 3: The progression of Vulnerability (Wisner B. et al., 2012)	18
Figure 4: EPIC-response framework (source: (Browder et al., 2021))	19
Figure 5: Modified vulnerability progression framework and EPIC- response framework (source Wisner B. et al., 2012 and Browder et al., 2021).....	20
Figure 6: Research methods timeline (source: author’s own work).....	24
Figure 7: Location map of Sharpsburg borough (source: author).....	32
Figure 8 Sharpsburg Borough topography (source: Sharpsburg terrain, 2022)	33
Figure 9: Lower Millvale flooding on Mrach 18, 1936 (source: Brady S, 2017)	34
Figure 10: USACE lock and dam 2 Allegheny river next to Sharpsburg borough (USACE,1993)	35
Figure 11: Sharpsburg flooding on September 18, 2004 (source: Sharpsburg flooding, 2004).....	36
Figure 12: During and after flooding in front of Sharpsburg voluntary fire department building on July 3, 2018 (Source: Sharpsburg voluntary fire department, 2018).....	37
Figure 13: Overall flood risk in Sharpsburg borough (Sharpsburg, Pennsylvania, no date)	38
Figure 14: Flood risk management in the United States: Pre-1950 to 2019 (Source: Kousky, C. and Golnaraghi, M., 2020).....	39
Figure 15: Local government hierarchy (Source: Retrieved from Sharpsburg borough websites).....	41
Figure 16: Existing flood management institutional hierarchy (Source: Author).....	43
Figure 17: Political map of Sharpsburg and its immediate surrounding. The darker blue shows most votes for the Democrat party while the lighter shade shows the split between parties (source: Sharpsburg, PA Political Map, n.d)	51
Figure 18: Local government officials’ level of concern about flooding in Sharpsburg borough (source: Survey conducted by the researcher 23 February- 15 April 2022).....	53
Figure 19: Residents’ flood preparedness (source: source: Survey conducted by the researcher 23 February- 15 April 2022).....	56
Figure 20: partial areal view of the Sharpsburg borough.(source: SWFC,u.d)	57
Figure 21: hydrology line in Sharpsburg and its surrounding (source: Author)	58
Figure 22: proposed site for redevelopment (source: SNO, 2022)	60
Figure 23: preliminary conceptual plan and initial rendering (source: SNO, 2022).....	61
Figure 24: Existing Stakeholder mapping (source: Author’s own work)	63
Figure 25: Summarized structure of existing flood governance network and their relations (source: Author).....	64
Figure 26: actions recommended for better preparedness plan in the borough (source: Survey conducted by the researcher 23 February- 15 April 2022)	66
Figure 27: Time sensitive warning information and instruction medium preference	69
Figure 28 : Locations Canvassed for Unsheltered Population, January 2019 vs. January 2020 (source: homelessness data, 2020).....	69
Figure 29: Local VOAD challenges (source: Survey conducted by the researcher 23 February- 15 April 2022).....	70
Figure 30: Residents' satisfaction with the previous response operations (source: Survey conducted by the researcher 23 February- 15 April 2022).....	71
Figure 31: How to Change Flood Risk Governance in a Specific Area. (source: adapted from Raadgever, T . and Hegger, D, 2018)	76
Figure 32: stakeholders mapping (source: Author’s own work)	82

Figure 33: proposal of Adaptive governance in Sharpsburg borough (below) and the existing structure (above). (Source: Author’s own work) 84
 Figure 34: Recommended Emergency Operation structure and team (Source: Authors own work)... 88

List of tables

Table 1: Table: data types and sources (source: author’s own work) 25
 Table 2: The annual borough budget compared to the neighboring boroughs and total allocated budget for environmental protection (source: Sharpsburg borough Annual budget, undated , Millvale Borough 2021 Budget, undated, and Borough of Etna 2021 budget, Undated) 45

Acronyms

NASEM= National Academies of Sciences, Engineering, and Medicine,

FEMA= Federal Emergency Management Authority

PEMA= Pennsylvania Emmeregnecy management Author

EMC= Emergency Management Coordinator

SNO= Sharpsburg Neighborhood Organization

Chapter One

1. INTRODUCTION

The World Bank report of 2020 indicates the substantiality of flood risk globally. The report estimates 1.47 people worldwide face flood risk. The report further indicates, "Flood risk is a near-universal threat: populations are not safe in any of the 189 countries examined". The report suggested that densely populated low-lying plains are among the high-risk flood zones. (JUN ERIK and MELDA, 2020)

The New York Times released news on 29 June 2020 with the headline "New data reveals hidden flood risk across America" reported that flood risk is far greater than government estimates show, exposing millions of Americans to a hidden flood threat according to the calculation done by First Street Foundation (FSF) (Flavelle *et al.*, 2020). Similarly, The USA Today news published an article on the same date with the headline "Millions of Americans think they are safe from floodwaters. They are not" (Kyle, B. et al. 2020).

The FSF is a non-profit organization registered in the state of New York. It is a research and technology group dedicated to quantifying and communicating American of their risk by incorporating world-class modeling techniques and analysis with the most up-to-date science available (First Street Foundation, n, d). The FSF analysis indicated a decade-long bungling of flood planning and policy at multiple levels of government across the country. The finding raised a new question about who will pay flood planning costs to save the vulnerable communities across the country (Kyle, B. et al., 2020).

The calculation, which considers sea-level rise, rainfall, and flooding along smaller creeks, estimates that 14.6 million properties are at risk from a 100-year flood (First Street Foundation, n, d). In Allegheny county, properties at risk of flooding from a major storm are estimated at 11,264, 1.9%, while FSF estimated 68,105, 11.8% of the property at risk. A 100-year flood is the one with a 1% chance of striking at any given year (First Street Foundation, n, d). The mapping did not explicitly indicate the risk of floods to people's lives. These show how vulnerable the people are, the inadequacy of the data, and the knowledge gap.

According to the newspaper article, the Federal Flood maps, managed by the Federal Emergency Management Agency (FEMA), have long drawn attention that their flood risk estimation is not efficient due to multiple reasons. The inability to keep the map up-to-date due to complications resulting from worsening climate change, mapping cost, and labor-intensive.

In addition, FEMA's maps are not designed to account for flooding caused by intense rainfall, which extenuates the risk as global warming increases. On top of this, flooding along small creeks is not mapped by FEMA (Flavelle *et al.*, 2020).

Since flooding has been affecting residents in numerous states of the country for a long time, an wide-ranging of research has been conducted on flood issues, and the researchers continue to explore the topic because the risk is increasing. Despite years spent by a multidisciplinary team studying the challenges of floods and ways forward, there is an increased need for a new approach and a fresh perspective. Therefore, recent case-study research conducted in the US to provide insight into urban flooding challenges indicates that managing urban flooding requires a multi-agency, cross-jurisdictional approach due to its complexity. Those challenges were also shared by participants at a meeting held at a regional level-Southwestern Pennsylvania-to discover the knowledge gaps in urban flood management. There is a lack of citizen awareness of their flood risk and challenges in implementing effective flood policies in upstream/upland and downstream/lowland floods due to a fractured governance system (Elliott, E. et al 2020). As a result, downstream valley residents who are the recipients of runoff and the highly impacted community should decide their fate by looking into flood governance approaches that fit their needs and adequately mitigate their risks.

From this, one can deduce that the experts perceive and accept the risks and that preparing for the adverse scenario is an unquestionable issue at this point. While efforts are being made from the top: mapping, modeling, monitoring structures, monitoring warning devices, etcetera. A bottom-up continuum approach to flood governance at the local level that involves all stakeholders and works closely with its neighboring areas seems to be overlooked. Governance that actively engages its citizens and is deeply rooted in its residents is more effective and empowers local actions (NASEM, 2019). FEMA, A. (2011) found that an integrated approach produced better results for many types and sizes of threats and hazards, improving security and resilience during emergencies. Enabling, flexible and adaptive institutions are crucial to help communities steer themselves and be prepared. To realize adaptive governance in the Borough of Sharpsburg, the paper discusses how public and private stakeholders in Sharpsburg Borough can contribute to a more effective flood risk governance that leads to resilient flood risk management.

1.1. Research Problem

Flood has been responsible for the loss of human lives, disruption of social activities, and destruction of livelihoods. In the United States, flooding is the most common and most costly natural hazard that causes disaster (*Flood Insurance and the NFIP*, 2021). Flooding is one of the natural hazards causing disastrous events in the commonwealth of Pennsylvania, particularly in the case study area. Many scholars argue about what we normally call "natural hazards." Their main argument is that all hazards are caused by direct or indirect human activities over a certain period. Among them, Smith's (2013) argues that flooding is a quasi-natural hazard, which means that human activity affects its outcome and causes some of its consequences. Gilbert Fowler White, who is considered to be the founding father of flood plain management, argued saying, "floods are "acts of God, but flood losses are largely acts of man" (White, G.F., 1945). Both scholars suggest that the flooding and the consequences are highly connected with human interferences; however, the flooding itself might not have a significant connection with the people impacted by it who reside in a particular area. The argument of White is rooted in the concept that even if we cannot avoid flooding, we can at least mitigate or avoid the negative impact of the flood by preparing for it. The argument depicts the importance of having a clear plan for natural calamities. It also shows the ability to Mitigate risk needs cooperation among three pillars: people, well-structured institutions, and policies that govern and facilitate risk governance.

Pennsylvania is a commonwealth where flood governance is handled at local administrations. The Borough of Sharpsburg flood governance system relies more on county and beyond tier of government institutions with very limited institutionalized efforts at a local level. It also has minimal resources, which primarily rely on federal, state, and county government bodies' grants and funds. The highly complex policy and institutional hurdle make it difficult for Borough to get funds for preparedness plan that the Borough might plan to execute. The administrative fragmentation and political polarization that result from a decentralized system where things are handled at the local level put the neighborhood even more at risk.

The presence of a significant number of literate residents is beneficial for adaptive flood governance, as literacy can help smooth awareness flow and aid management efforts. Residents' willingness to participate in flood mitigation and their willingness to support the government's efforts help to bring a bottom-up change and engrave preparedness deep into the larger community. Additionally, faith-based organizations that support environmental issues could be viewed as a major opportunity to strengthen and promote the role of civil society

actors in flood governance and thus ensure a community-based approach to flooding. Lastly, the fact that the flooding issue is a regional problem would make cooperation among the jurisdictions less difficult.

1.2. Research area

Sharpsburg is a borough in Allegheny County, in the state of Pennsylvania, 8 km northeast of downtown Pittsburgh, along the Allegheny River. The Borough is one of the 130 small autonomous administrative units which is administered by the Mayor and borough council.

The Borough is situated on a land area of under 1 square mile (2.6 square kilometers). The length of the Borough has stretched about 2.5 km along the Allegheny River and is only 500 meters wide when measured from the river's edge. The Borough is a home for 3446 residents where 96% of the structure is prone to a greater than 26% chance of being affected by flood at any given time in the next 30 years (*Sharpsburg, Pennsylvania*, no date). This shows how severe the risk would be primarily for Sharpsburg borough if the action could not be taken to be prepared and mitigate the risk.

To briefly describe some background, I got an opportunity to work as an intern with Sharpsburg borough following the Borough's community rating system (CRS) application acceptance by FEMA. The CRS enables the Borough to get discount flood insurance for the municipality based on credit achieved on the CRS. I worked on preparing a program for public information (PPI) documents and identifying public outreach initiatives creditable under CRS under the supervision of Sharpsburg Neighborhood Organization (SNO). The program recognizes and encourages community floodplain management initiatives. In this activity, the neighborhood forms a committee of at least five members from both government and the community who should undertake community outreach to reduce and avoid flood damage in the Borough.

SNO is a non-profit community organization that works to improve the neighborhood residents' quality of life. The organization cooperates and works closely with the borough elected councils and is subservient to the borough government administration. The various level of government reaches them either through the elected officials or representative at a local level.

1.3. Research question

situations like this, I realized that the municipality needs a clearly defined form of adaptive governance, an approach to environmental governance that facilitates interactions between actors, networks, organizations, and institutions in a way that allows the community to prepare, respond quickly, and build back better by organizing local resources and skills. Moreover, The

risk analysis shows the solution should include more than subsidizing flood insurance, which focuses only on a property instead of human lives at stake; the social disparities that may arise during flood response and afterward reconstruction, along with the hidden impacts of psychological and social disruption, should also be addressed instead of the traditional flood response. Thus I came up with the idea of working on flood governance in this context for the sustainable well-being of this riverine community. A presentation was made to SNO on the project idea and its necessity for the Borough. Upon reviewing the topic, they thought it was pertinent to their context and offered their support, thinking it could also help reduce FEMA's flood insurance premiums down the road.

1.3.1. The main question

How can public and private stakeholders in Sharpsburg Borough contribute to a more effective flood risk governance which leads to resilient flood risk management?

1.3.2. Specific research questions

- 1) What are the flood governance challenges in Sharpsburg Borough?
- 2) What can be done by public and private stakeholders to make a transition towards a more resilient flood management?

1.4. Section of the thesis

Chapter one introduces the problem's sternness at the global, country level, the commonwealth, Political territory formerly part of the British Empire later renamed Commonwealth rather than state, and down to the research area. It gives background on the issue and the urgency of the case area to act and be prepared for future highly likely flood events. Additionally, it discusses the context for the research area and the research question that examines the challenges inherent in existing flood governance and how possible actions can be collectively undertaken to determine the fate of the action area under a decentralized governance system.

In Chapter Two, the researcher provides a detailed account of the existing flood risk management system, the national policies that govern flood management, and the decades of flood impacts in the research area. Additionally, it evaluates initiatives taken by the Borough in order to ensure the safety of residents and their livelihoods, as well as the annual budget for the Borough.

Chapter Three discourses review of literature on key factors such as vulnerability, hazards, and risk in the context of the flood event. It outlines elements of adaptive flood governance, theoretical frameworks for adaptive flood governance, disaster amplification factors, and modified frameworks that are appropriate for the local context when managing floods. In addition, it discusses the various perspectives on flood governance, contemporary governance trends, and adaptation strategies to avert risks and their shortfalls. In the end, I adopted the EPIC response Framework in combination with the progression framework, which could solve the problem in its bigger context and adapt to the changing world.

Chapter Four gives the methodological description of how the thesis is conducted. It also discusses how data collected is analyzed and the methods. I explained the types of data collection methods used and the data collected. The limitations in the research are also acknowledged in this part, along with the ethical dilemma faced throughout the process of the data collection period.

Chapter Five presents a case area analysis—the case analyses existing governance structures under three broad categories: before-flood, during-flood, and post-flood. The vulnerability issues that may accentuate the impact describes under each category based on the framework presented in chapter two. As a result, the paper illustrates how the existing flood governance system functions in the borough of Sharpsburg; and that the rapidly changing environment and the need for adaptive flood governance approaches are evident in the borough of Sharpsburg.

Chapter Six attempts to present the findings and answers the research questions in relation to UEP value positions and the modified adaptive flood governance framework. It gives summarized recommendations of governance structure and operational plan that illustrates the structural relation of stakeholders in the system. Lastly, it ends with an implication of the research to practices and to the theoretical framework.

Chapter Two

2. Theory and Theoretical framework

This chapter presents the existing knowledge regarding flood governance and management methods and its shortcoming. The conclusion validates the importance and relevancy of my study. Community vulnerability issues and the impact they have on the lives and livelihood of residents, as well as the significance of averting such susceptibility factors, are essential for the community's sustainable development. In the end, the chapter will conclude with an appropriate theoretical framework. This will help increase the capacity of the community to deal with their flood hazard and its associated adverse effects. As a result, it facilitates the community's ability to navigate itself and realize adaptive flood governance, which could assist in transitioning the community to a more resilient state by developing a resilient network of well-connected and effective institutional arrangements.

2.1. Flood risk

Flood risk has been a major hazard that threatens humans and disrupts the function of day-to-day social activities and economic development. World Bank mentioned in its recent report that "Flood risk is a near-universal threat: populations are not safe in any of the 189 countries examined". Increased risk due to land use, urbanization (Carolyn K and Maryam G, 2020), and climate change outcomes such as changing storm and precipitation patterns and rising sea levels (IPCC 2018) are evident., The report suggested that densely populated low-lying plains areas are among the high-risk flood zones (JUN ERIK and MELDA, 2020).

The same is true in the case of the US, where communities living along major river streams are one of the hardest hit, and those living in flood plains face high risk. The assessment of previous flood risk in the US shows that Major freshwater flood events from 2004 to 2014 claimed 71 lives and costed an average of \$9 billion in direct damage annually. These figures do not include the cumulative costs of frequent, small floods, which can be similar to those of infrequent extreme floods (NASE M, 2019). The risk has not stopped there; the damage from floods continued until recent years. That is why flood risk is framed as the most expensive natural hazard in the US. It is also the most frequent and costly of all-natural hazards in Pennsylvania (Allegheny county hazard mitigation plan, 2020).

2.2. Existing Knowledge

Before diving into the theories, I would like to present the information gap about a flood. Many articles and information from different resources suggest that the community has limited information regarding the flood situation and the intensity of its potential impact seems to have been either under-estimated or unaddressed by the government. Oddly, the government has been unsuccessful in mapping and estimating flood risk exposure in different areas across the United States.

A large number of articles and internationally reputable publications have revealed that millions of Americans are unaware of their flood risk. Furthermore, the articles pointed out that government agencies themselves have limitations when it comes to conducting a thorough assessment. The New York Times released news on June 29, 2020, with the headline "New data reveals hidden flood risk across America" reported that flood risk is far greater than government estimates show, exposing millions of Americans to a hidden flood threat according to the calculation done by First Street Foundation (Flavelle *et al.*, 2020).

Likewise, The USA Today news published an article on the same date the New York Times released with the headline "Millions of Americans think they are safe from floodwaters. They aren't" (Kyle, Dinah, and Kevin, 2020). The FSF analysis indicated a decade-long bungling of flood planning and policy at multiple levels of government across the country. The finding raised a new question about who will pay flood planning costs to save the vulnerable communities across the country (Kyle, Dinah, and Kevin, 2020). Although FEMA has been criticized for its shortcomings in risk assessment and management, this recent finding should also alert communities living in flood plains and beyond. Consequently, there may be a knowledge gap regarding their vulnerability to flooding. Lack of awareness can significantly hamper preparation efforts at an individual level and community scale. In addition, it hinders the community's interest in becoming involved in a formal institution geared toward changing behavior and transitioning towards sustainability.

Despite this longstanding knowledge, history and politics in the United States have established a flood-risk governance structure that provides the perverse incentives for the occupation of flood-prone areas along with a widespread lack of awareness of the associated risks. (Opinion, un-dated)

The quest for appropriate flood governance is at the center of discussion in academia and government platforms due to the intense increase in global climate change, the product of

human actions. This would have double implications for local governments such as Sharpsburg, which should act immediately and must build the capacity to deal with flood events.

Flood hazard has remained the country's most expensive so-called natural hazard in the world in general and in the US in particular. Even though it is almost impossible to avoid natural phenomena, scholars have tried to understand the driving forces behind all sorts of natural phenomena. These would have prevented the hazard if the root causes had been managed and diagnosed. However, the researchers in academia debated whether Flood-event, among others, can be called a Natural hazard or not. Those in favor of the prefix 'Natural' argue that the process of the natural system inevitably happens in both the presence and absence of human beings. Thus flooding cannot be avoided. However, flood losses can be mitigated. A prominent scholar who is considered to be the father of floodplain management, Gilbert White, argued that "Floods are acts of God, but flood losses are largely acts of man" (White GF (1945))

On the other hand, those against the prefix argue that the behavior of humans and irresponsible development activities are the driving forces behind the calamity or all forms of disaster. For instance, global warming is anthropogenic, which causes the ice to melt and drive the cold weather elsewhere, resulting in sea level rise and severe monsoon storms. Most scholars agree that human activity plays a tremendous role in accentuating the hazard to an extent it can cause harm to lives and livelihood.

As Sanderson, (2019) put it, similar to natural hazards, he mentioned the so-called natural disaster is well accepted now that it is not natural. He further noted that the natural phenomenon- flood- has to meet some sort of vulnerability to produce disaster. Also, despite the fact that flooding is so common in most parts of the world, technological advancement in real-time prediction and decades of study cannot efficiently mitigate its consequential disaster. This is because cities are home to vulnerabilities that can coincide with a hazard to create a disaster (Sanderson,2019).

Often the solution from the top with different underlying types of vulnerability factors without creating an equally concerned and committed base has proven its failure and inefficiency. Hence, the need for community resilience emerged as a way to avert the risk from themselves using local knowledge and long-lived networks.

2.3 Community Resilience

Resilience is a multidisciplinary concept that has drawn urban practitioners' attention due to the overcast urban settlements' stresses. This can be exemplified as vulnerability issues discussed in the following section validates its necessity and urgency. Thus resilience is defined as “the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt and grow no matter what kind of chronic stresses and acute shocks they experience” (urban resilience,2019). The definition has set up pre-requisites to build resilience such as building capacity, building a network, defining the role of stakeholders and strengthening the collaboration among them, decision-making capacity, proactive leadership, and adaptive solutions. The concept leads us to bring Institutional resilience into the discussion at this point as it has been widely discussed in many disciplines. From a crisis management point of view, Resilient institutions are those that can absorb and recover from external shocks while adapting and transforming to deal with long-term changes and uncertainty (Haider, H. 2021). The external shock, in this case, is the severe environmental uncertainty that questions the institutional capability to recover from its ominous effect and develop the flexibility to deal with future uncertain impacts. Hence, Developing institution that supports flood resilience is critical for a sustainable living environment and development. At the same time, sustainability likely must occur via the institutions we have in place, combined with alterations in policy and regulation within the context of these institutions (Garmestani, A. 2017).

2.4 Flood risk governance

Governance and risk are defined differently in different disciplines, although the concept and the essence of the term remain similar across all practices. Although there is no single definition for governance, it has been used, and the concept has been exercised for hundreds of years. However, the concept seems to have evolved and developed along with the development and transformational eras in human history.

The different approaches followed and multi-arrayed lenses utilized to define the term contextually backed up the evolution of the definitions. The paper is interested in shedding light on contemporary definitions and concepts of governance as it is exercised today in general and in flood contexts.

Although, Currently, there is no unified body of governance theory, making it difficult to understand what governance theory is (Mette kjaere , 2004), The paper is interested in presenting the definitions and concepts of governance appropriate to environmental management.

Governance is defined as managing the rules of the game in order to enhance the legitimacy (efficiency) of the public realm (Mette kjaere , 2004). Rule of the game referred to here is governing principles of how system functions or how one should behave in a given situation is a key concept used in environmental aspects that basically differentiate it from the government: a concept that is built around hierarchical structures. While governance translates into the mechanisms, processes, and institutions that citizens and groups use to communicate their interests, exercise their legal rights, comply with their obligations, and resolve their differences (UN D P 2001)

The above definition edifies the power given or authority taken by a group of organized entities to undertake the management role in dealing with societal affairs. It also lacks in that the governance is the system laid out by an entity with at least three elements: economic, political, and administrative authority. Hence the citizen articulates their interest, exercise their right, and mediate their differences according to a system laid out by the entity on top which has the authority to do so. The definition seems to be a top-down governance system where solutions drafted by technocrats and citizens accept or are denied based on the already defined rights and responsibilities.

In defining the differences between government and governance, Dobson defined governance as society's self-steering rather than being steered by some hierarchically superior body (Dobson, 2009). The definition received a critique that it emphasized the citizen being receiver and steerer, failing to address the problem in a rapidly changing environment and increasing uncertainties. This could be one way of illustrating the backfall of the traditional governance system in addressing the complex dynamics and uncertain hydrological hazards the world is suffering from, and the US is particularly hit hard.

One of the critical elements of governance is to create a framework (institutional and administrative) within which strangers or people with different interests can peacefully discuss and agree to cooperate and coordinate their actions. Some form of binding arbitration is needed to break irreconcilable differences, which would ultimately reside in government and the judicial system. Barber Conable (1986-1991), President of the World Bank from 1986 to 1991, defined good governance as efficiently running public services, a trustworthy judiciary, and an administration responsible to its citizens (Tripathi, 2017). Lack of transparency,

accountability, responsiveness, and inclusivity in the governance system and overall institutional malfunction seems to have catalyzed the quest for good governance.

2.4.1 Good governance

UN-Habitat used the concept as a tool to solve urban problems through its objectivity of increased capacity of local government and other stakeholders for its agenda. Hence they defined the term from their operational experiences that good governance is “a well managed and inclusive approach” of a system (UNHSP, 2002). This entails an enabling system where nobody is left behind from discussing, negotiating, and making decisions about their social and economic matter.

According to the UN-Habitat, the operation of good governance comes from the desire to establish a standard of practice of urban governance by which one may consider the system is functioning as it reflects the context of the area (UNHSP, 2002). Hence, the organization considers Good governance as a sine qua non for human settlements and sustainable development.

The concept of Good governance could also emanate from aspiring reform in the existing institutional arrangements that are criticized for being a barrier to economic, social, and environmental development. Some of the elements of good governance are inclusiveness, accountability, participation, transparency, predictability, and responsiveness; hence it matters a great deal in all aspects of developmental outcomes and resiliency (Rogers, P. and Hall, A.W., 2003). These denote that the reverse or lack of these elements results in increased risk and compromises the societal ability to cope with uncertainties through increased vulnerability.

Social analysts have shown that there is a robust causal relationship between better governance and better development outcomes (Kaufmann et al., 1999). Similarly, Risk mitigation could be enhanced by a stable and just social order founded on clear institutional rules and effective policy that facilitates flexibility in the decision-making process and implementation of the actions. Most scholars generally agree and denote the importance of Effective governance in risk mitigation and other related developmental conditions, which otherwise can be a barrier and consequently deter the sustainable livelihood and make an already vulnerable community unable to adapt to changes.

Therefore, In order to shift from poor governance to more effective governance, structural and institutional reforms are needed. Examples include creating accountability in the use of public funds and building national capacity for better policy formulation, implementation, and enforcement mechanisms. By transforming decision-making and implementation into more inclusive processes, civil society and the private sector are expected to play clear roles with shared responsibilities on the basis of public-private partnerships. The division of labor and the sharing of responsibilities of the different actors, as well as balancing power relations, are all part of the same process, the process of defining governing systems (Rogers, P. and Hall, A.W., 2003). In the context of swift and major changes, the effectiveness of governance depends on its capacity to respond flexibly and use reversible strategies that can be adapted to new circumstances, i.e., adaptive governance (Gerrits 2011).

2.4.2 Adaptive governance

The term adaptive governance was introduced in 2003, and its use has steadily increased since then out of the necessity to cope with a new uncertain reality that needs a new approach to management. Various scholars have defined the term differently, but the conceptual foundation seems to be the same. Despite the extensive utilization of the concept to deter the risk recently across multiple disciplines, (Chaffin & Gunderson 2016, p. 83) argue that its conceptual basis remains largely under-theorized. Nonetheless, they defined the term as “an emergent self-organizing process of a social-ecological system that changes form as systems undergo periods of crises and stability” (Chaffin & Gunderson 2016, p. 83).

Adaptive governance is also defined as a governance system of using reversible strategies that can adapt to new circumstances in the context of swift and major changes and increase the capacity to respond flexibly (Eshuis and Gerrits, 2021). The specific characteristics of climate change, its complexity, ambiguity, uncertainty, and versatility have implications for crafting adaptation strategies. The challenge is to accept the dynamics and uncertainty, be prepared for unexpected feedback patterns (Folke et al. 2005), and maximize learning and experimentation opportunities.

Adaptive governance acknowledges that learning is an important aspect of dealing with uncertainty and change in complex social-ecological systems in an integrated and multidisciplinary manner (Folke et al., 2005). Two things are central to adaptive governance in this definition. One is gaining knowledge. Reflecting continuously on the steps taken and

gaining knowledge of what works and what does not work in implementing a certain strategy will help to learn to take corrective measures in dealing with hazards. As John C. Maxwell, an internationally recognized leadership expert, said, "A wise person learns from his mistake. A wiser one learns from others' mistakes. But the wisest person of all learns from others' successes" as the learning can be acquired from one's own experiment and from others' experiment. In both cases, both failures and success are key aspects to learn from and incorporate the insights to future implementation according to the above definition. For instance, in the case of flood risk governance, the Sharpsburg borough can have an opportunity to learn from its previous flood events and the subsequent disaster and shortcomings faced in governance during a response operation, preparedness plan, or post-flood construction. It can also learn from the neighboring municipality in good practices and from failures experienced. Parallel to that, what is not mentioned in most literature is the explicit forms of learning and its practicality in challenging environments and silos due to democracy and political landscape that could hamper the efforts of creating awareness or outreaching society so that they can effectively deal with their hazard. Some of the flood risk governance challenges observed In the US are the politicization of flood management, engaging the public in activities, and integrating engineering, law, and social sciences in research activities (Tullos D.,2018).

(Tullos, 2018) mentioned further that the integration of multidisciplinary stakeholders and the participation of diverse actors in the governance system is crucial in the decision-making and implementation of adaptive strategies. It also helps to organize capacity and knowledge and creates commitments to reduce uncertainty or cope with the risk. It is evident that integration can be both internal and external cooperation that is basically across administrative jurisdictions and scale and therefore imply inclusive approaches and broad participation.

As part of adaptive governance, it is also essential to emphasize the notion of adjusting participation in response to changing conditions. Because of changing objectives and circumstances, participation in a project can be restricted or widened at different stages. Participation in adaptive governance is characterized thus by the possibility of entering or leaving the arena, an element that is often overlooked but of vital importance. (Van Buuren et al., 2015).

Polycentric governance is another essential characteristic of adaptive governance in dealing with hazards. Within a hierarchical governance system, without enough redundancy, variety,

and dispersion of power, it is deemed rather difficult to deal with disturbances and unforeseen circumstances (Chaffin et al., 2014). This is because polycentric governance results in overlapping responsibilities that can contribute to the resilience of a governance system when parts of it fail (Huiteima et al., 2009).

2.5 Critiques about adaptive governance

As (Eshuis and Gerrits, 2021) stated in their study finding based on an empirical analysis of adaptive governance in the Zomerhof neighborhood case area in Rotterdam, the Netherlands, is that adaptive governance has an ability to induce an institutional-formal and informal- and material-physical infrastructure modification- changes in the case area. Despite the result it brought, they argue that adaptive governance has a limitation on bringing up the deep-rooted transformational change. Change is characterized as three-dimensional change that is deep change, wide change, and enduring change.

Nonetheless, the find recognizes that adaptive governance still has the potential power to change the lagging behavior and build the behavior that starts to act differently or take an action that is tailored to the changing environment and global warming about to ascent above 2 degrees, which can trigger flood hazard and many other related uncertainties. The impact would be compound for such a small community located at the crater of the stream and in flood plain areas.

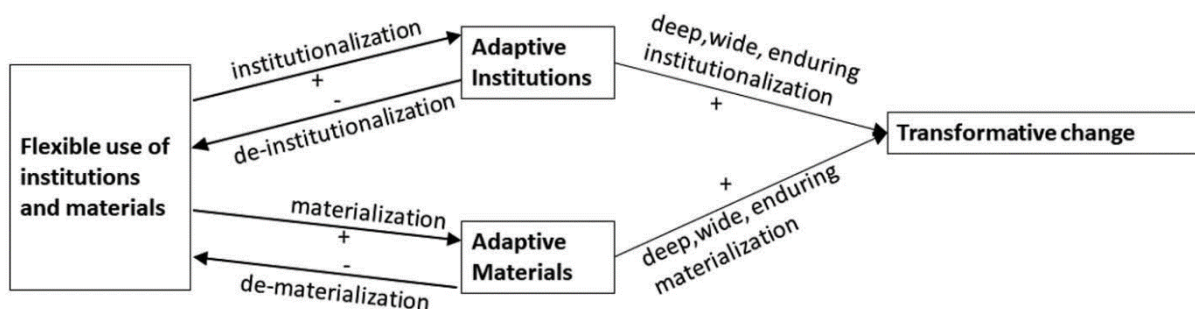


Figure 1: Conceptual Model (source: Eshuis and Gerrits, 2021)

As a remedy to the system's backfall, the figure above depicts how adaptive governance itself should be backed by a strong institutional setting that goes beyond just flexibility. The model basically shows how flexibility in decision making, scope, and organization cannot bring transformative change unless the institution formation and stabilization and material or object

formation and stabilization become adaptive. The author described the material as both physical objects such as buildings and infrastructures and paper objects such as policy, reports, maps, etc.

On the other hand, literature shows that the implementation of adaptive governance regarding the complex uncertainty has been hampered by a lack of technology, knowledge, and enabling institutions. As evident in developed countries like the US, Harding 2006 uncovered the slow implementation of adaptive environmental management despite the availability of technologies and knowledge required in most cases. Numerous scholars have identified the range of impediments, many of them related to governance. For instance, as recent research demonstrates, traditional servicing arrangements and limited capacity are among other things that hinder practitioners who are willing to embrace new practices (Brown et al., 2009)

(Jeroen R. et al., 2012) came up with a "fit to purpose" governance framework in an effort to assist in overcoming the challenges of making adaptive governance operational. The need comes from the fact that challenges of recognizing complexity and uncertainty, continuous learning, and ongoing reflection and adjustment of management approaches are not being institutionalized into planning practices. Rikje et al., (2009) argue that adaptive approaches should preferably be incorporated into the existing institutional framework to resolve and achieve the shift in the governance system.

However, according to (Jeroen R. et al., 2012), utilizing a framework that complements majorly with the existing dominant institutional arrangement is feasible if used at the starting point than introducing a new approach such as flexibility and self-organization at the beginning. Nonetheless, the authors admitted that the framework has limitations in incorporating meaningful and active participation due to its reliance entirely on stakeholders. Hence, they suggested careful design of engagement and participation to ensure meaningful and reliable assessment. The three-step framework to diagnose the fit-for purpose of governance mechanisms is presented in the paper. As illustrated in fig 2, the diagnostic framework serves as an indication of the effectiveness of ongoing action in the adaptive governance system.

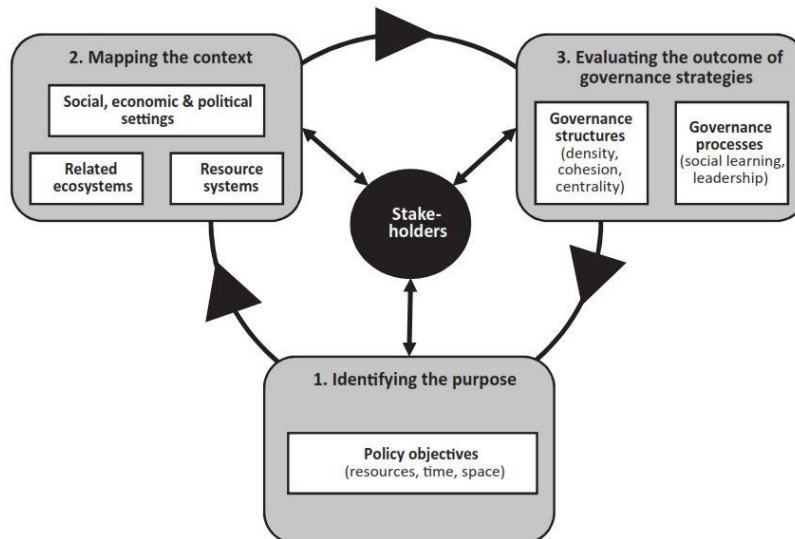


Figure 2: Three critical steps for diagnosing the fit-for-purpose of governance mechanisms: (1) identifying the purpose of governance, (2) mapping the context, and (3) evaluating the outcome of governance mechanisms. (source : (Jeroen R. et al., 2012)

2.6 Theoretical framework

Wisner B. et al. 2012 argue that disaster is a product of hazard multiplied by vulnerability. This means hazard alone cannot cause disaster. Underlying factors in the community's social, economic, political, and environmental aspects could result in its susceptibility to the disaster risk. The following figure indicates that disaster is not something we can cope with just by dealing with the hazard alone rather than addressing the problem with its entire accentuating factors that have led to the event. Therefore, we can minimize the risk by addressing all the accentuating factors. These require every individual's effort in an organized manner – a self-steering community (governance) - to address all the flood-related vulnerability issues.

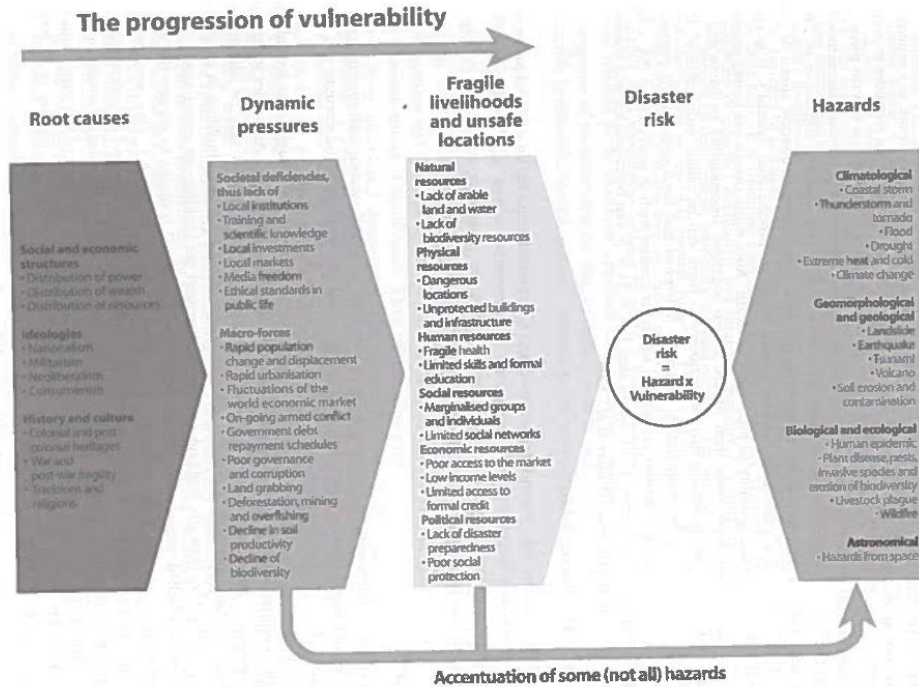


Figure 3: The progression of Vulnerability (Wisner B. et al., 2012)

Adaptive governance strategies are required in the quest for the solution to achieve better flood risk governance. Adaptive governance, in return, requires the whole-society approach where responsibilities for managing risk should be shared through vertical integration among different levels of government structures and horizontal coordination among various groups and jurisdictions.

The approach must also include those who are marginalized. In other words, flood risk management requires a kind of governance that leaves no one behind in every process toward alleviating the risk and ensuring the community's resilience. According to the world report, maintaining both vertical integration and horizontal coordination "is one of the most important and complex governance challenges that the world faces in the 21st century, particularly with the mounting threats posed by climate change".

The World Bank introduced the comprehensive framework that helps governments lead their society in addressing flood risks through the EPIC response framework. It is a mnemonic device that highlights the overarching elements of an effective hydro-climatic risk management system that helps integrate government agency programs. The framework is designed for both flood and drought risk management, considering both as two faces of the same coin. However, I focused only on the flood risk approach, although the framework has an effect beyond flood risk management.

The EPIC Response Framework

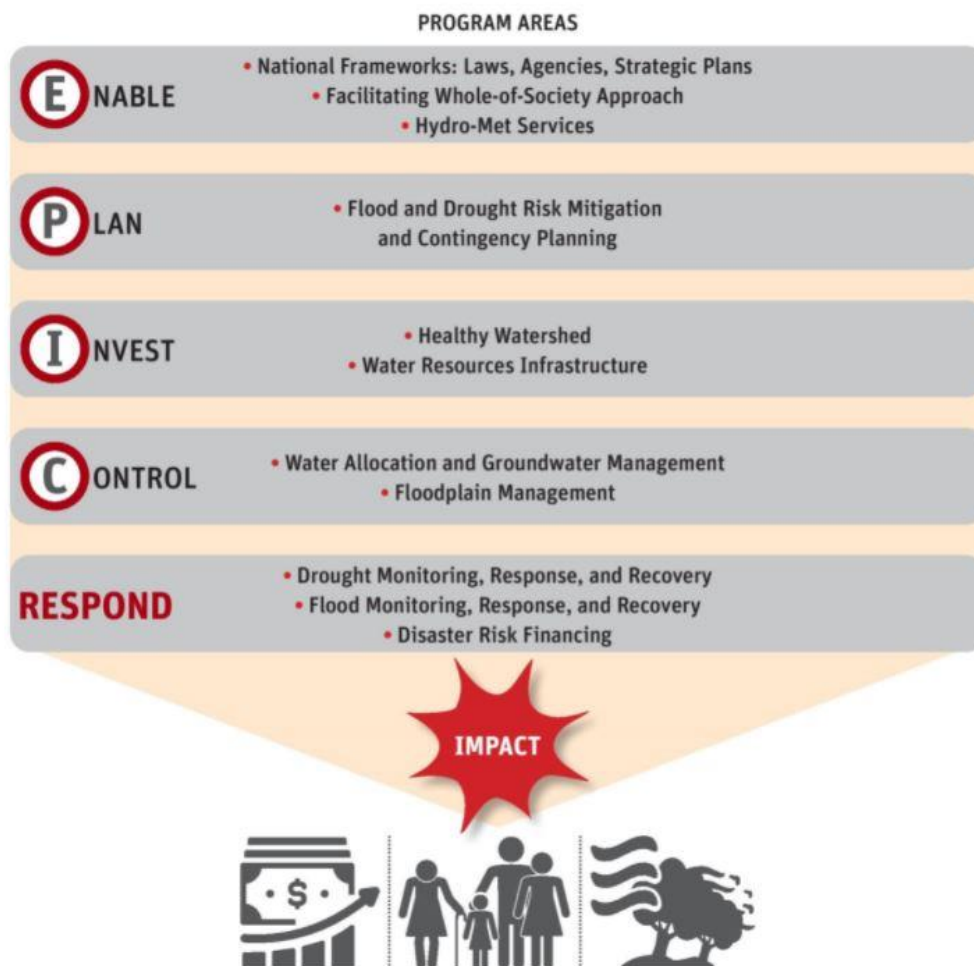


Figure 4: EPIC-response framework (source: (Browder et al., 2021))

The above figure depicts that the framework has five major elements and other program areas that could impact the economic, social, and environment of a certain geographic location. It is a comprehensive framework that is designed to solve hydro-climatic problems at the country level. However, the concept has been modified to the local level by taking the major elements and program areas relevant to the research.

The following framework is a hybrid of both concepts from the vulnerability progression framework and EPIC-response framework. The framework put the governance issue as an overarching element anchored by vertical integration and horizontal coordination to solve the flood problem through five main mechanisms that would ensure a safe living environment by decreasing the underlying vulnerability issues that could eventually cause disastrous events.

Residual floods that cannot be controlled and mitigated will be addressed through timely and efficient Responses. It also illustrates that creating an enabling environment in Sharpsburg would help invest in the effort to plan and control the adverse effects of flooding.

The federal government is responsible for major flood protective infrastructure and insurance plans, while Sharpsburg, the local government, is tasked with incorporating adaptive resilience and ensuring people's safety (Singh et al., 2021). However, there is no strict regulation from the top tier of government, nor does there need to be due to the commonwealth state characteristics. This provides maximum power to residents to decide their affairs within their jurisdiction. Also, the nascent stages of integrating flood resiliency strategies into a local government's vision plan call for adaptive governance.

In light of the city's increased vulnerability to high-intensity flooding, Sharpsburg local government must develop a long-term system and proactive preparedness by institutionalizing and realizing adaptive governance. In this way, the adapted hybrid framework of vulnerability and EPIC-response helps to set up an adaptive governance system when it comes to giving a comprehensive solution to the problem as it encompasses the qualities of both frameworks. This paper aims to use the framework to analyze the vulnerability problem in the borough so as to build an enabling and flexible system that will solve the problem from the root up and strengthen the institution to achieve community and institutional resilience.

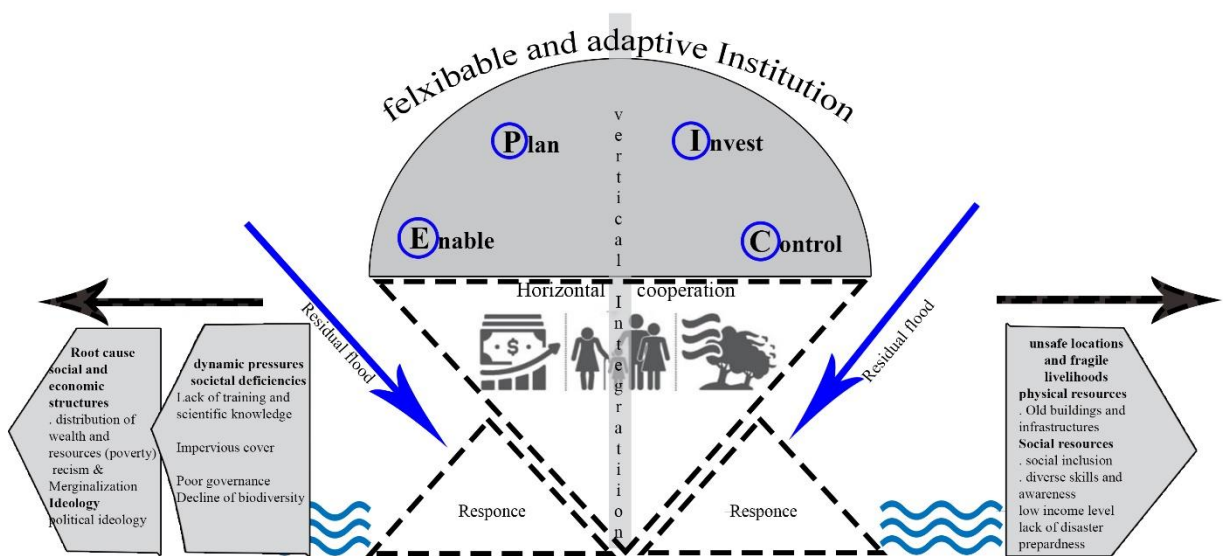


Figure 5: Modified vulnerability progression framework and EPIC- response framework (source Wisner B. et al., 2012 and Browder et al., 2021)

Chapter Three

3. Methodology

In the second semester of my MS program in Urban Ecological Planning, I took a course on contingency planning that played a huge role in conceptualizing the importance of being prepared for a rapidly changing environment as a result of human-induced factors like climate change, especially in developing countries in the Global South.

As part of my exchange program, I studied sustainability program in the United States of America in the Fall semester (August to December 2021). The program has given me the opportunity to learn about climate change and the preparedness of the people and government in the US, particularly in Pennsylvania.

On top of the water's edge course I was taking at the time, which is basically about the point where water meets the land, I became intrigued by the flood event report I saw on local television. Thus, I began investigating the area's flooding situation and the government's efforts to mitigate the flood risk. When I was conducting research, I found out that Sharpsburg, Pennsylvania, was seeking an intern who could potentially help them in preparing a program for public information (PPI). Consequently, I used the opportunity to understand the issue better and build some networks since preparing PPIs is related to flooding. It was a requirement for getting discount flood insurance from the Federal Emergency Management Agency (FEMA). After considering all this, I realized flooding has been a challenge in the commonwealth of Pennsylvania for a long time and continues to be a problem, especially in Sharpsburg. There is also concern that many small pieces of autonomous administrative neighborhoods in Allegheny county, with their decentralized governance, especially those riverine communities, are at a much higher risk for flooding.

Lack of detailed and focused research on how to govern flood risk in such a small autonomous neighborhood, Sharpsburg lacks the resources and capacity to deal with a featuring risk at them. While doing preliminary desk research, I found that efforts have been made to mitigate flooding through engineering solutions. However, the officials and academia have given little attention to the overarching sustainable solutions that would bring all parties together to work within and beyond administrative areas.

My research is based on mixed methods of analysis. I selected this method because I want to look into the quantified value of the vulnerable assets and lives and the qualitative values of impacts that the risk might cause to the community. The nature of my research question demands qualitative analysis; however, quantified analysis of the structure at risk and the number of people susceptible can help validate the analysis.

My aim in this research is to explore the existing flood governance challenges in the neighborhood along with efforts the local government is undertaking in order to avert the adverse impact the hazard might cause to the community. Additionally, the paper looks into the flood governance strategies the local government has been implementing and the relationship across the hierarchy concerning government bodies and the enabling environment of the existing institution in engaging all stakeholders.

The research has rooted into the UEP paradigm in studying the interaction of society with their environment in making the place, thereby ensuring their resilience and sustainability. Hence, elements of UEP or value positions in urban planning will be utilized in the data collection and analysis. The rapidly changing environment and the need for collective actions make the applicability of the UEP approach evident in the US. However, "... it is important to note that we do not see UEP as a panacea for all urban problems and replacement for traditional planning methods, but rather a supplement and redirection that addresses the shortcomings of "business as usual."(Sliwa et al., 2018).

Due to the already established relationship with the Sharpsburg Neighborhood Organization (SNO), I started my analysis with the government officials where I interviewed officials, including the county emergency management coordinator. I decided to do triangulation methods to validate my findings where Perspectives from government officials, neighborhood residents, and voluntary non-government organizations (VNGO) will be analyzed before concluding the paper with a recommendation. The findings would imply how concerned they are about the hazard and the state of each entity to cooperate in the mitigation plan, which will ultimately help set up adaptive flood governance in the locality.

3.1. Case study method

“The distinctive need for case study method arises from understanding complex social phenomena. It allows an investigator to retain the holistic and meaningful characteristics of real-life events-such as group behavior and organizational and managerial processes.” (Yin, 2009)

This paper seeks to understand the complex phenomenon of flood governance in the Sharpsburgh borough in order to investigate the challenges of flood governance in the borough and the vulnerability issue that aggravates flooding. As a result of the involvement of different entities (residents, civil society actors, and government officials) in the governance of environmental aspects, this study seems to be complex in nature. Hence, To get the full picture of the problem and diagnose it, it is necessary to triangulate the source of data and conduct multiple data collection methods.

Furthermore, “The choice of the method largely depends on the type of questions. The more that your questions seek to explain some present circumstance (e.g., “how” or “why” some social phenomenon works), the more that the case study method would be relevant.” (Yin, 2009). Hence, as Rober K., Y. (2009) describes, the research questions I have (see chapter one), along with the fact stated above, make the case study method more relevant to collecting and analyzing data using the unit of analysis which in this case is the Sharpsburgh flood management authority.

My data collection methods are based on the information I need concerning the topic. Four factors shaped my approach to data collection. One is the sensitivity of my topic due to the politically sensitive environment and polarized community and administrative officials, for which I have to get permission from the gatekeeper, SNO. The COVID 19 coupled with the festive season, I could not make direct contact with the community to conduct a physical interview. Finally, I had to leave the area due to a visa expiry. Hence, I categorized my data collection methods into time bounded and the possibility to conduct considering the above factors. Kothari, (2004) is referring to Dr. A.L. Bowley's remark on the appropriateness of using common sense when researching a similar problem. He said, "in the collection of statistical data, common sense is the chief requisite and experience the chief teacher." (Kothari, 2004).

Accordingly, data collected during fieldwork and data collected virtually are the two categories resulting from the factors discussed above. Data collected during fieldwork are observation and interviews, While virtually collected data is an online survey, interview, and secondary data from different government and non-governmental organizations' websites. In this category, I spent about a month. The following figure summarizes the research method timeline.

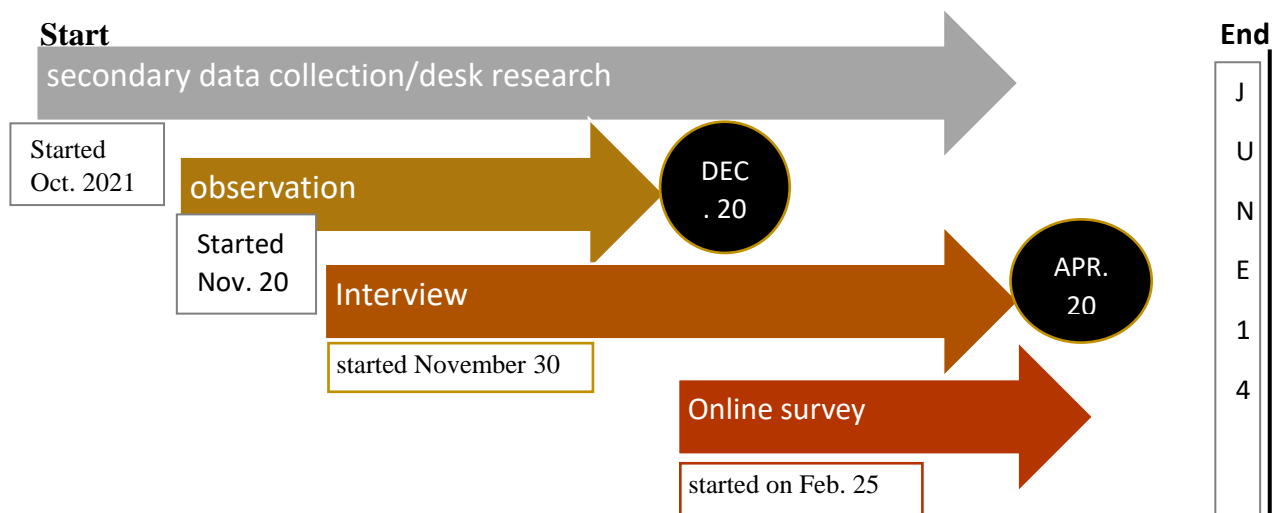


Figure 6: Research methods timeline (source: author's own work)

With the research topic in such a fragmented county, it is not practical and possible for me to conduct the research on all those autonomous administrative units within the county with limited time, financial and other constraints. So the need to study the governance system in-depth in a selected focus area guided me to use the case study methods. Due to the similarity of the administrative system and with minimal differences in approaching flood risk mitigation, a deep study in one case study area can, to some extent, substitute, and the solutions can be applied to other similar areas within the same geographic and socio-economic correspondence within the county and beyond. In this regard, the residents of the Sharpsburg and the local government are under the I put more emphasis on finding out the local government's perspectives in perceiving the vulnerability of the people and the preparedness plan they have on the table.

3.2. Data

As summarized in the following table, the overall data is categorized into primary and secondary data. In secondary data, desk research is what the research initiated to understand the overall issue regarding natural hazards and helps narrow the lenses toward the overarching

factor that the researcher finds out – risk governance. Moreover, the need for investigation is also informed by the desk research. Then the primary data is collected to validate issue relevance and further proceed with digging out information simultaneously

Table 1: Table: data types and sources (source: author’s own work)

Data	Data type	Source	Number of Interviewee and respondents
Primary data	Observation	From the fieldwork by the researcher	
	Interview	VOAD	4
		Civil society actors	2
		Government officials	2
	Academician	3	
Survey	Residents and	89	
	The borough elected officials	8	
Secondary data	Articles, Journals, News, Newspaper, e-Books	Google scholars, Google, NTNU's library (Oria)	
	Maps	Flood factors.com	
	Flood management policy	Sharpsburg borough official website (e-coding)	
	The municipality's emergency operation plan (EOP)	Allegheny county official websites	
	The county Hazard Mitigation Plan (HMP)	Allegheny county official websites	

3.3. Observation

however, human beings naturally observe things, and observation should serve a formulated research purpose, is systematically planned and recorded. Validity and reliability should also be controlled and checked in order for it to become a scientific tool and the method of data collection for the researcher. (Kothari, 2004)

During fieldwork, I used an existing transportation means to do an investigation in a large area and walk through the neighborhood that can be accessible on foot. Chatham University Shuttle runs on a road called Route 8 to transport students between Shadyside campus and Eden hall campus. Since Sharpsburg is surrounded by roads that shuttles use when running back and forth, it gave me a quick observation of the whole neighborhood from different angles and the surrounding elements that could have been difficult to access on foot. Additionally, these gave me a chance to look deep into the area and understand the geolocation of the neighborhood and flood gateway point to the borough.

Data were collected and recorded during observation through photographing where I feel safe to do so and otherwise take notes. This method was chosen because it enables me to accurately observe the current status quo of the neighborhood, which could be regarded as flood accentuation factors such as the estimated ratio of impervious cover and old structures versus new development. The other advantage is that this method does not require getting consent from people, unlike in interview and survey questioners.

3.4. Stakeholder mapping

Many scholars define stakeholders differently. However, one of those scholars defined the term stakeholder in the following way: "Any person, group, or organization that can place a claim on the organization's attention, resources or output, or is affected by that output" (Bryson, 1995 as cited in Bryson 2004).

Stakeholder mapping is one of the methods used to identify the relevant stakeholders to engage in the project. Identifying stakeholders is crucial to having a plan that involves all and making sure the project recognizes the stakeholders' concern for a better outcome because, as Jane Jacob (1961, p.238) described, "The cities have the capability of providing something for everybody, only because, and only when, everybody creates them." Likewise, Stakeholder identification and involvement are recognized in both flood risk governance research and praxis (Ziga-Abortta et al., 2021).

Hence, after assessing the relevant stakeholders in the area based on the interest and the power each stakeholder has in the project, I categorized all the stakeholders into four major categories. They are Government, Non-government, Residents, and Civil society actors. Thus, the

involvement of these entities will help identify flood risk issues and foster consensus to enable efficient preparedness planning by reducing problems. The method also helps identify whom I should reach to collect data.

3.5. Interview

An interview is an art governed by scientific principles in which it is imperative to establish a friendly environment of trust and confidence with respondents, ask unbiased and accurate questions, and record findings in a complete and accurate manner (Kothari, 2004).

Interview has been conducted in two phases. Categorization is based on the need to understand the issue's relevance in the area first, which will allow me whom I should talk to and what aspects I should consider before diving into preparing an interview guide for the stakeholders of the project. Additionally, whether sufficient research has been conducted on flood governance to alleviate the flood risk in the area and the need for it now has also been discussed. Besides mapping the interview guide and understanding the need, the limited time I have on fieldwork influenced me to spend my time understanding the general aspect of my research topics and facilitating conditions- building a network- for the next phase of online interviews with stakeholders. In the first phase, My interviewee were scholars- a Chatham university professor who has expertise in governance and ecology and with some government officials. A focused interview is utilized in the first phase with a focus on attention on the given expertise and experiences of the interviewee.

As stated in the methodology book of CR Kothari, focused interviews are generally used to develop hypotheses and constitute a significant type of unstructured interview where the main task of the interviewer is to confine the respondent to a discussion of issues with which the researcher seeks conversance (Kothari, 2004). Hence, I used a few structured interviews that are fundamental to my research topics and the majority of unstructured questions that were prompted during the interview.

The second phase of the interview was commenced online through developed networks. This time, separate interview questionnaires were prepared for the project stakeholders. I used key informant techniques where important persons from mapped stakeholders were interviewed. Accordingly, a representative from the three categories of project stakeholders: government officials, municipality residents, and Non-government organizations was chosen to share their experiences and insights. However, due to the overlapping representation of some of the

interviewees who are either both government officials and residents of the neighborhood or non-government organization members and resident at the same time, the resident's views will be Analysed through those types of people.

The key informant interview was conducted through an online zoom interview with the representative of selected participants- government officials and Voluntary organizations active in disaster (VOAD). Based on the snowballing of the sample frame, the participation request accompanied by the consent form emailed to them. In both interview types, an in-depth structured interview is conducted to collect qualitative data from the three entities of my sample frame. The interview's main intention is to get the respondents' perspectives on flooding risk mitigation. Accordingly, 11 stakeholders were interviewed in the first and second phases.

3.6. Online survey

My alternative data collection method utilized an online survey to reach out to as many stakeholders as possible. Especially Sharpsburg residents' flood experiences, their vulnerability issues, and overall perspectives of existing flood governance challenges in the borough and their recommendations are surveyed through an online survey. This data collection method was the only way out to get the residents involved when there is a gatekeeper to reach out to the larger community and other officials due to limited time on site to get known by the people in the action area and the bascence of trust built. Nonetheless, government officials who were not interested in participating in the interview for different reasons are also participated in the online survey. Thus two different online survey questioners were prepared. The questionnaires are prepared in such a way to get an insight into the need for flood preparedness in the borough, the participants' perspective about the challenges of flood governance in the borough, and their recommendation that they think could alleviate challenges and realizes the resilience capacity of the borough.

Advantages of the online survey are listed as follows by Kothari (2004)

- 1) It is free from the bias of the interviewer; answers are in respondents' own words.
- 2) Respondents have adequate time to give well-thought-out answers.
- 3) Respondents, who are not easily approachable, can also be reached conveniently.
- 4) Large samples can be made use of, and thus the results can be made more dependable and reliable

Considerable time has been spent on preparing the survey questions. During questionnaire preparation, the essentials of a good questionnaire, as described by CR Kothari, were applied, such as keeping the question short and straightforward and the minimum questionnaire size. This was to deter the possibility of participants' hesitation from filling out or early drop-outs from the survey. Besides, ambiguous terms were avoided so that the survey should not require knowledge in the field to increase the participant's possibility to cooperate. Finally, before sending out the survey to participants, the questionnaires had to be reviewed by SNO, and the survey form was posted on the community Facebook group by the gatekeeper-SNO.

3.7. Data Analysis

"Data analysis involves transforming and interpreting data in order to capture the complexities of the social world we seek to understand" (Pole and Hillyard, 2016). After concluding most of my data collection processes, first, I started organizing the data and transcribing all recorded interviews. Then the organized and transcribed data are analyzed according to the selected theoretical framework while checking the research questions are being answered in the process.

Also, to increase data validity and reliability, the triangulation was executed while analyzing the data collected for this purpose (i.e., a survey with Sharpsburg neighborhood residents and the borough officials). Based on my research questions, the first research question will be answered in the analysis and empirical data presentation chapter, while the second research question will be answered in the Recommendation chapter.

3.8. Research limitations

As with any other research, my research also has its own limitations. Although limitations are known as a systematic bias that a researcher cannot control, I had expectations at the beginning that the following limitations may arise, and I was trying to take corrective measures so that the result would be as reliable and valid as possible.

Access

As mentioned at the beginning of this chapter, I decided to do an online survey to reach out to access the Sharpsburg community's social group on Facebook was not possible for me. This was because the group is close to outsiders except for residents of the borough. This has limited me to reach out to the community personally and the chance to initiate those who, for some reason, could not fill the online survey link attached to the group on my behalf.

Time gap

Time was one of the limiting factors to being able to spend more time on fieldwork. In the beginning, I planned that about a month and 15 days would have been sufficient for fieldwork to collect data. Although I started desk research earlier, physical interviews with residents could not happen for two reasons. One, the covid-19 restrictions and fear of contracting the virus made people to be hesitant to hold a physical meeting with a stranger- the researcher. Two, since my fieldwork was between the end of November and December, the people were rather busy with the festive time, making it difficult to hold up on people. Had These factors been fixed through giving more time after the new year, more people would have participated in the interview. However, the result would remain the same anyways.

3.9. Ethical Dilemmas

I got the email address of the borough officials from the borough website. Since the email was public, it was easy for me to send out the survey link to each elected council member and other government officials, along with the statement of consent and the purpose of their participation. At first, Only a few among the recipients filled out the survey. People I considered to have more information regarding the issue due to their longtime service in the borough and who were in charge of the position during previous flood events and response operations could not get back to me in time. Resending the survey link again to ask them to fill out the questionnaire seems like forcing them to participate in the research even though the questionnaire says participation is voluntary.

The organization, the SNO, with which I initially cooperated in doing research, became a gatekeeper. I proposed doing an interview and distributing the questionnaire physically at the beginning of December 2021. However, the SNO was skeptical about the idea of me contacting the residents to collect data during that festive season, saying that it was not the right time to use their time or event as an opportunity to collect data. The questionnaire had to be reviewed by the organization even when I decided to do an online survey later. Even though the organization deems itself as a non-governmental and non-profit, the organization is directed by borough high government officials. This makes the organization to be a disguised organization in the name of a non-government or community-owned organization.

Due to the later learned fact that the organization is led by a government official, telling people that I collaborated with SNO could have limited the residents' interest to some extent in taking in the survey or limited them to express their thoughts regarding the issue genuinely.

Chapter Four

4. Context of the Research

4.1. Context of the case

This section highlights the case study area geographic context, flood vulnerability issues, socio-economic and existing institutional structures, and brief about policy and regulation that govern flood governing efforts at the local level. In this way, this section elucidates the susceptibility of the communities living in the area and better understands the current flood management challenges in Sharpsburg.

The section will lay foundational background and facilitate the work towards laying down a more effective flood risk governance framework. It will also examine the efforts of public and private stakeholders in Sharpsburg Borough contributed to flooding risk governance and management in three flood management durations- pre-flood, during a flood, and post-flood. With that framework, the paper points out the way forwards for a flood preparedness plan for the community through adaptive flood risk governance where all stakeholders work collaboratively toward the common goal- a flood resilient community.

4.1.1. Sharpsburg

Sharpsburg is one of 130 municipalities in Allegheny County, Pennsylvania State, USA. The Borough is found five miles (eight kilometers) northeast of Pittsburgh, along the Allegheny River. It has about 3446 residents on less than one square mile land area that is composed of 3 districts (*Sharpsburg Borough, Pennsylvania, n,d*). Sharpsburg has four land borders, including Etna to the west, Shaler Township to the northwest, Aspinwall to the east, O'Hara Township to the north and southeast, and. To its south, across the Allegheny River via the 62nd Street Bridge, the Borough is bordered by the Pittsburgh neighborhoods of Upper Lawrenceville and Morningside. The following figure shows the location of the Sharpsburg neighborhood.

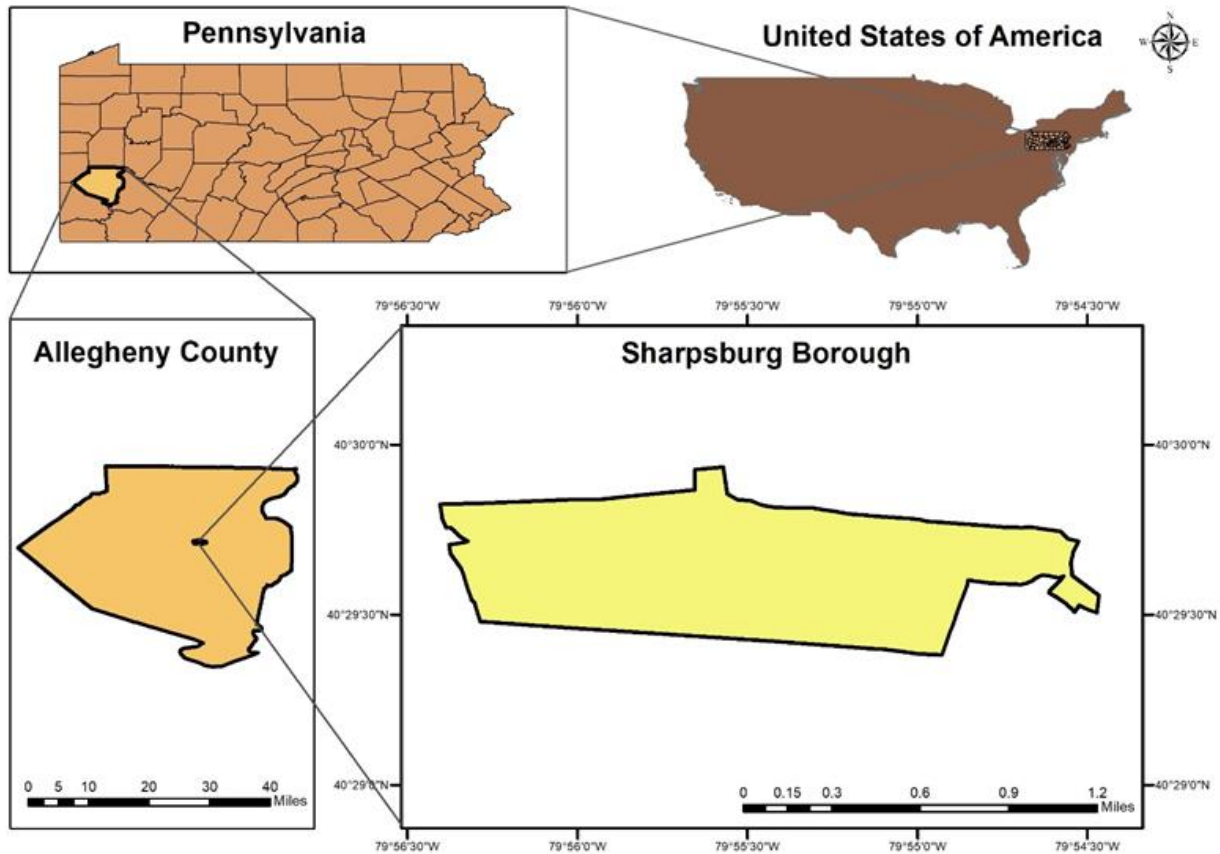


Figure 7: Location map of Sharpsburg borough (source: author)

Demographic context

The US census shows that the Sharpsburg population is 3358, of which the majority gender is Male, and the age population is in the range of 18 to 64. The data shows a significant population decline in just two years between 2017 and 2019, from 3414 to 3358. This is perhaps because most people are renters, 59.2% in 2017 (*Sharpsburg Community Vision Plan, 2019*). The residents' median household income is \$36 360, with an employment rate of 52.5%, where the majority are private company employees and hardly any self-employed. According to the data, Overall income in the Borough is about 35% less when compared to the neighboring municipality (see Table 2 for detail).

Based on my observation, most of the municipality's landscape is covered by impervious covers asphalt. Existing built-up characteristics indicate 50% single-family residential, 29% commercial, 14% industrial, and 9% institutional buildings. Only 8% of the Borough is vacant (*Sharpsburg Community Vision Plan, 2019*). The neighborhood has many public amenities such as public parks, a library, educational institutions, and religious institutions. A railroad

track passes through the neighborhood along the Allegheny river buffering the neighborhood from the river. A boating association also gives boat services for tourists and residents.

4.1.2. Terrain and its impact

Although the terrain of Pennsylvania is mountainous and owing to the scale and size of the Sharpsburg borough, the Borough is situated at a low-laying terrain at the bottom of the mountain situated in Ohara municipality. As a result, the municipality frequently experienced a flood draining down the mountain to the very gently flattened landscape. The figure below depicts how the natural terrain impacts the municipality in addition to its long stretches along the Allegheny River and creeks that run through the Borough. The valley of the mountains shows the flooding gateway to the neighborhood.

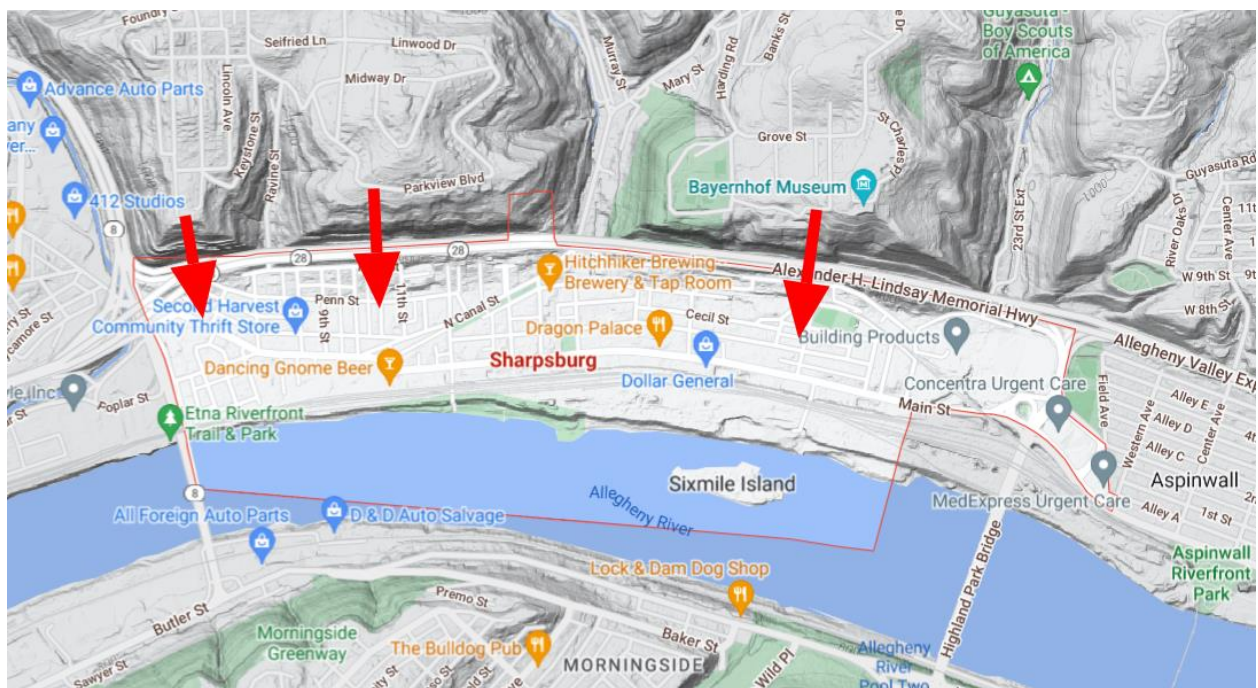


Figure 8 Sharpsburg Borough topography (source: Sharpsburg terrain, 2022)

4.1.3. Previous flood events and challenges

An event of flooding is a temporary condition of partial or complete inundation of two to large acres of normally dry land or two or more properties caused by an overflow of inland or unusually rapid accumulation of surface water from any source. Fluvial flooding, coastal flooding, and shallow flooding are the three main types of flooding (Flood, 2020).

As well, the Natural Resources of Defence council defines a flood as an accumulation of water over the normally dry ground due to inland waters (such as rivers or streams), tides, or irregular accumulation of water from heavy rains, dam breaches, or levee breaches (Denchak, 2019).

Sharpsburg has been hit by floods several times that claimed people's lives and destroyed a building and public infrastructures. It imposed a severe economic impact and disrupted social activities.

Before Flood control measures, On 16 March 1936, an additional two inches of rain fell on top of the 63 inches of snow that had fallen throughout the winter. Warm temperatures along the Allegheny River led to swollen creek beds. These caused the river level to rise on 17 March, reaching 46 feet at the point. This caused it to flood more than half of downtown businesses. Several towns in western Pennsylvania were affected, including Johnstown, Sharpsburg, and Etna, where the damage and destruction were almost unimaginable - 62 people dead, many injured, and millions of dollars in property damage to homes, businesses, and industries. Sharpsburg was the hardest hit area in western Pennsylvania. (Brady S, 2017).



Figure 9: Lower Millvale flooding on March 18, 1936 (source: Brady S, 2017)

The US Army Corps of Engineers began building the Allegheny river lock and dam No2, which is also known as Highland park lock and dam, to improve navigation along the Allegheny River. The concrete weir or wall dam across the river keeps the river channel upriver of the project deep enough for navigation and was opened on 2 October 1934. Although many think that locks and dams can contribute to controlling floods, the USACE indicated the project could not provide any control over flood water because water that flows over this type of dam cannot be controlled locally (USACE,1993)



Figure 10: USACE lock and dam 2 Allegheny river next to Sharpsburg borough (USACE,1993)

Hurricane Agnes, that was happened on June 23, 1972, was among the most destructive storms in Pennsylvania history. One of the areas hardest hit by the remnants of Hurricane Agnes was again Sharpsburg. Hurricane Agnes was not a terribly powerful storm when it hit the Florida coast. However, as it made its way up toward Pennsylvania, slow and heavy rains caused flooding and millions of dollars in damages. Sharpsburg residents witnessed the situation back in the day, saying that the flood was devastating due to the creek and river overflowing. Everybody got hit hard. Everybody was living in Sharpsburg, and people's houses were filled with water. Agnes killed 122 people in its path and caused flooding damage across the state and region, eventually leading to major disaster area declarations in Florida, Virginia,

Maryland, Pennsylvania, and New York by the Then-President Richard Nixon (Deanna G,2012).

Rains from a massive storm, remnants of Hurricane Ivan that was happened on 18 September 2004, forced people to evacuate and trapped them in their homes, schools, and cars because rivers and creeks had flooded. The rising rivers caused havoc with some marinas, particularly those along the Allegheny River. Sharpsburg was all but inaccessible as water covered Main Street and prevented access from the east, west, and north. Etna and Sharpsburg were closed to outsiders as emergency workers removed tons of dirt, sand, tree limbs, and other debris.

Among many Agencies involved in emergency response, Red Cross, and Emergency medical service, Pittsburgh's port authority bus transportation service played a crucial role in assisting the operation. School, recreation center, and other facilities located on higher ground were used as a temporary shelter. Some of Sharpsburg's neighboring boroughs declared a dusk to dawn curfew in response to the disaster. By taking advantage of the chaos created in certain neighborhoods, looting has also taken place (Pittsburgh post-gazette, 2004).



Figure 11: Sharpsburg flooding on September 18, 2004 (source: Sharpsburg flooding, 2004)



Figure 12: During and after flooding in front of Sharpsburg voluntary fire department building on July 3, 2018 (Source: Sharpsburg voluntary fire department, 2018)

Floodwaters swept through Sharpsburg on Monday night, July 3, 2018, filling homes and businesses. Pittsburgh-affiliated television station WPXI reported that flooding water levels reached as high as five feet. This is also the worst flooding the community has experienced since Hurricane Ivan in 2004. Multiple creeks flooded during that early evening. In that event, the Voluntary Organizations Active in Disaster (VOAD), including from the county and eventually from Western PA, came to help. Crews from the Pennsylvania Department of Transportation (Penn DOT), Etna, Millvale, and Shaler helped clean up Sharpsburg. Mud-covered roads were cleaned with a special machine from Penn DOT (Roads caked with mud after flooding, 2018).

Sharpsburg again struck with drenching rain on July 4, 2019, almost within a year gap. Most of the water was run off the hills from the adjacent Borough-O'Hara Township. The water was running fast and high in a creek called Sites Run, which goes through Sharpsburg and empties into the Allegheny River (Heavy Rains in Sharpsburg-Millvale Causes Some Flooding and Debris, 2019).

4.1.4. Future flood risk in Sharpsburg

According to flood factor analysis, this city has a greater overall flood risk than 99% of cities across the commonwealth. Most of all property types, including the vacant space and properties with unknown land use, have a significant risk of being severely affected by a flood over the following years to come. This means that about 96% of properties found in the municipality

are at risk. Neighboring municipalities such as Etna, aspen wall, and Millville also have extreme flood risks.

In addition to the damage to properties, flood risks are expected to disrupt access to utilities, emergency services, and transportation and may impact the overall economic well-being of the area. It can also be impeding day-to-day life within the community.

The following figure shows an overall flood risk map that Sharpsburg has over the next 30 years. The overall flood risk is mapped based on the risk of 5 categories: properties, businesses, roads, infrastructure, and social. Each metric is graded on a six-point scale, and the combined score is used to calculate the overall risk over 30 years to account for the changing climate. Approximately, a 20% chance of some amount of water reaching the buildings up 3 feet (1m) this year alone.

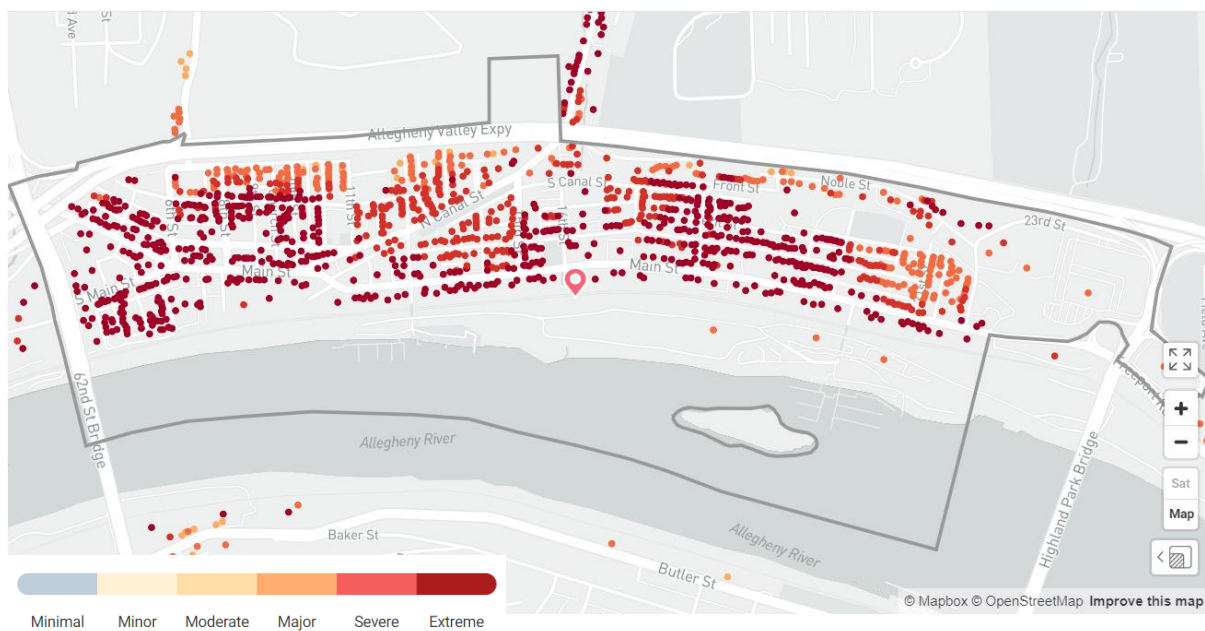


Figure 13: Overall flood risk in Sharpsburg borough (Sharpsburg, Pennsylvania, no date)

According to the Allegheny county Hazard Mitigation Plan document, flood hazard risk deemed as high in the county-wide ranking of hazards has a risk factor of 3.3. This makes floods the highest risky hazard in the county. However, Sharpsburg borough has a more significant flood risk than the one indicated as high in the county-wide ranking of hazards, which makes the Borough the second most vulnerable municipality in the county, with an asset value of more than \$520 million exposed to flooding (Allegheny county 2020 hazard mitigation plan update, 2020).

4.1.5. Policy and institutional context

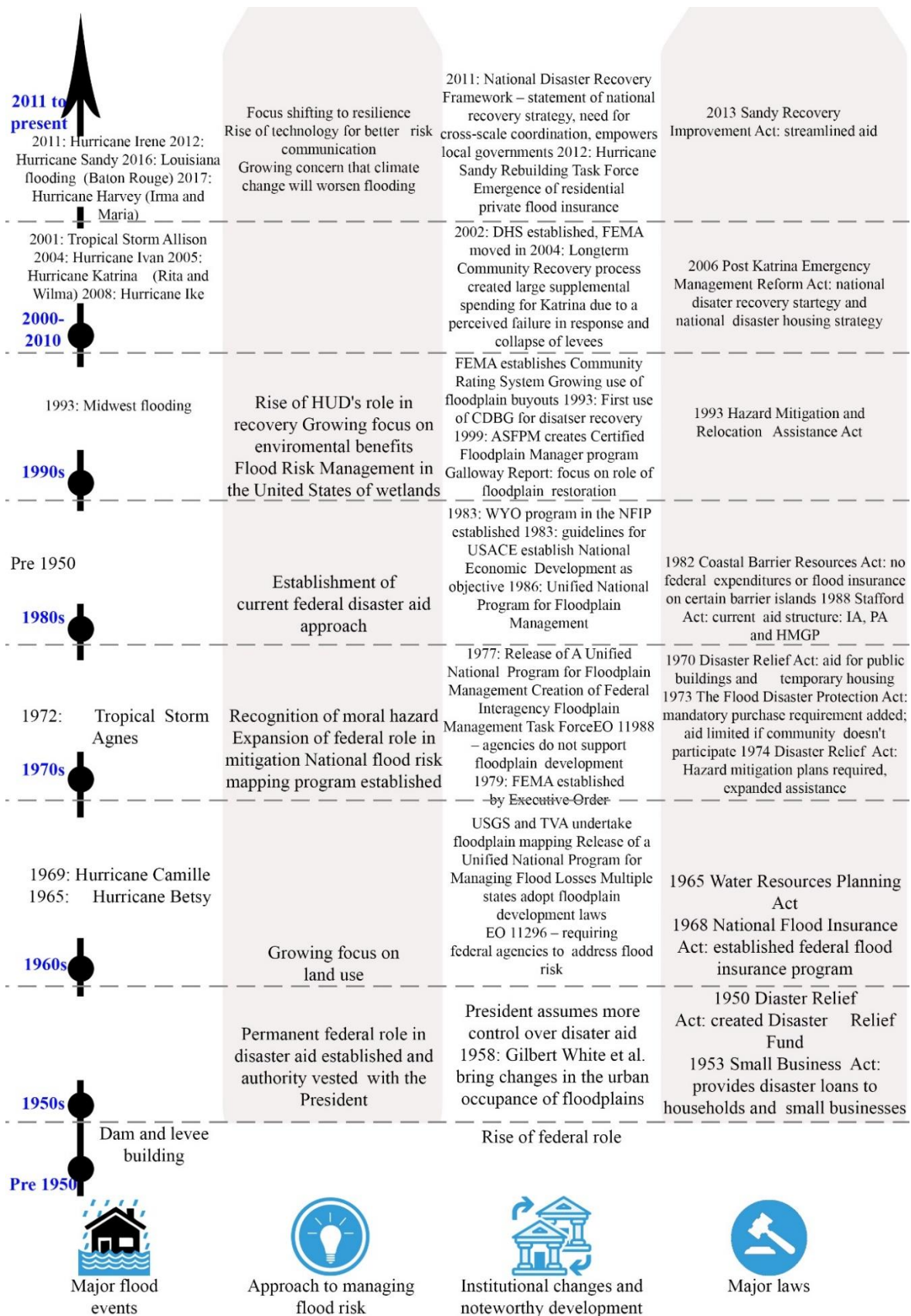


Figure 14: Flood risk management in the United States: Pre-1950 to 2019 (Source: Kousky, C. and Golnaraghi, M., 2020)

The above figure shows that US flood risk management has been developing with its historical devastating and disastrous flood events. It seems that the lesson learned and challenges faced in response to those events led to significant changes in institutional changes that can better deal with issues and laws that limit harmful activities and increase the institution's ability to respond to disasters and rebuild afterward. For instance, from pre-1950 up until the 1960s, the flood management approach in the US was a defensive mechanism. From 1960 to 2010, the country focused more on response to flood hazards and post-flood recovery aid, along with an inconsistent focus on land use. With more disastrous hurricane events and future concerns that climate change will worsen flooding and the rise of technology for better risk communications, the management approach has shifted to resilience to withstand the uncertain flood events in the future. With these, different institutions and policies have been developing along with these developments.

Flood Risk governance in the US follows the management system where responsibilities are shared among multiple federal agencies, state, county, and local governments, the private sector, and non-government organizations. Multiple federal agencies and states provide risk reduction and prevention grants, where over 90% of federal dollars are appropriated in off-budget supplemental legislation tied to a particular disaster, with much less appropriated pre-disaster. However, there are many areas at risk of flooding where the risk is not actively addressed. Despite the developments highlighted in the above figure, the FRM system in the U.S. remains, in general, a reactive response to floods, highlighting the need for a more cohesive system-based forward-looking approach that includes the impacts of climate change (Kousky, C. and Golnaraghi, M., 2020)

The Stafford Act of 1988 governs Federal involvement in disaster recovery and reconstruction after a flood. When the expected disaster recovery costs are greater than the fiscal capacity of state and local governments, the President can authorize federal assistance programs. The FEMA, Small Business Administration, Department of Housing and Urban Development, and Internal Revenue Service provide different types of assistance. The Geneva association documents, however, indicate that the federal government offers limited post-disaster aid to flood-affected households, which hampers their financial recovery (Kousky, C. and Golnaraghi, M., 2020).

4.1.6. Government structure

Like many other municipalities within the county, Sharpsburg has an autonomous local governance structure comprising seven elected council members who represent the Borough. They always meet on the first Thursday of every month to discuss agenda items, pass resolutions, share committee items, and hear from its residents. Each council member is the chair of each department, as illustrated in the hierarchy diagram below. While the mayor of the Borough is responsible for the overall activity of the Borough, the council president is the chair of the council meeting and the official signatory of all borough documents. The president is appointed as an executive officer of all committees.

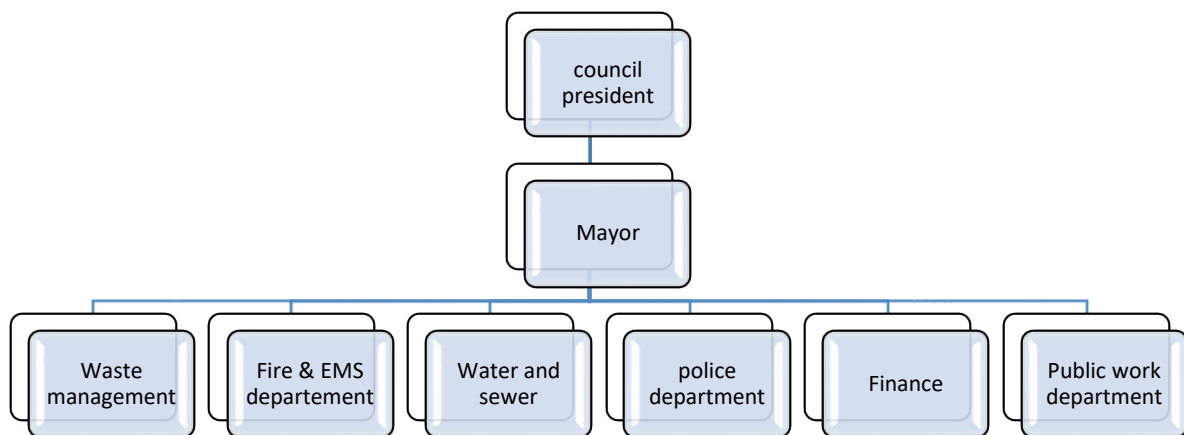


Figure 15: Local government hierarchy (Source: Retrieved from Sharpsburg borough websites)

The elected council hires a manager who serves as the local government's chief executive. The manager oversees all borough staff. The borough auditor is also appointed by the council each year, the borough engineer, vacancy board. For transparency purposes, Citizens are welcome to attend the council meeting to comment on the agenda items only, and the citizen involvement during COVID 19 pandemic was virtual where the Borough live streams the meeting via zoom.

Flood management authority

Since Pennsylvania is a commonwealth state, flood management is handled at the most local level. The municipality has an accessible and searchable code which was adopted in 2014 by

the borough council. According to this searchable municipality code, article 8 sub-article 101 states the statutory authorization of flood plain management as follow.

" According to The Pennsylvania Flood Plain Management Act of 1978, the Legislature of the Commonwealth of Pennsylvania has delegated to local governmental units the responsibility of adopting floodplain management regulations to promote safety and the general welfare of its residents. " (Municipal code, 2014)

Emergency management in Pennsylvania begins at the municipal level, with every municipality in the commonwealth having a designated coordinator chosen by the jurisdiction's elected officials. As a result, the emergency management coordinator of the Borough of Sharpsburg has a role in developing plans, providing training, and coordinating all available resources in the community before and after a disaster. The emergency management coordinator represents the Borough at the county level and serves as a bridge between the county and the Borough.

Within Allegheny County, administrative and technical capability varies widely between the municipalities mainly due to population size and resources. Even neighboring municipalities may exhibit extreme variations in technical capability.

On the other hand, Allegheny County's seven Council of Governments (COGs), which is an important administrative and technical capability available to member municipalities, are authorized in Pennsylvania under the first Intergovernmental Cooperation Act of 1972. Generally, it is a voluntary coalition that acts as a forum for addressing regional challenges and improving intergovernmental cooperation. The COG collects and analyzes data, develops codes, applies for grants, provides technical assistance, helps with procurement, manages blight, and manages Community Development Block Grants. Sharpsburg is a member of North Hills COG with nineteen other Boroughs and townships. They coordinated on various services, such as the administration of developmental block grants (Allegheny county HMP, 2020). The hierarchy in requesting assistance should a disaster occur follows the steps illustrated in the following diagram.

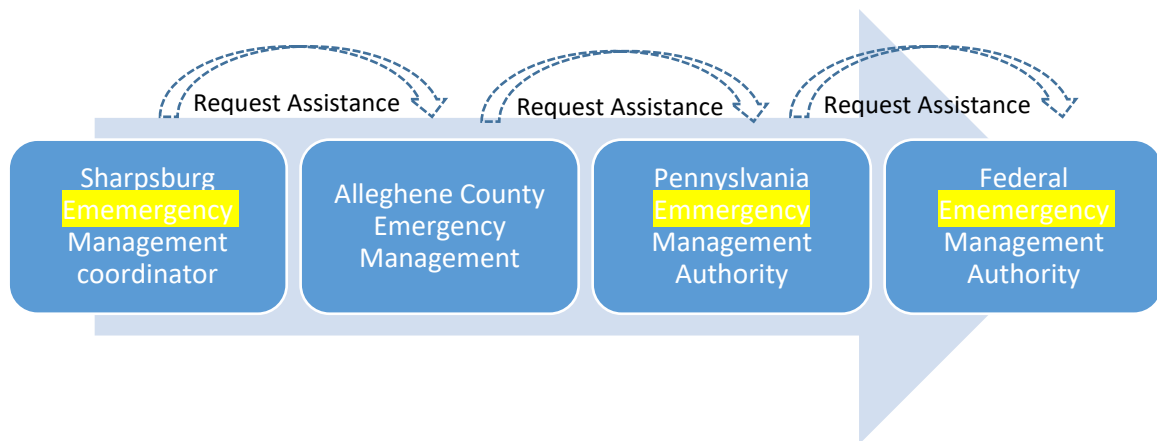


Figure 16: Existing flood management institutional hierarchy (Source: Author)

Like many others, the Borough follows a reactive flood management strategy. This strategy is mainly to react to flood events after they occur to save the lives and livelihoods of the community.

Besides formal government structures, a non-profit community organization works to improve residents' quality of life. It was founded in 2014 as an association of residents and community stakeholders interested. The organization aims to improve the community's quality of life through a volunteer project based on four priority guiding-Engage residents, promoting equitable property ownership and development, strengthening connections between the community and nature, and promoting community-oriented economic development. To execute all these works, the organization partners with various organizations and funds its operation, program grants, and funding from non-profitable organizations and other private institutions. (*About Us*, no date)

Sharpsburg Borough is working to become eligible for the National Flood Insurance Program's Community Rating System. This is because it has been experiencing floods and other related issues. During heavy rain events, Sharpsburg is impacted by overflow from creeks and sewer backups. The impact on the structure, which is assessed at a market value of over \$ 116 million, and people living in the flood plain are at a greater risk. If a 100-year flood plain were to occur, these property owners would suffer a loss of over \$ 28 million. Hence every property that falls within FEMA flood hazard zone must hold flood insurance, and insurance costs have been experiencing a rise due to frequent heavy rainfall events, which is one area of concern for many low-income homeowners in Sharpsburg.

Thus, the Community Rating System (CRS) that the Borough has been developing, which I participated in as an intern, is designed to provide property owners with discounted flood insurance premiums based on their flood mitigation and preparedness activities.

Also, the Borough has made an effort to extend its cooperation across Allegheny county through various flood management initiatives. Some of them are the river Bend Comprehensive Plan and Tri boro eco-district collaboration- Etna, Millvale, and Sharpsburg.

Sharpsburg community vision plan

The Sharpsburg neighborhood organization has come up with a community vision plan in 2019 that will guide development in the neighborhood and shape their future for the next 5 to 10 years (*Sharpsburg Community Vision Plan*, 2019). One of the developmental principles set out in the plan is aligning with Triboro Ecodistrict to boost environmental performance. Triboro Eco district is an effort to promote coordinated, sustainable community development throughout the Borough of Millville, Etna, and Sharpsburg. They got a grant of \$ 2.3 million to work together on six areas of development: Mobility, air quality, energy independence, water management, and food affordability.

Sharpsburg identified water as both an asset and liability that enables them to generate and maximize revenue by facilitating access to the Allegheny River. The document indicates cooperation with riverfront communities to decrease vulnerability by reconnecting hydrological networks. It also shows that drainage pipe enhancement is underway to decrease the amount of water entering the sewer system during heavy precipitation.

Policy and program recommendations for 2026, as stated in the documents, are as follows:

- 1) It is developing policies for new development, including parking lots that require a certain quantity of green infrastructure.
- 2) Develop a stormwater ambassadors program in which residents help their neighbors install rain barrels and learn about stormwater management techniques to reduce vulnerability to flooding.
- 3) Advocate for upstream improvements to reduce Sharpsburg's vulnerability to flooding.

To minimize long-term risks to life and property from all forms of hazards and creating successive benefits over time, the Allegheny county prepared a Hazard mitigation plan for all its 130 municipalities by involving representatives from all municipalities. The mitigation plan steering committee, hazard mitigation planning team, government leaders and other elected

officials. The plan update takes place every five years where the previous plan reviewed and re-prioritize hazards in terms of frequency and severity.

Every municipality in Allegheny County adopts the county hazard mitigation plan that they participated in. according to the document, Sharpsburg borough has an ongoing project on the flood and flash flood through a mitigation action of additional flood proofing of municipal facilities and conducting stream restoration to reduce flooding (HMP, 2020).

The municipality is also undertaking the action of reducing the possibility of damage and loss of function to community-identified critical facilities in the flood plain. FEMA/PEMA funds this project. The project will commence as the funds become available.

Although there is no official maintenance plan for the complex, the local plan seems to have priority weaknesses where root-up management should have been applied to land-use change and a green approach instead of physical structure maintenance or at the very least simultaneously, given the budget constraints.

The annual budget of the Borough compared with its neighboring boroughs

Financial capability is important to the implementation of hazard mitigation activities. Although there are many financial aids from the federal government to help state and local governments improve their street, water, and sewer facilities and hazard mitigation activities, local governments are experiencing financial incapability to undertake effective preparedness activities.

Table 2: The annual borough budget compared to the neighboring boroughs and total allocated budget for environmental protection (source: Sharpsburg borough Annual budget, undated , Millvale Borough 2021 Budget, undated, and Borough of Etna 2021 budget, Undated)

Fiscal year	Borough name	Total Revenue	Highest % of revenue sector	Expense	Highest expense % sector	Total budget for emergency management &
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						preparedness
2021	Sharpsburg borough	\$ 2,568,808.85	real estate taxes & intergovernmental revenue	\$ 2,568,808.85	public safety police	\$ 2000
2021	Etna	\$ 4,852,997	Sewage usage fee and environmental service	\$ 4,852,997	Miscellaneous	\$ 42500
2021	Millville	3,017,583	Real state and property taxes	3,017,583	public safety police	46,000+500

The federal government's policy changed significantly during the early 1980s, as deficits increased and political philosophy was introduced that encouraged states and local governments to raise revenues for capital programs, which led to the need for alternative funding sources (Allegheny County Hazard Mitigation Plan Update, 2020). As depicted in the table above, the Sharpsburg borough has less budget compared to the neighboring boroughs. This has to do with facilities and the number of residents contributing to more income as property tax is the highest revenue generation sector. Due to limited income, the Borough allocated a small amount of money for emergency management. However, like other municipalities, the Sharpsburg borough covers environmental management and other developmental projects through various grants and donations from government and non-government institutions.

The Pandemic, COVID 19, and flood management

A fair amount of papers have been written on managing flood hazards in the context of multiple hazard contexts- flood management during the COVID-19 pandemic. Multiple hazards that

occur at the same time have been researched to be hampering the management process by dividing the attention and resources. For example, a situation where two potentially serious emergency events were happening at once posed a nightmare scenario for emergency managers, such as evacuation and social distancing when responding to an emergency (Simonovic, F.2021). The flood governance system may function in an "unknown unknown" scenario in the future and should thus be factored into the governance system. Luckily, Sharpsburg had a lower infection rate, and major flooding has not occurred since 2018, a year before Corona's outbreak. However, as a solution for such a scenario, Turay, B., (2022) suggested that institutions should create non-structural enabling environments for managing combined hazards.

Chapter five

5. Case presentation and analysis

I have Analysed the governance structure in three phases: preparedness phase, during a flood, and post-flood event. I will analyze how the governance system function in these three phases.

The paper discusses the municipality's flood preparation, response, and reconstruction efforts undertaken by the government, civil society actors (VOAD), residents, and the existing institutional capability to accomplish those activities. Also, this chapter presents the vulnerability issue in the borough under each phase based on the framework presented in chapter two. A brief discussion regarding what constitutes vulnerability in the Sharpsburg borough, such as the root causes, dynamic pressures, and fragile and unsafe livelihoods pertinent to the neighborhood, is examined. These will illuminate disaster amplification factors in the municipality and their impacts on flood management efforts, including social disparities in the region as well as the impact of politics in shifting attention away from proactive flood management. As a result, the paper illustrates the need for adaptive flood governance approaches in the Sharpsburg borough in the context of the rapidly changing environment.

5.1. Preparedness plan before a flood event

Preparation at a local level is vital in managing and mitigating flooding. Considering what can be done within all three phases and analyzing flood governance, this section discusses the preparedness level of the borough: the local government, Civil society actors (VOAD), and the community. Moreover, the vulnerability issues that could influence the governance system are considered in this section.

In addition to direct impact, flood disasters can trigger secondary disasters that cause damage and destruction. For instance, when the flood disrupts the electric supply, all services run by electric power will be unfunctional, including the household appliances. Again, the tertiary disaster effects such as increment in insurance may follow. These show that flooding can have a cascading effect on almost all services for which the actual impact is oblivious and somewhat overlooked by people.

As the depth of water inundation increases, the inevitable volume increment will significantly impact people, especially since impromptu preparedness is very unlikely at that time. For example, during the night of June 3, 2018 flooding in the Borough (see chapter four), one of the neighborhood residents told the local media saying, “we looked up to the sky, and we said

‘Lord! Please, stop the rain’. That is all we could do. We could not do anything else” (Roads caked with mud after flooding, 2018).

Although the extent of flooding was not as severe as that of 2004 Hurricane Ivan (see chapter four), the municipality could not respond to the event where the neighboring municipality came in for help (Roads caked with mud after flooding, 2018). Hence, preparedness ahead of a flood event is the only way to cope with uncertain flooding events.

5.1.1. Vulnerability issue

Among various definitions given to Vulnerability, Kelman (2016) refers to it as "the propensity to be harmed by hazard".

In this case, the community’s degree to be harmed by hazard could be accentuated by the physical environment in which one lives, social ecology, and political ecology. Those vulnerability factors could also cause a disparity of impact among people and the recovery period of an individual. These show the entanglements of the flood hazard governance with other related issues.

As already discussed in chapter two, a hazard alone cannot cause disaster or disrupt social processes. Being vulnerable to a hazard or experiencing the hazard alone could not significantly impact the individual or community if there are no other social, economic, political, and environmental factors that can accentuate and transform the impact to the other level are resolved. These mean the ability to deal with the hazard and other underlying accentuation factors: root causes, dynamic pressure, unsafe location, and fragile livelihood, as discussed in chapter two, are key elements to consider in the governance system to mitigate the propensity to flooding in the neighborhood.

On the other hand, “Environmental and population characteristics are system-resistance factors related to population vulnerability level” (Du, Y. et al., 2015). Based on the survey conducted by the researcher, several root causes of vulnerability, including social factors, physical factors, and political ideology in the municipality, are mandatory to address and be considered in the governance system; Because flooding can impact those vulnerable people more. For example, a low-income resident of Sharpsburg who lives in a flood-prone area and is marginalized in any way and any form has at least three layers of vulnerability, which will make the individual more vulnerable to the hazards than the others.

According to the survey, some homeowners with houses in flood plains who consider their homes to be at high risk are unable to obtain flood insurance due to its affordability. So, considering the vulnerability factors in governance is essential and will play a significant role in community resilience to flooding.

The following are some of the vulnerabilities identified and should be considered during the preparedness phase and within the borough based on the collected primary and secondary data.

5.1.2. Political ideology

Each state has an independent government, and the commonwealth type of government gives the authority to the lowest level of municipality. Local leaders and local people have control over their respective neighborhood affairs. However, since most outside resources that come into a community are accessed through political processes, the nature of the political environment could influence the disaster preparedness situation. The process of requesting, justifying, and acquiring emergency preparedness resources is one of the most “political” of all disaster actions (Selves, M. 2003)

When we look into the political leaning of people in Sharpsburg borough and its immediate surrounding, as illustrated in figure 17 below, the majority of people voted for a democrat in the borough of Sharpsburg, Aspinwall, and Etna, while the O’Hara township vote was generally split between the two parties. The 2020 election shows that the majority of people voted for Democrats at both county and state levels, while in the previous 2016 election, Pennsylvania voted for Republicans (Politics & Voting, n,d)



Figure 17: Political map of Sharpsburg and its immediate surrounding. The darker blue shows most votes for the Democrat party while the lighter shade shows the split between parties (source: Sharpsburg, PA Political Map, n.d)

The flooding issue was one of the political campaign agendas of the borough. When the democrat nominee for the 2021 election (the current mayor) asked about the biggest issue she planned to address if she would win, addressing the flooding issue was one of the priorities.

The electoral vote in the borough may show less tension between the local government and state regarding the priority of environmental policy. However, the political affiliation change in the future may cause tension regarding what local priorities are and what the state gives resources for.

In addition to hurdles during disaster actions, Political affiliation may determine what policies get prioritized and what kind of things got chosen. That could dictate the relationship between the tiers of government.

Although the majority vote was for a democrat in the borough of Sharpsburg, some people may have voted for Republicans. Even if 10% of the borough residents voted for the party that undermines environmental actions, it would impact the governance system and the whole community approach. As an anecdotal example, the first day I visited the Sharpsburg borough, I met with a lady, a Sharpsburg resident, and discussed the flood issue, the residents' awareness, and if there was anything the individual residents were doing to mitigate flooding. She said, "When you reach out to the people, do consider the language you should use because the people

may not be interested in talking to you anymore, or you might face another issue." (R1, December 5, 2021). Then I asked what those languages could be and if she could give me some examples to be aware. She said," sustainability, Climate-change etc.". These are the words that the then-president of the US used on media to disparage the environmental policy of the US in response to the pro-Paris agreement counterpart- democrats.

Although the agreement was reinstated immediately after the administration of Joe Biden took office in February 2021, the deep fragmentation of political ideology among the US citizens and the two sides' divergence, especially regarding environmental policy, could lead to citizens' negligence of their vulnerability to the flooding and obstruct their interest in taking part in the management processes. It could further hinder the collective efforts at a local level.

According to the survey conducted in 2020, the perceptions of whether and how much climate change is affecting local communities in America are closely tied with political party affiliation. In the following diagram, about 83% of democrats and democrat leaning say climate change is affecting their locality at a great deal or at least some, while republicans and lean republican said there is no effect (Kennedy, B, 2020)

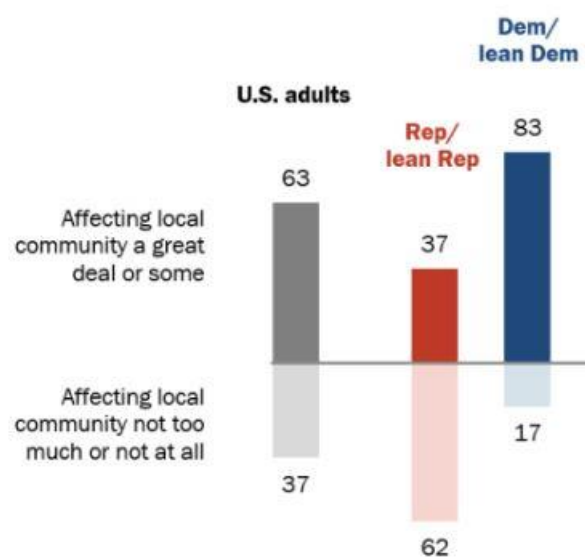


Figure: partisan divide in views of climate change's impact on own community (source: (Kennedy, B, 2020))

The fragmented political ideology on hazard mitigation has a long history that has rarely been discussed in the US. To mention another example, back in 1906, when a massive earthquake shocked California, There “was significant conflict regarding response and recovery issues

attributable to this political reality where the national administration was Republican, and the city of San Francisco was Democrat” (Selves, M. 2003).

Overall, a mere politically motivated decision while millions of Americans are at risk of the outcome of climate change, the decision at the national level can have a cascading impact on flood management activities and influence the work toward the overarching problem. No matter what party one votes for or think should be president of the United States, Sincere collaboration and not politicizing the natural hazard should be a middle term where everybody should come to for the sake of the safety of the residents and a better living environment for all.

Dynamic pressures

5.1.3. Societal lack of awareness and training.

A hazard in itself will not cause disaster unless the vulnerability is significant and the ability to cope is limited (Sanderson, D. 2019). In the survey conducted in Sharpsburg borough, I asked a question about how concerned the citizens and the government are and whether they are aware of the hazard and their vulnerability to it. As shown in the following figure, the survey result shows that borough officials are concerned about flooding and potential vulnerability.

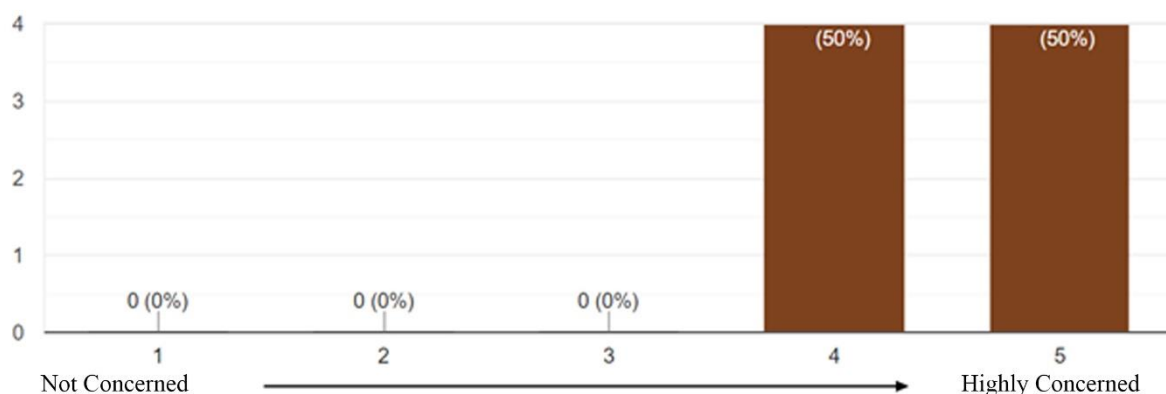


Figure 18: Local government officials' level of concern about flooding in Sharpsburg borough (source: Survey conducted by the researcher 23 February- 15 April 2022)

As it can be seen in the figure, The slightly differentiated concerns where half of the surveyed officials are less concerned than the others could have emanated from the different perceptions regarding the impact it could cause or the shift of concern to other pressing problems in the

borough. Furthermore, in the survey, four officials surveyed said the borough is somewhat prepared, while others said averagely prepared. On the contrary, some of the officials surveyed mentioned that they do not even know whether the borough preparedness plan is written down, while others suggested accessibility of the plan to other officials and to a larger population. This shows the data accessibility problem and lack of awareness of the municipal plan in the borough, which indicates that things are left only to EMC and that its plan is not transparent.

“We need our flooding plan to be accessible via the borough website and physical copies of it at the office. I do not know if the plan is written down. It may just be understood by emergency services and faith-based organizations. If we had a public written plan and checklist, that would help along with a notification system.” (V 3, 18 April 2022).

The borough does not have a preparedness dashboard, nor does the SNO. The reason behind this is that the lack of a preparedness plan for the community might arise from two aspects. One, small but basic proactive preparedness plans have been neglected in favor of large projects carried out with state or federal funds. This might come from the second reason: the absence of a flood emergency management institution or committee that could develop its own exhaustive preparedness plan at all levels. The top-down approach to mitigation strategy is preferred over a bottom-up continuum.

"I believe there needs to be a committee made up of various individuals. This group needs to meet and have a definite plan in place, with individuals, each knowing what their role would be should we get major flooding. That way, each person knows what their specific tasks are and where they need to be. Our emergency management coordinator has the book saying what should be done, but come to a disaster, I do not think we truly are prepared" (V4, 27 April 2022).

Hence, 87.5% of the respondents think that the borough has a plan in place in case a flood event happens tomorrow, while the rest believe that the borough has not prepared yet for the looming flood event. What is meant by the emergency preparedness plan here is the emergency operation plan, which is discussed under the response phase.

These show the inconsistency of awareness regarding the preparedness plan among the respondents and, more importantly, the lack of awareness among the local government officials except for a few. This further shows the lack of communication among the local government on and the lack of a flood governance structure that works attentively on preparing the community for an uncertain future event. This might come from overly relying on the upper-

level government assistance during an emergency which could lead to overlooking the importance of equipping everybody with the knowledge about the preparedness plan.

In terms of preparing the community for a better flood disaster, the government officials – almost all of the borough council members who participated in the survey unanimously agreed on the need to be prepared as soon as possible. This can be considered a good gesture of readiness and reveals the need for more work in this regard.

On the other hand, no data shows formal residents' flood awareness and training sessions, particularly for flooding in the borough by the government at least in recent years. When the borough residents are asked about their preparedness in handling flooding, 40% of the respondents do not feel prepared if there was a flood tomorrow. As indicated in the following diagram (see figure 19), even those who said they had a plan did not feel prepared. That might arise from a lack of confidence in their plan, which could have been taken from their own personal knowledge and the fact that many educated people live in the borough. The respondent's length of residence in the neighborhood and whether they are renters or landlords may also affect their preparedness knowledge. Because past flood experience and their exposure to awareness or training programs might initiate preparedness.

Looking at the gender variation of the respondents, 60 % (59) are male while 40% (39) are female, and the duration of residence in the borough of all respondents is more than five years. These signify that despite the long residency duration and previous flood experience of at least two times in the past five years (see chapter four for detail), more male (15) feels prepared than female (5). The result shows gender-focused awareness and education gap, which should be reformed as female has a role of caregiving for children and elders, their vulnerability would be high and could leave them behind in preparedness for flooding. This can also be substantiated by example from the 2005 Katrina disaster, where about 80% of people left behind in New Orleans after a mandatory evacuation was female (CDP, n.d).

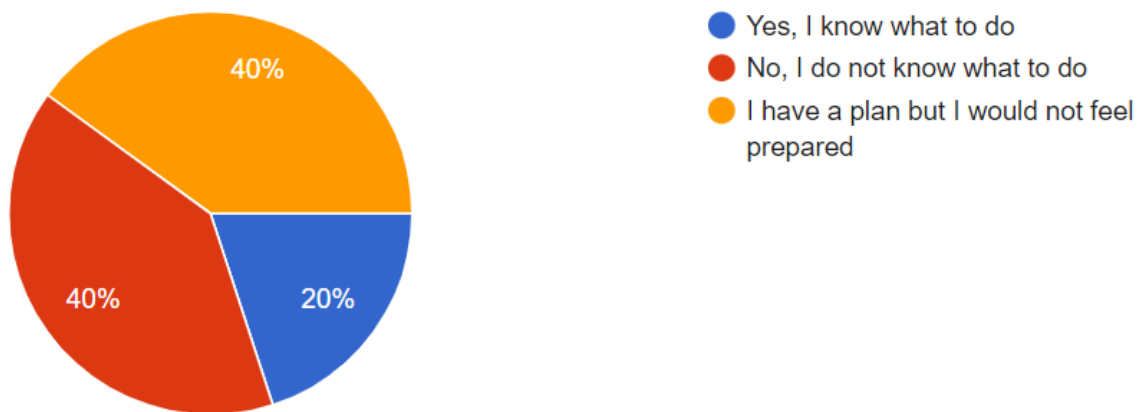


Figure 19: Residents' flood preparedness (source: source: Survey conducted by the researcher 23 February- 15 April 2022)

Therefore, it can be extrapolated that the 20% who feel prepared could be the residents that have gained some awareness regarding the flooding through intermittent training sessions done by local organizations active in disaster- for example, Roots of Faith. That was possible because Roots of Faith has a resource that can provide various services to the community through its outreach center.

The residents suggested the borough should have flood abatement, sewer maintenance, and timely and precise communication to help mitigate and recover from flood events. Is having a plan in place make the borough prepared? Well, as long as the plan is drafted and acquainted with the residents and other stakeholders and habituated by the borough, the plan remains on the table and cannot bring the benefit it is meant for. Especially , the residents of the borough and beyond should be aware of the plan and get adapt to the changing situations on the ground.

In terms of the residents' willingness and readiness to do their part and keenness to cooperate with the local government, the survey result shows that they are highly interested. For example, Flash flood, a frequent type of flooding in the borough, is created mainly by overwhelmed or clogged drains. Hence, in the survey, most respondents were committed to reporting clogged street drains and not littering. They are also keen to know the prevention methods and what to do, including preparedness at home and doing their part.

5.1.4. Rapid Urbanization & poor governance

Historically, Sharpsburg was an industrial town manufacturing iron, brick, and glass; thousands of people moved to the area to take advantage of the job opportunities offered by its proximity to the railroad. As a result of this. The existing built-up structure was for as much as nearly threefold of the current population (*About Us*, n,d). The field observation result shows that the neighborhood's built-up structure comprises many old industrial, commercial, and residential buildings. Again, the state-owned highways which surround the borough: Route 28 in the north, William Flinn Highway in the west, and Highland Park Bridge in the east, as well as the demarcated geographical boundary, seem to have resulted in a reasonably dense neighborhood, compared to the neighboring boroughs-Etna and O'Hara.

The prevalent reliance on the automobile (private cars) at the national and borough level further increased the impervious cover development in the neighborhood, hampering the already dire situation of flooding in the area. When a heavy storm falls, a high percentage of hardscape cannot absorb the water, and the runoff could accumulate and cause damage. This impervious cover in the upstream borough can significantly impact the downstream boroughs. In this regard, there are underperformances in managing the impervious cover in the borough and poor urban development governance. The following picture shows the neighborhood's less vegetation and a large proportion of impervious cover (soft scape).

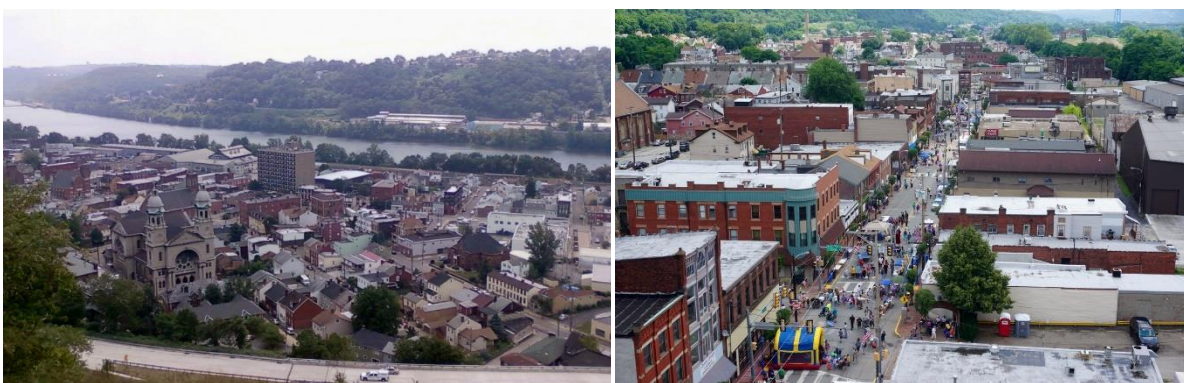


Figure 20: partial areal view of the Sharpsburg borough.(source: SWFC,u.d)

The borough has recently produced a community vision plan (see chapter four for details) to increase mobility and explore land-use change alongside the six areas of development: equity, food, water, energy, air quality, and mobility (*Sharpsburg Community Vision Plan*, 2019). Increasing the green spaces by decreasing the hardscape and infill development is one of the land-use initiatives the Borough plans to execute in the future. All in all, the borough governing body made limited efforts to enforce the land-use change to increase infiltration and mitigate

flooding a natural way. The local government is expected to offer contextualized solutions and implement strategic and contingent actions through robust formal and informal engagement processes. It is a good indication that all the respondents are convinced that adaptive flood governance: a process that incorporates interactions among the administrative, social and geographical levels, is essential to dealing with flood hazards at this point. This magnifies the importance of collaboration among government structures.

Concerning the physical structure located in the flood plain and along the creeks, the following figure 21 depicts the small hydrology line that crosses the neighborhood. Not only are the structures along these lines vulnerable, but the property value could decrease, and the property insurance may increase. For instance, If someone is going to buy or build a house, the real-estate developer would look to a GIS map to identify if the property is located in a minor or significant flood plain. They would also review the topography to approve the purchase or permit. That dictates the property insurance and how much the insurance will go up. The survey result also shows that some of the respondents who own a house consider their property to be located along the creeks. Despite all this, The local government does not have a plan to engage with those people more and increase their capacity to cope with possible future hazard.

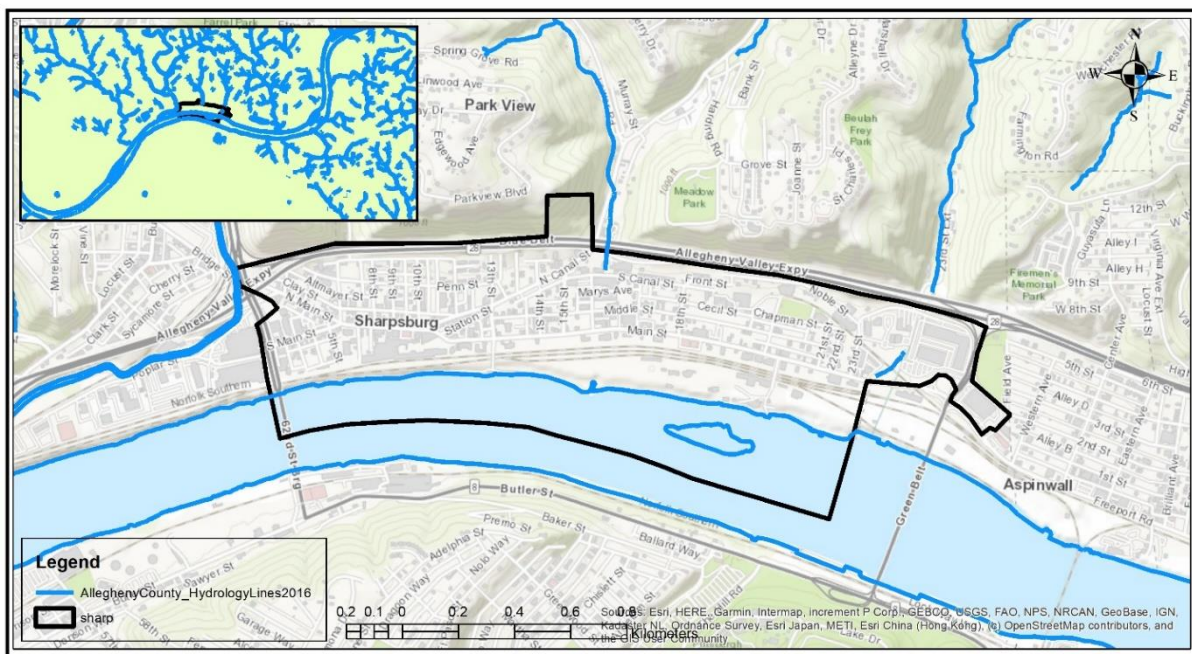


Figure 21: hydrology line in Sharpsburg and its surrounding (source: Author)

In analyzing preparation actions to preserve public amenities and infrastructure, what can be observed from both primary and secondary data is that preventive measures (structural or

engineering solutions) received more attention than robust natural solutions-green infrastructure. As a Federal agency, the US Army Corps of Engineers (USACE) has the capacity to oversee the management of all the rivers, dams, levees, and other flood prevention structures (Billington, D et al. 2005). The construction of even small structures and retrofitting of existing infrastructure to prevent potential flooding requires substantial financial capacity. However, it is crucial to cooperate with federal agencies and the upper government level and maintain regular communication to increase capacity because they could have a lot of resources.

In addition, The coast guard monitors the safety of the river. Also, the county helps out with one of the preparedness staff like a GIS map and topographical analysis of where the low flood areas are (low flood plain) in collaboration with other agencies who do the modeling, such as the National Ocean and Atmospheric Administration (NOAA), FEMA, and USACE. All of these can be considered as a resource for the borough to incorporate into its own plan and continuously update the content whenever necessary; however, we can understand from research that the relationship of the borough flood management with those entities is very limited, and the Lack of active cooperation is reflected.

SNO has introduced a new riverfront development project to revitalize the community to solve various development needs and increase the borough's revenue through welcoming business and recreational opportunities in the neighborhood.

According to the project development team, this project will be implemented on 60 acres and 1.5 miles of former industrial shoreline along the Allegheny River, as shown in figure 22 below. The purple dotted line illustrates a project site that stretched up to the O'Hara township and Aspinwall borough eastward, while The yellow arrow is the connection of existing green spaces with the preserved one and further expansion link to the Aspinwall borough. However, the connection to downtown is not yet incorporated.

The project development team said that “the project is unique in its kind (in terms of integration and mixed-use)” (SNO, 2022). The project site shown in figure 22 is located in a flood plain area designated by Federal Emergency Management Authority (FEMA) and further on the shore of the Allegney river. which could further worsen the risk and vulnerability and the special attention the area needs in flood governance.

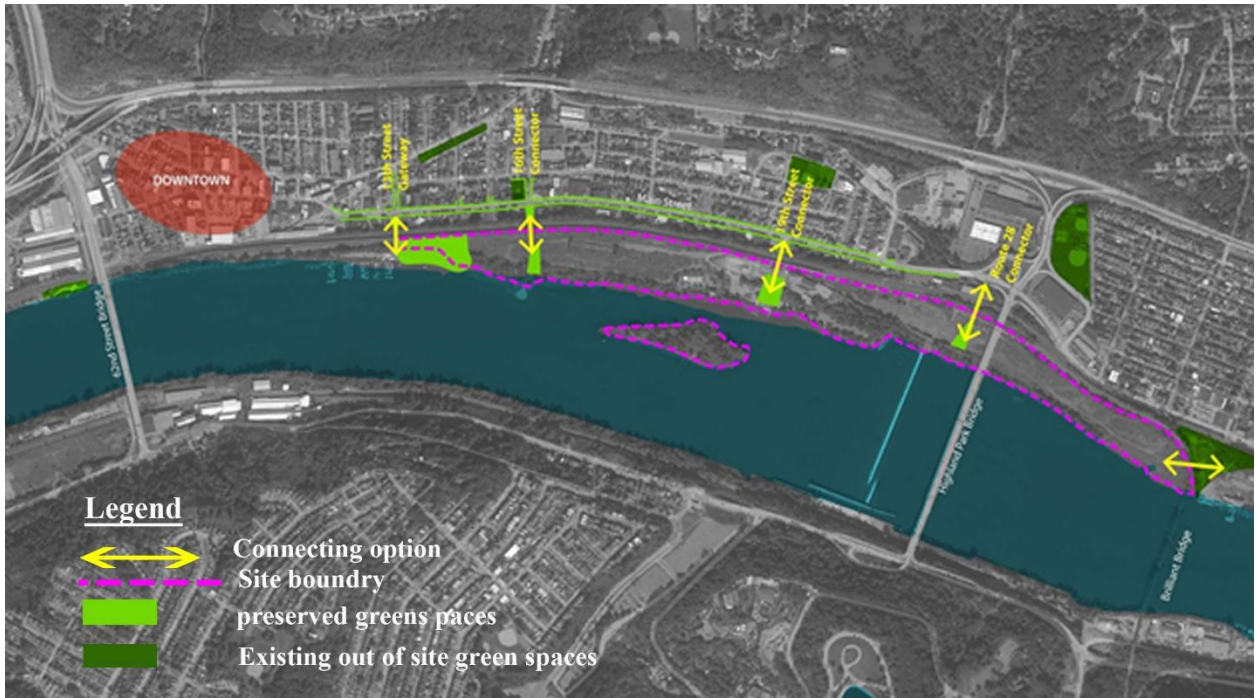


Figure 22: proposed site for redevelopment (source: SNO, 2022)

Although addressing stormwater management issues is one of the key priorities that were included in the Sharpsburg community vision plan, the preliminary project has nothing to say about the details as it is in the process of discussion.

The project development team, where SNO is the leading discussion organization, has conducted three community feedback sessions held in September 2021, November 2021, and January 2022. In the first two sessions where the community meeting was held physically, the residents raised concerns about flooding and tax increases where capturing stormwater to reduce flooding was incorporated as specific comments should be considered.



Figure 23: preliminary conceptual plan and initial rendering (source: SNO, 2022)

The development team has also identified some of the essential public infrastructure and investments to reveal the site's prospective. Among those essentials, they collaborate with local and regional leadership to secure public funding and finance for stormwater and flooding solutions. The project is intended to be funded by the federal and the commonwealth of Pennsylvania.

The data shows that flooding has not gotten sufficient focus even if the community iteratively raised the concern. Furthermore, there is no clear plan of mitigation measurements at this stage that the project should answer. In this brainstorming stage, new development provides new opportunities for the community, but it also means the need for an effective flood management system for the borough as a project tradeoff the risk associated with it. Additionally, it carries a risk of tax increment, which will prevent the low-income community from being able to pay flood insurance.

As a solution to the resident's concerns, the borough noted that revenue generated from the new development would enable the borough to address public safety concerns. The borough currently get annual revenue It is necessary to hire more personnel for the Police and Fire Departments to cover the new development, a move that will enhance emergency response since these two departments are the main response partners. In spite of the existing concern and

tradeoffs of green space for development, rethinking and expanding the capacity of institutions to deal with flood damage remains an untapped priority for flood management. That makes the research paper more relevant and grounded.

5.1.5. Institution structure, responsible, and capacity

In Sharpsburg, the Emergency Management Coordinator (EMC), who represents the neighborhood at a county level and serves as liaison, has an assigned authority to manage emergency management in the borough. Before disaster strikes, the EMC must develop a robust coordination framework, understand the situations, and establish good relationships with stakeholders to achieve a successful outcome (Selves, M.D., 2003). The EMC who represents the Sharpsburg borough has to coordinate with stakeholders from local and county and manage the works with the borough fire chief and the police at a local level. Also, they work closely with the borough council, civil society actors and VOAD, and different tiers of the government agencies. Furthermore, they monitor the triggering factors of the hazard, spacial occurrence, duration, and other related flooding characteristics. Therefore, knowing the stakeholder in flood governance is vital for better coordination and capacity building. Figure 24 shows the existing stakeholders' power and interest in the current governance system. As illustrated in the diagram, the neighboring neighborhoods are the stakeholders with less power and interest, while the American Red Cross (ARC), the Allegney county, the fire department, the Police, the Roots of Faith Church, and the SNO are the critical stakeholder.

The interview result shows the fragmentation and absence of teamwork practices in the major development of the borough. The relationship between the existing stakeholders and the EMC is shallow. For instance, given that the EMC is responsible for monitoring the emergency preparedness activities in the borough, the SNO alone, without involving and consulting the EMC and other stakeholders, participated in the Triboro development project, which was named the “Sharpsburg community vision plan” (see chapter four for details). Interestingly, the O'Hara township, which floods the Sharpsburg borough from upstream, has not been invited to participate in the initiative. As a result, the EMC did not support the borough's engagement priority. One of the Borough members said, "Our most significant strategy should be upstream. Upstream! Upstream!" (V4, 27 April 2022). In engaging with stakeholders, one must consider the power (influence) and prioritize collaboration accordingly. Again, the social capital that could be utilized to increase the capacity of local resources and knowledge by engaging with local stakeholders such as local business organizations, schools, and faith-based organizations is neglected due to loose stakeholders' networks in the existing governance system.



Figure 24: Existing Stakeholder mapping (source: Author's own work)

The EMC responds in coordination with the fire chief, local organizations, and other partners during an event. Currently, Five entities at the local level work in flood management in the borough.

1. Flood administrator: this is a borough manager or president. The main task of flood administrators is to govern the floodplain and enforce code.
2. Sharpsburg Neighborhood Organization (SNO): a non-profit community organization run by the mayor of Sharpsburg borough. It works with various developmental needs and issues of the community. The organization may do a flood preparedness plan in collaboration with local and /or other partners.
3. Emergency Management Coordinator (EMC): a volunteer assigned by the county to primarily manage and coordinate emergency preparedness and operation.
4. Fire Department: They are volunteer personnel who respond to fire hazards and participate in flood emergency response and post-flood actions.
5. Roots of Faith: Faith-based organization that provides aid and support to the community

Unlike during emergency response, The initial and major responsibility of governing floods lies with local government. It has the mandate to figure out the preparedness plans and work on ways to proactively manage flood impacts through vertical (with a higher level of

government bodies, regional VOAD) and horizontal integrations (with neighboring boroughs and local civil society actors and residents). Because local governments are proximate to disaster sites, they are considered to have some management and response capacity.

"They (local government) know their community, where the people go, where they are and how to get them out." (V1, 15 April 2022).

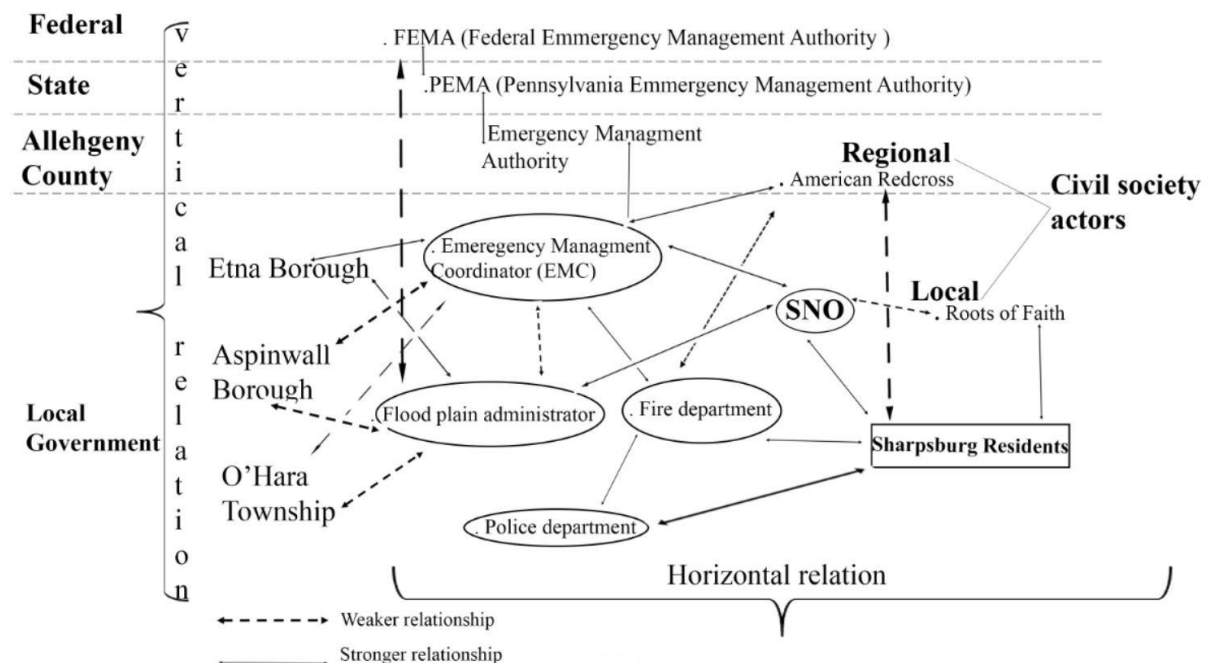


Figure 25: Summarized structure of existing flood governance network and their relations (source: Author)

The borough presents its flood management plan to the county on how to carry out the plan in accordance with the overall county and commonwealth planning procedures through the represented EMC. As illustrated in figure 25, the EMC is the central key individual coordinating both flood preparedness and response with the appropriate body illustrated in the diagram. The diagram also shows the existing relationship among the entities participating in the local flood governance system, both horizontally and vertically. There is an absence of relation between the EMC and residents and a weak relationship with the upstream neighboring borough, which indicates the gap in networking and engaging with such vital stakeholders.

They may manage to handle all the rainfall that falls within the borough, but the problem from upstream may pose an issue. As the borough receives runoff from upstream due to its altitude, collaborating with the neighboring municipality is essential, especially in the upstream

neighborhoods. When the interviewed official commented on the importance of partnership with adjacent neighborhoods on the effectiveness of flood mitigation, he said;

"The biggest thing that, I think, the borough runs into is that our upstream partners need to be more engaged and involved in the overall management processes. Upstream is our biggest problem and issue right now. We have to play with O'hara, Etna, and Aspinwall. we can not do it alone." (V2, 20 April 2022).

The respondent further strengthened the point about collaboration, saying, "it is not just the emergency management and community; it goes back to the council, the neglected leaders, the day-to-day borough managers need to collaborate across the stream. Everybody needs to be at the table." (V2, 20 April 2022). This shows the borough's pressing needs to engage with partners regardless of whether they be at a local level or federal level.

One of the key issues raised in engaging with the borough residents is that it was challenging to reach out to the landlord /homeowners/ when they needed to contact them. These show significant challenges in contacting the landlord to have them on board in flood management and other aspects of development. So engaging stakeholders is not just a local government issue; the problem is reflected from the residents' side that people who own property in Sharpsburg live in neighboring municipalities. So, the borough of Sharpsburg noted that they certainly need to have good communication and collaboration between all of them.

Additionally, although many faith-based organizations, private organizations, and community organizations exist, only the Root faith church organization is involved in the existing governance system. The lack of involvement of as many private and public organizations in the system would impact the capacity to deal with the hazard and strengthen the coping capacity.

Whenever there is a more significant project, federal money should come in because Flood mitigation alone will cost the borough a lot. However, bureaucracy and procedural hurdles in government institutions make it cumbersome to implement a swift preparedness project without prior cooperation and engagement. Otherwise, a lack of resources will compromise the borough's capacity to prepare and respond,

Nonetheless, the data shows that The SNO and the borough administration have partnered with the local, county, state, and federal agencies to alleviate the capacity repercussion and specific project-oriented funding. For instance, the borough is coordinating with FEMA to be in the

subsidized flood insurance program and the state fund for separate sewer projects. Again, the borough of Sharpsburg has proposed to investigate and prioritize additional floodproofing of municipal facilities and conduct stream restoration to reduce flooding through the Municipal EMC. These two projects are still ongoing to be completed within five years with funds from the federal and commonwealth and the municipal budget.

On top of structural and natural system protection techniques, the borough does a cleaning after flood events. So, some of it is just keeping up with dredging. Nevertheless, they faced challenges as the machinery for dredging used to come from a neighboring municipality. Later, In the past three years, the borough started to get the vacuum tracking, which they did not have two years ago. These are claimed to be an indication of moving forward regarding capacity-building efforts with resources.

"Because if we do not go forward, we will go backward." (V 2, 20 April 2022).

By and large, The respondents identified some of the areas that the borough has to consider /take action on/ for better preparedness, illustrated in the following diagram. According to the survey, collaboration with the neighboring borough and substantial resources to deal with the flooding is pointed out as the pressing vital means of mitigation capacity. At the same time, strong flood management institutions where the environment of consensus among all stakeholders is ensured are identified. The latter is the foundation by which all other activities are executed and organized.

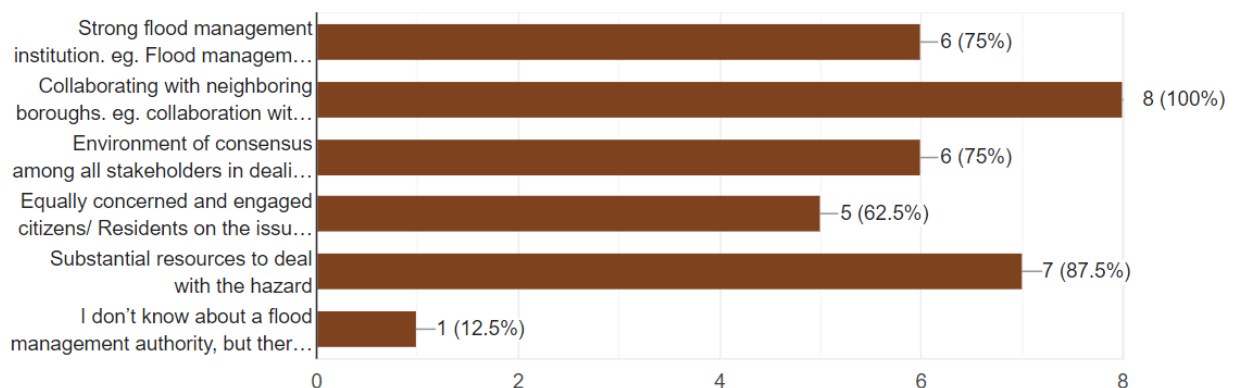


Figure 26: actions recommended for better preparedness plan in the borough (source: Survey conducted by the researcher 23 February- 15 April 2022)

5.1.6. Civil society actors (VOAD) preparedness

Many local and national VOADs operate in Sharpsburg. They all have their preparedness plan, response strategies, and specific focus areas of flood management.

Among them is the southwestern Pennsylvania chapter of the American Red Cross (ARC). As part of their preparedness, the American Red Cross identifies several high-impact and high-threat areas in Allegheny County that will likely flood yearly. They identify to know which river r creeks will flood and monitor the crest of the river (the Allegheny river) and if It gets so many centimeters above the river crest; they keep track of when the rivers rise so many centimeters, the creeks will rise and get a flood.

“ In case of emergency, we have predesignated shelters to evacuate people. In Allegheny county, I have 80 shelters- already surveyed. We have a shelter that accommodates 80 people in a Presbyterian church in the next neighborhood called Aspinwall. The shelter is located higher than Sharpsburg altitude. In Allegheny County, I can set up a shelter within 4 hours. When larger development happens, I will take the people to a larger area .” (V3, 18 April 2020)

In terms of creating awareness, the ARC focuses on general preparedness for youth and kids. They teach them how to have a kit, how to be informed and how to respond, Where to meet their family, and where they need to go too.

" If you educate a child, you tend to educate a family. When teaching a child two three four times when they are in elementary school, the likelihood of them spreading that knowledge to the parents, it decreases the risk 30 to 40%." Said the ARC staff interviewed. They also do community preparedness events by reaching out to the community- going to where they reside, such as complex apartments, retirement centers, community centers etc.- and do preparedness education.

However, "In the end, we realize that the general community does not know what to do and how to do it, that is why EMC is around to help them out because people panic." (V4, 27 April 2022).

5.2. During flood

“Policies aimed at disaster prevention and rescue must consider the hazard intensity, environmental, and population characteristics that will affect the impact and outcomes of a disaster.” (Du, Y. et al., 2015).

Depending on the community's social characteristics, the layers of susceptibility may dictate the intensity or degree to which a person or a group of people could be impacted. For instance, when a flooding hazard hit Sharpsburg in 2004, where the flooding impacted the whole borough, everybody was impacted by inundation. However, the different social groups categorized based on gender, age, physical and mental health status, occupation, etc., were among those impacted severely and had a more prolonged impact than those who merely experienced the basement inundation (Pittsburgh post-gazette, 2004). Hence, Government decisions regarding the allocation of resources and priorities contribute to deal with such disparity of impact due to vulnerability factors. To allocate resources and prioritize, the decision-making ability of the existing governance structure matters.

“Vulnerable populations usually include those with low incomes; individuals who may be chronically or terminally ill, physically or mentally disabled, homeless, or uninsured or underinsured; and the elderly, children, and pregnant women.” (Du, Y. et al. 2015)

The emergency response happens in the course of the time duration through which the flood lasts. This is the very important duration and the time when the long preparedness plan and accumulated resources and knowledge would be experimented. It is also the duration when cooperation among the stakeholders is vital and, if failed, would consequently cost lives and livelihood. Due to the nature of the uncertainty of flooding in most cases and the short time of onset characteristics, managing the operation and general responses is the hobson's choice of the local flood governance department.

The National Weather Service, Media outlets, and Weather Applications warn residents in case of flooding from a heavy storm or when a flood over a large area is imminent. Unlike Child abduction and Tornado, it is rare to get a warning for floods caused by the creek or river overflow and flash floods. In the survey, respondents preferred Text message or Email for local and small-scale hazards. The figure below shows that all respondents voted for a Text message. The figure shows how close the respondents are to their cellphones than to TV or radio, so they prefer to get information right on their hands. Besides warning, This could be beneficial to reach out to people for preparedness education purposes.

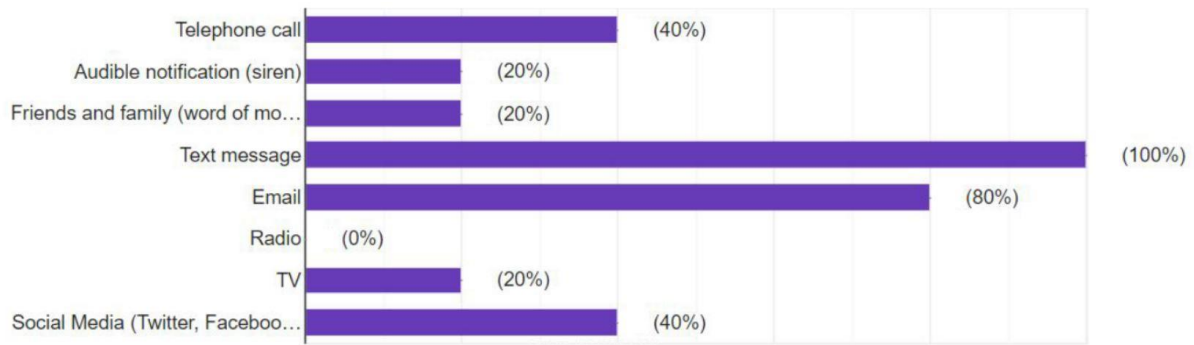


Figure 27: Time sensitive warning information and instruction medium preference

(Source: Survey conducted by the researcher 23 February- 15 April 2022)

On the other hand, homeless people are the vulnerable social group during flood events. Although there is no definite number of homeless people in the borough and their specific data, the statistical information from Allegheny county shows that 887 people are homeless in 2020 in some of the surveyed municipalities, including Sharpsburg, which sees an increase of 113 people than previous year's count (homelessness data, 2020). The surveyed municipality is indicated in the following diagram.

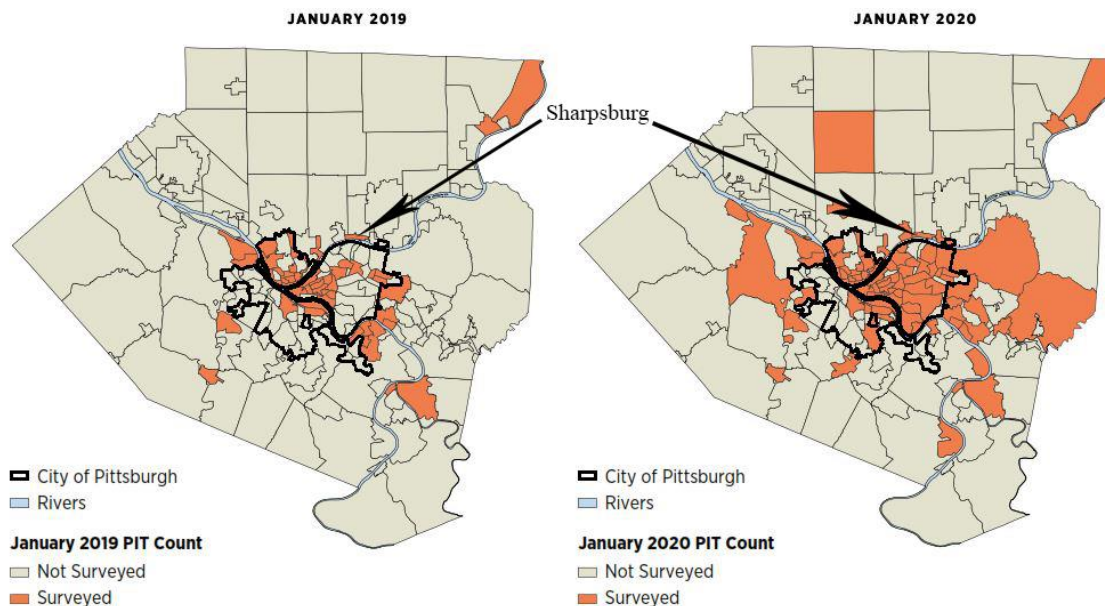


Figure 28 : Locations Canvassed for Unsheltered Population, January 2019 vs. January 2020

(source: homelessness data, 2020)

Although there was no previous investigation about homeless people's impact in relation to environmental stresses in the case area, the homeless population is also susceptible to being in a harsh situation during a flood event and has a fragile livelihood. The statistical figure indicates

that a significant number of homeless people would be at risk in the county, and the same is true in Sharpsburg. This may require collective action to address the problem from the root at a regional level. However, at the local level, the borough should consider such social groups in its emergency operation plan and engage with them as much as possible.

5.2.1. Previous flood hazard response experiences

In the previous flood events, although the duration and time of onset vary greatly, the response is governed by the borough. For instance, in 2004, When the pine creek flooded, it came up to the lower level of the Sharpsburg area. There was a flood down to the lower altitude where the fire department or municipal building is currently located (Pittsburgh post-gazette, 2004). After that, the former EMC decided it was time to evacuate people. It was a voluntary evacuation, not a mandatory one. In a liberal society, it is hard to force people despite its importance to save their lives. “We told the residents (by choosing our language), saying, ‘Hello! How can we reach you if you do not evacuate soon?’” (V2, 20 April 2022). This exciting point shows how important it is to build trust with the residents before a disaster happens who otherwise may not listen or get confused to whom they would turn to during the disaster. In terms of civil society actors' previous response challenges, some of the local and county-level VOAD shortfall areas have been summarized as follows.

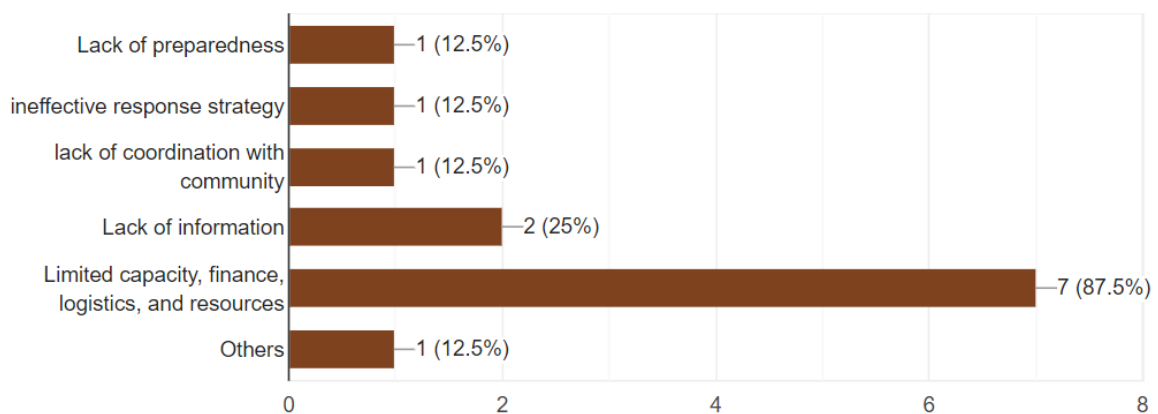


Figure 29: Local VOAD challenges (source: Survey conducted by the researcher 23 February-15 April 2022)

The respondents think that the stakeholders (residents, civil society actors, and VOAD) were cooperative in the past flood management efforts. Mention some, Roots of Faith and the fire department are some of the local VOAD most helpful in dealing with flooding.

On the other hand, the effectiveness of the emergency response to the previous flood events was also summarized in the following diagram. According to the data, the satisfaction with the response operation is above average. This can be considered a positive outcome. Nonetheless, Some of the challenges the residents faced in receiving assistance during the previous emergency response were: slow response and many red tapes, absence, and delay of aid.

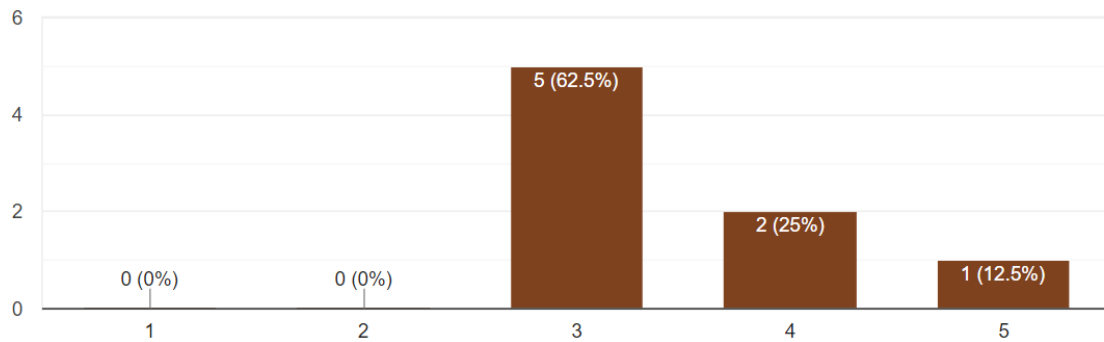


Figure 30: Residents' satisfaction with the previous response operations (source: Survey conducted by the researcher 23 February- 15 April 2022)

In case of disaster, the first step that EMC does is to reach out to the Root of Faith because they are the local ones; they are the uproots on the ground who are able to come in immediately. Then they start building up the call in from there based on the extent of the flood events and other variables. The EMC will inform everybody, saying, “ hello! The Allegheny River is flooding, and the following creeks are flooding. We are expecting these areas or these communities to be impacted. So expect flood for the next so many hours or so many days.” (V2, 20 April 2022). This shows the informality of communication in the governance system which may have an impact on conveying the message thoughtfully and may lead to miscommunication from the other end. A guiding principle on communicating with agencies (vertically or horizontal structures) during emergency response is essential as the consequences could be loss of life or property damage. However, timing is a significant factor in the response operation. "If we have a major disaster event, it is gonna take at least two days to get everybody on board, and everybody has enough to get there." (V2, 20 April 2022). These would make things delayed, and the delay may end in disaster.

As American Red Cross (ARC) looks up at the forecasting data ahead of time, they coordinate with a county and local EMC. They pre-position supplies. As ARC is a mass care agency, not

a first respondent, they specialize when people have to evacuate and temporarily take care of them. Hence, They deal with the people and mass care.

“I pre-position trailers each one has enough supply such as coat, blanket, pillows, other essential stuff, chair tables, etc. and stuff for kids like shampoo. So, I pre-positioned a trailer with a sufficient supply for 50 people all around the county. I have 20 of them prepositioned in areas outside of flood zones but near areas that can be flooded. We set up a shelter (long-term or temporary), usually at a school or designated shelter site like some kind of convention center etc. We position them based on topography and access. From the moment we are called, within four hours, we can set up a shelter and take care of the people.” (V1, 15 April 2022).

The interview result shows that the civil society actor reflected that people sometimes are hesitant to evacuate when they are told so and suggested that they should be responsible. Furthermore, as emergency management is where collaboration is significant with everybody, the biggest thing in engaging the stakeholder is building a relationship before an event occurs- meeting beforehand. Networking and engagement are considered significant issues that should be fixed to overcome the response challenges.

When things go out of the control of local government and need immediate assistance, It is unavoidable for the local level executive, mayor, or president of the council to declare an emergency disaster. Thus, When that disaster occurs, the emergency declaration wraps up everybody that allows people to step in and move it quickly. So, a disaster declaration is considered helpful and assists them in moving forward.

Regarding the means of communication among entities during response operations, The EMC keeps track of all partners involved in the responses through email chains or Zoom meetings. Real-time communication technology is believed to advance emergency management and response operations.

Local police officers tend to be more helpful because they are full-time paid staff. So, usually, the only full-time person that is part of the emergency operation is a police officer. When something big, like a hurricane, happens, the EMC reaches out to the county Emergency Management Authority. So the county has all the assets, and it is straightforward for the coordinator to say, “Hello! I need this and this, or Can you take over and run this operation for me? I will keep my mayor informed.” (V2, 20 April 2022)

5.3. Post-flood reconstruction effort

“ in the aftermath of a disaster, the Vulnerable group will have a series of needs, and failure to satisfy those needs leads to long delays or unsatisfactory ‘recovery and further marginalization, which leads one to displacement, continued weakening of human resources, perpetual dependence on anonymous public or international charity, homelessness. And indebtedness” (Wisner et al., 2008)

5.3.1. Fragile livelihoods & unsafe location

The extent, resistance, and stability of livelihoods also determine people’s ability to avoid harm when dealing with natural hazards (Gaillard et al., 2009)

In terms of livelihoods, most Sharpsburg residents are employees and self-employed, with an unemployment rate of 7.1%, more than the national average of 6% (Economy in Sharpsburg, u.d). Out of the Residents with diverse professional backgrounds who participated in the survey, most of The employees commute to the neighboring neighborhood for work. So, flooding may hinder the commute, affecting mobility. Additionally, the average residents' income in the borough is less than the national income rate (Economy in Sharpsburg, u.d). As the disaster could hit the people with a low socioeconomic status harder, this could hinder the residents' speedy recovery from possible future risks and be impacted more during flooding events. Hence, financial incapability has a link with flood governance as the system is actualized and operationalized by resources.

5.3.2. Restoring the normal activity

The Root of Faith, through its outreach center, provides assistance to people by coordinating with the borough of Sharpsburg. The center focuses on low-income families in need assisting the community with a range of services such as food stamps, shelter etc. (Roots of Faith, u.d). Hence, the organization is one of the major local civil society actors partnering with the borough of sharpsburg in various community development activities and post-flood recovery processes. Due to their influence on the borough issue, they play a significant role in bridging between the community and the other governmental entities. On the contrary, The faith-based organization’s influence is not utilized well by the local flood management entities when it comes to building capacity. “ It (the Roots of Faith) is not really well involved, and it is not well involved yet. They (borough) are working on it. However, we also do not have a lot of those outreach groups.” (V3, 18 April 2022).

American Red Cross is the other regional actor that mainly participates and partners in post-flood mass-caring activity. According to the Interview conducted, Last year, In southwestern Pennsylvania, the ARC gave over \$ 400,000 in direct client assistance in post-hazard recovery processes in Allegheny county. For all kinds of hazards that happened in the county, including Sharpsburg, they gave money assistance to over 697 families-that was, about 1500 people. That money provided a hotel accommodation for a night or two, to replace some clothes, to get some food until other agencies came and provided assistance. ARC assisted with flooding, fire, building collapse, gas leaking, and explosions. They had 370 events, and 250 were just in Allegney county last year.

After completing the first emergency response, they collect all the data and refer them to the county. Then they inform a county of the number of people affected by the flood, and they would need long-term assistance. This indicates that the connection between the county and VOAD is two ways that enhance communication. “We do have a plan to clean up after a flood, but we need a more solid plan to get help from agencies for our borough immediately and individual residents” (V1, 15 April 2022). A well-networked governance system with clear responsibility and relationships may alleviate such concerns and help enhance the efficiency and cooperation of various actors in the system.

5.3.3. Experience exchange

There is no data that shows means of experience exchange among the different actors at the local level after a flood event. However, the organization typically tries to know their client's satisfaction and whether there is feedback from victims to use the information for their organizational reform. For instance, ARC surveyed people after aid and stayed with them to ensure the victims met with the appropriate agencies. This is a good approach to seek feedback from people to evaluate their operation and get prepared better for the successive recovery operations. Apart from using the feedback for its own internal service assessment, and inter-organization experience-sharing platform that would create a learning environment for local and regional emergency response and relief organizations is challenging.

Conclusion

"The municipality needs to be an advocate for its community. The whole point of local government is to defend and protect its people. In the commonwealth, the municipality has to come out and tell their leaders, saying, ‘we have an area that will have a major flood soon; we need to put some green scape.’They need to be working with their leadership to ensure their

infrastructure and more preparedness. If flooding is their concern and priority, they have to do it sooner than later. Unfortunately, flooding and other hazards are not a priority until it happens." (V1, 15 April 2022). Education gap, lack of capacity, and lack of cooperation and engaging with as many actors as possible are what can be deduced from the statements.

Challenges

The main challenges that were echoed during an interview with people in the emergency management at the local level are that the position is not a full-time job and that most of them are volunteers. Even though they showed their passion for the work in the planning and rescue position, the fact that they do not get paid and the position is a part-time job has a significant effect on the management work and timely and effective response operations.

"I think the people should take emergency management plan seriously. We should also do more to educate the children and the community- about what to do in the home for a disaster. Most people who suffer major injury and losses from a disaster are those who are not prepared. And it doesn't take a lot to be prepared. For a child to be prepared, simply take a pillowcase full of flashlights, a radio, some snacks, some pairs of clothes, and a blanket. That is all they need! So the community needs to get educated and take it seriously. How do we do that? I do not know. but they have to take it seriously." (V1, 15 April 2022)

In the US, since everything is privately owned and individual people have freedom, "it is challenging to take people's property for whatever reason we have. Even the poorest who own a house have a say on what is going on in his or her community benefits, and no matter how significant the benefit is for millions of people, we cannot do anything until everybody is convinced. That process may take years and decades to get things done because people have to support and be paid out etc., which is the downfall of everything here in the US." (V4, 27 April 2022)

In the end, there will still be people who will get an impact by a flood. Hence, adaptive flood governance that can proactively manage flood preparedness, respond, and recover is vital for a borough like Sharpsburg.

Chapter Six

6. Finding and Implication

6.1 Findings

Based on the analysis done in the preceding chapter, the significant finding that answers the first research question will be reviewed in relation to the UEP value position and framing the challenges in flood management in the neighborhood. These Outline the foundation for the subsequent (the second) research question to be answered in relation to the theoretical framework adopted by the researcher (refer to chapter 2). The chapter concludes with the implication section that narrates the learning from this research.



Figure 31: How to Change Flood Risk Governance in a Specific Area. (source: adapted from Raadgever, T . and Hegger, D, 2018)

Using the above cyclical steps of changing the flood risk governance in a specific area, I used the cycle as a tool to run the theoretical framework discussed in Chapter two and/or reactivate the processes. The steps are utilized to alter the institution's status quo and strengthen the existing agencies as the governance is a continuous process and iterative than a one-stop solution. Hence, the first step starts with analyzing the current situation, more specifically, the challenges of flood governance in the borough, and framing the challenges. The second step, the central solution part, is defining and prioritizing the actions using the theoretical framework of Adaptive flooding governance. The third and fourth steps are implementing the adaptive

elements, monitoring the result, and taking corrective measures or restarting the process in case things are missed in the initial process.

6.1.1. Step 1: Define the challenges.

Research question 1: What are the flood governance challenges in Sharpsburg Borough?

Managing the flooding through well-followed management, transparent and shared responsibility, and a participatory process plays a vital role in coping with the hazard and effectively responding to its ramifications. As the discussion in the earlier chapter shows, the burden of building the kind of governance that ensures public safety from flooding lies on local government. Like other municipalities in the county, the Sharpsburg borough is mandated legally to manage their flooding and has an autonomous right in decision-making in compliance with the commonwealth and federal statutory requirements. As the research shows, The challenges that the borough has faced partially emanate from the lack of flexibility in contextualizing the management efforts (including the governance structure) and the eventual shortfalls as a result of lack of capacity at a very local level. The other is the borough's excessive reliance on the other federal agencies for planning for inundation from river overflows; and the reliance on other agencies' help during crises than developing its own local capacity. The lack of a preparedness plan for the flooding that might get up from the Allegheny River and the absence of a clear contextualized emergency operation plan in case of a disaster indicates blind reliance. These and other challenges are discussed hereunder in relation to UEP value to frame the challenges and understand the problem. These UEP values are contextuality, Bottom-Top approach, and strategic and contingent planning.

It is understood from the research that the borough does not have a governance structure that suits the context of the area. In other words, the absence of an institution with a capacity that at least equals the menacing threat of flooding uniquely affects the borough. They follow the standardized and generalized emergency response and preparedness that does not consider the degree of threat pertinent to the area. These could show the lack of Contextualized governance networks.

One of the value positions of UEP is the Bottom-Top approach which I consider the anchoring element and the end result of the whole concept because the environmental problem is a collection of each individual's action, and the solutions should focus on changing the individual's behavior through linking stakeholders initiatives and need. On the contrary, even if the problem is not local, the effect(in this case, flooding) impacts individuals more. Hence, the institutional approach to addressing the worsening environmental problem has to be a

society-centered- bottom-up continuum approach. This means that the knowledge about the hazard, preparedness mechanism, response operation, and recovery course of action occurs through social interaction and collaboration. The research identifies The absence of such practice where the need is reflected by government officials and residents in the survey conducted.

The local government should facilitate the flood management works and stretch the responsibility along the stakeholder spectrum. As indicated in the analysis chapter, there was little done in participating the broader individuals from brainstorming the idea of planning through rebuilding. As in conventional planning practice, the nature of local government as an executor or implementer impedes the whole management approach. For example, the borough council members have a monthly meeting where residents can participate in giving their idea on the agenda introduced before the meeting date. Although the effort seems to open up a door for the residents to have their say and attend the decision-making process, the research shows that very few people participate. The reason can be deduced from the data collected that the officials lack the activity to build a relationship with residents and other stakeholders prior to the meeting and figure out various ways to enable the residents to participate. Lack of engagement and stakeholder-driven solutions may lead to technocratic planning practices. These have steered to stick to the standard and rigidity than being strategic and contingent.

Institutional organization and structure

Collaboration with all stakeholders is also a challenge in the research area. The borough tends to focus on vertical governance in its management approach. These can be observed in the emergency management arrangement at the local level where The liaison official representing the borough at the county level alone maintained the middle man status with a very limited horizontal governance that includes all actors and residents. For instance, no data shows an observable or direct relationship between EMC and residents in the flood governance system, as indicated in chapter five, figure 25. Residents may have indirect contact with the EMC; however, considering the importance of coordinating every resource to make emergency management more effective and efficient, the EMC should build a direct relationship with residents and other local organizations (strengthening the horizontal cooperation). The other challenge is that the EMC position is voluntary, and it is a part-time job while mandated to coordinate and lead emergency management activities in the borough. Since EMC needs to devote sufficient time to emergency management work as a full-time job, the status quo of

EMC's position in the governance system needs to be reassessed. Collaboration helps strengthen the flood governance system by increasing the capacity to reverse the disaster. It is observed that the local government engages with limited local level entities, faith-based organizations, fire departments, and police. However, many actors left a side or untapped, such as local business organizations, schools, and private sectors.

Regular meetings and contextualized preparedness plan in place

The county emergency management authority requires the municipality to have either their own preparedness plan or adopt from the county (County, A. 2020). As the county's plan is comprehensive and lacks details of the context of the Sharpsburg borough, the borough needs to come up with its own plan that addresses the flood by identifying flood-prone areas, vulnerable people, and property and finding a contextualized remedy for the problem while utilizing resources from county state and federal government. Such a preparedness plan also requires participatory actions to develop deeply analyzed preparedness needs and incorporate local knowledge. Hence, a recurring meeting with all stakeholders is vital to have everybody on board on the issue of flood preparedness, response and recovery actions, and assessment.

Accessibility of the data and transparent plan

Information and awareness tools are essential in equipping the individuals with the knowledge of preparedness and response and what they should do before, during, and after a flooding disaster on their own until other agencies reach them.

This issue was identified as the major bottleneck in the existing governance. As an example, some of the borough officials surveyed were unaware of the emergency preparedness plan, in addition to residents. Maybe the lack of data accessibility or the borough's dependence on the county resulted in the plan being left to EMC without engaging all stakeholders. These are so they can make sure everyone knows about their responsibilities in the event of a flood. Local disaster response solutions are critical since some disasters occur without advance warning, inhibiting other agencies' ability to focus on vulnerable people and address the issue. In addition, the absence of a preparedness plan (even if it is the county's plan) from any official borough website and the lack of a more solid plan may impede borough and individual residents from swiftly responding to a flood event and could consequently result in loss of property or lives.

Furthermore, Communication challenges between EMC and the people are evident in the borough, where flood risk communication indicates that. The study results show that residents misunderstand or underestimate the effects of floods. Local governments tend to focus on material risk, which led them to focus on flood insurance as a primary mitigation strategy. These may come from two factors. One, The past flood experienced in the last two decades that the human casualty has not been recorded might obscure and give the wrong perception that the likelihood is not there. Second is the lack of delivery of accurate information regarding the risk. Therefore, effective communication is vital for flood governance to resolve the Lack of communication across horizontal and vertical relations that affects preparedness, response operations, and recovery efforts.

lack of resource capacity for proactive planning

Stormwater management, mitigation, and emergency management require funds. Many federal, state, and county funds and grants are allocated for eligible local governments, which will be utilized for flood management purposes. However, there is a high bureaucracy and institutional hurdle to getting funds and grants on time. These will have significant ramifications on the local governance capacity building

As described by Gencer (2017), the authority to control the budget for specific disaster risk reduction or be able to increase funds through the use of taxes and/or other resources will empower the local government to do disaster risk reduction.

As the research identifies, the borough depends on funds from state and federal agencies allocated for a specific action that the agencies prioritize. Sometimes, this may fail to solve the issue contextually and may not result in the desired outcomes. Although the borough is trying to build its responsive capacity to flooding, for example, by buying a vacuum track for dredging, a more robust resource capacity building could have been undertaken by enhancing the institution's ability to raise funds from different stakeholders. Hence, a deliberative governance structure adjustment to solve the issue and enable the institution toward capacity building is essential.

6.1.2. Step 2: define and prioritize the actions

Research question 2: What can be done by public and private stakeholders to make a transition towards a more resilient flood management?

As White G (1945) said 77 years ago, flooding is always a watery marauder against which society has to wage a bitter battle where the price of defeat is a continuing chain of disasters.

Unlike the white saying that the sole price of victory is the cost of engineering required to control floods, engineering alone cannot solve the problem at the source. There must be some kind of governance to coordinate and plan the technical measures. Due to the nature of uncertainty created by climate change, dramatic urbanization, and impervious cover development, vulnerability issues necessitate a shift toward a pragmatic and contingent solution that requires all stakeholders to work together. Therefore, the research shows that the key to victory is adaptive flood governance that enables self-steering environments to collectively respond to the ominous quality of flooding in this era.

Flood risk management is inherently a shared responsibility that requires a public and private partnership involving citizens from all walks of life. Although some of the flooding management activities require a range of technical expertise, the governance system at least should not be a technocrat. This kind of agency has to have adaptive governance characteristics: flexibility, competency to plan, capacity to invest (resources, time, and energy), and ability to control in a way that involves all society to respond collectively to uncertain flood events.

In realizing a whole society management approach, it is vital and mandatory to map all the stakeholders along with their possible interests and the power they have in the project. Figure 32 above shows the list of the public and private stakeholders in the borough of Sharpsburg. They are arranged over the four quadrants based on their every interest and power. Engaging

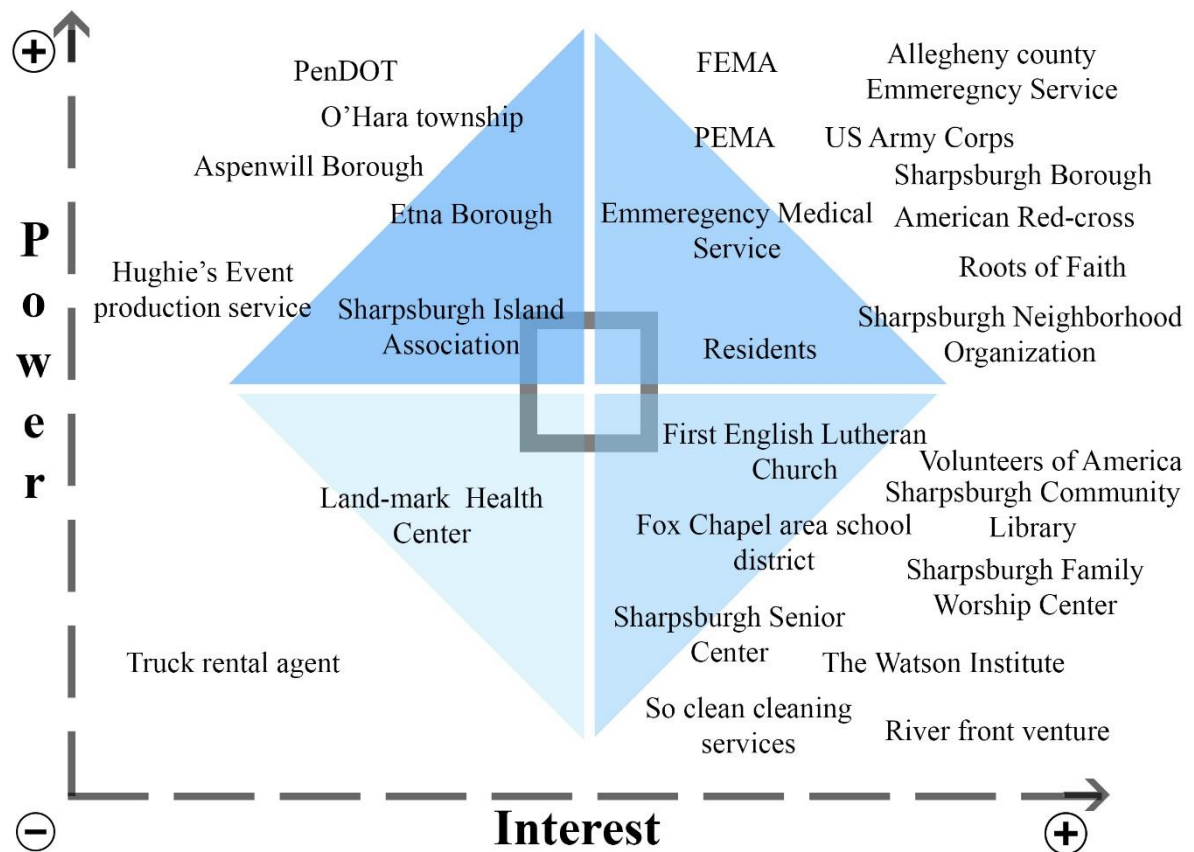


Figure 32: stakeholders mapping (source: Author's own work)

with stakeholders may take a lot of time and effort. Nevertheless, once all partners reach a consensus, the planning, investing, controlling, and the response will take place smoothly.

As the interest changes over time and power fluctuate, there will be a position shift over the quadrants. For example, the neighboring borough, such as O'Hara and Aspinwall, may strongly influence the Sharpsburg flood management as they are the upstream affecting the borough. So, their interest may change based on the engagement processes and in the course of recurring discussions. On the other hand, the local private organization included in the diagram may gain interest based on their knowledge regarding the significance of collaboration and the inclusive approach used by the government. In addition, the stakeholder could lose interest in the project over time and lose its power, something that happens and causes stakeholders to come in and out over time. So the diagram is not a complete list of all the stakeholders, and the arrangement is not absolute. All stakeholders that fall in the second quadrant are the key partners who should be involved and collaborate with, while those who fall in the first and the fourth quadrant need more engagement and reach out to have them on board, which leads to the periodic diagram assessment.

Enabling

Since fluvial risk management requires an environment of consensus and shared responsibility, there should be an agency that may facilitate an enabling environment through the out-and-out inclusion of stakeholders. The borough needs to have a well-organized flood risk governance institution to operationalize this. What is meant by well-organized governance here is the composition of various entities in the system, structuring and positioning within the existing institution with a clear relationship among them, orderly flow of responsibilities.

For example, it is necessary to restructure the enabling role in the system from EMC to SNO because it gives better compositions of stakeholders and can serve as a converging point for various entities. Figure 33 shows a graphical representation of recommended governance structure and how each entity related to each other compared to the existing practices. In the figure, the SNO's role is to enable or facilitate a discussion and collaboration environment by creating a conducive situation for all. The SNO should ensure maximum flexibility while performing the leading role around the four main elements of the governance illustrated in the figure. The two-way linkage between the SNO and the main stakeholders in the system will be the role players and decision-makers around the four elements- planning, investing, control, and response and reconstruction. This way, risk communication, resource capacity through the utilization of social capital, and contextualized preparedness plan will be realized. Although entirely restructuring and operationalizing the system could consume time, the transformation process may start by introducing these adaptive governance elements and build on that. The existing structure can also be strengthened by including as many local and regional civil society actors, citizens, and other borough officials in the modified form of flood management authority. Through this, we can reimagine the structural organization of people who should be involved in it in conformity to the commonwealth statutory law and regulations and national risk management framework. In such a way, public and private stakeholder participation, social inclusion, and strong relationship can be created as a result.

There could be a facilitated reflection meeting for the governing body to assess the milestones and identify potential areas of improvement. Also, Facilitating the Coordination of preparedness and emergency response teams and a clearly defined reconstruction team could ease the arrangement and responsibility-sharing. These teams can meet periodically to coordinate their activities to enhance transparency and reduce the work's redundancy. These enable the team to be more self-aware and enhancement-focused. This kind of retrospective meeting can be held every three months or at a reasonable time.

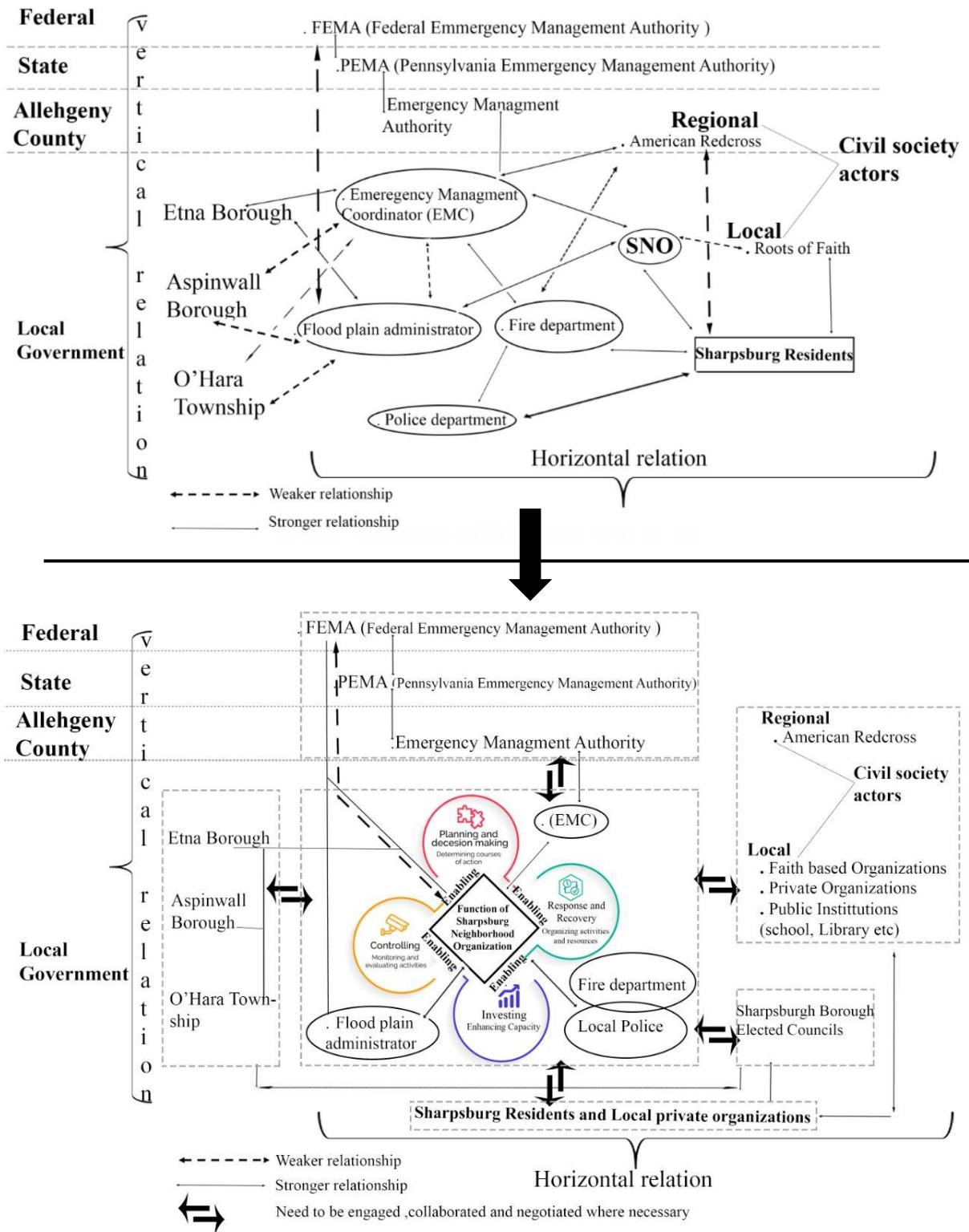


Figure 33: proposal of Adaptive governance in Sharpsburg borough (below) and the existing structure (above). (Source: Author's own work)

Adapting a municipal regulation, where necessary, to ease regulatory barriers may enable an active collaborative working condition for the whole stakeholders. These could enable them to make timely decisions regarding the prioritization and scope of the requirement and allow more effective governance by improving the team's decision-making ability.

Furthermore, enabling accurate and timely information transmission and updates mechanisms for the teams and the larger residents is vital, as discussed in the previous chapter. These can be conducted through the municipality website, dashboard (a wall-mounted monitor), or other more accessible advanced technology means. The whole idea here is to have a concerned body on board, activate them, update them with a clear and defined responsibility and work ahead.

Plan

Planning ahead is the fundamental means of combatting the adverse impact of the hazard and having a picture of detailed work needed to be done, who does it, how, when, and by what means. This course of action, or what is called Contingency planning, could be the main task of the planning team.

As defined by UNHCR and UN Disaster Management Training Programme, contingency planning is "a process of forward-planning conducted in a state of uncertainty during which scenarios and objectives are agreed upon, managerial and technical actions are determined, and potential response systems are set up in order to prevent or better respond to a critical incident". (Choularton, R., 2007).

This means the planning team would initiate context-based contingency planning ideas by uncovering a list of alternatives for action under each: response strategy, operation, implementation, and budgeting section of the planning. Contingency planning differs from conventional planning in that it is participatory, realistic enough, and process-driven through tabletop discussions to increase the stakeholders' familiarity with the plan (Choularton, R., 2007).

Considering the need for technical knowledge input in planning, a team from various departments (experts) within the borough and auxiliary personnel from the county level and a research institution can be assembled. In order for the team to achieve an effective outcome, it is expected to utilize adaptive planning. This is by referring to the Commonwealth and/or National Preparedness Guide, as well as all relevant legislation while ensuring that the plan is contextualized based on the unique nature of the borough.

Invest:

The concept of investing in this particular scheme is allocating material, human, and time resources into a broader management effort and taking part in the programs as a stakeholder. These can be investing in healthy watersheds in forest management, wetlands management, and other flood infrastructure safety such as levees, dikes, flood control gates, and pump stations that are imperative in reducing flood hazards in the region. Similarly, the institution needs to increase its own capacity through advocacy for the increasing flood hazard associated with climate change and other means to materialize the planned actions.

As the borough has very limited resources, the team should seek an alternative way of increasing the resource capacity for the borough that enables the execution of mitigation plans. The broader spectrum of investing can also include investing for prioritized vulnerability issues in the borough through advocacy at the borough council and upper tier of government and searching for grants and funds. After all, Investing in localized flood mitigation preparedness and response plans is a significant source of resilience.

Controlling flood plain management

Managing floodplains requires the science and art of utilizing strategic and contextualized options appropriately. These include flood plain mapping, regulations, and flood mitigation planning. Among these, the responsibility of controlling each flood plain management is specially assigned to local government while upper tier of government bodies and other agencies support with technical and technological solutions.

Strategic options for floodplain management: protecting floods using infrastructures such as river embankments and dikes, accommodating through the practice of reducing the vulnerability of structures and facilities by raising building elevations, and retreating critical infrastructures from repeatedly flooded areas. To end with, controlling the enforcement of municipal code, monitoring development in the borough, and avoiding an additional risk by not putting assets in flood plains if possible.

Response and recovery

Response and relief require a multi-agency approach and engaging as many stakeholders as possible in a response operation and recovery. However, preplanning the response strategy increases the response efficiency, and holistic awareness of each partner's responsibility during a disaster is vital. More importantly, a well-organized operation in a timely manner plays a significant role in saving lives and livelihoods. For these to happen, the institution should have a capacity and strategy to work in response and relief through engaging with partners and

holding a meeting with them before flooding to build a relationship and a shared understanding among them. As noted in chapter five, the Sharpsburg municipality does not have its own written response operation plan. Instead, they use the county operation plan that is accessible through the EMC. The county operation plan is a comprehensive plan designed for larger geographic areas and all types of hazards. So the county operation plan lacks local potentials that should be utilized and does not consider the specific contextual situation of the area.

Also, the management of disaster is given to EMC in the county operation plan, which did not consider the complexity of the event that would be difficult for just one person to coordinate all the spectrum of hazards. So, the following figure illustrates the recommended operational plan for the borough. The main change from the existing practice is adding SNO as an entity to manage and coordinate the operation along with EMC. This helps share a responsibility to reach out to stakeholders and effectively coordinate them. The other is bringing in potential local business associations such as the Sharpsburg boat association and recognizing and working with emergent voluntary groups.

The figure illustrates what each stakeholder can contribute and whose responsibility to request neighboring boroughs in case of the need for assistance is inevitable and also when the disaster is severe, and the borough needs upper-tier government for more resources to cope with the devastating event and recovery phases. The diagram is neither a detailed operation plan nor the final version because the plan needs to be revised based on the need and situation.

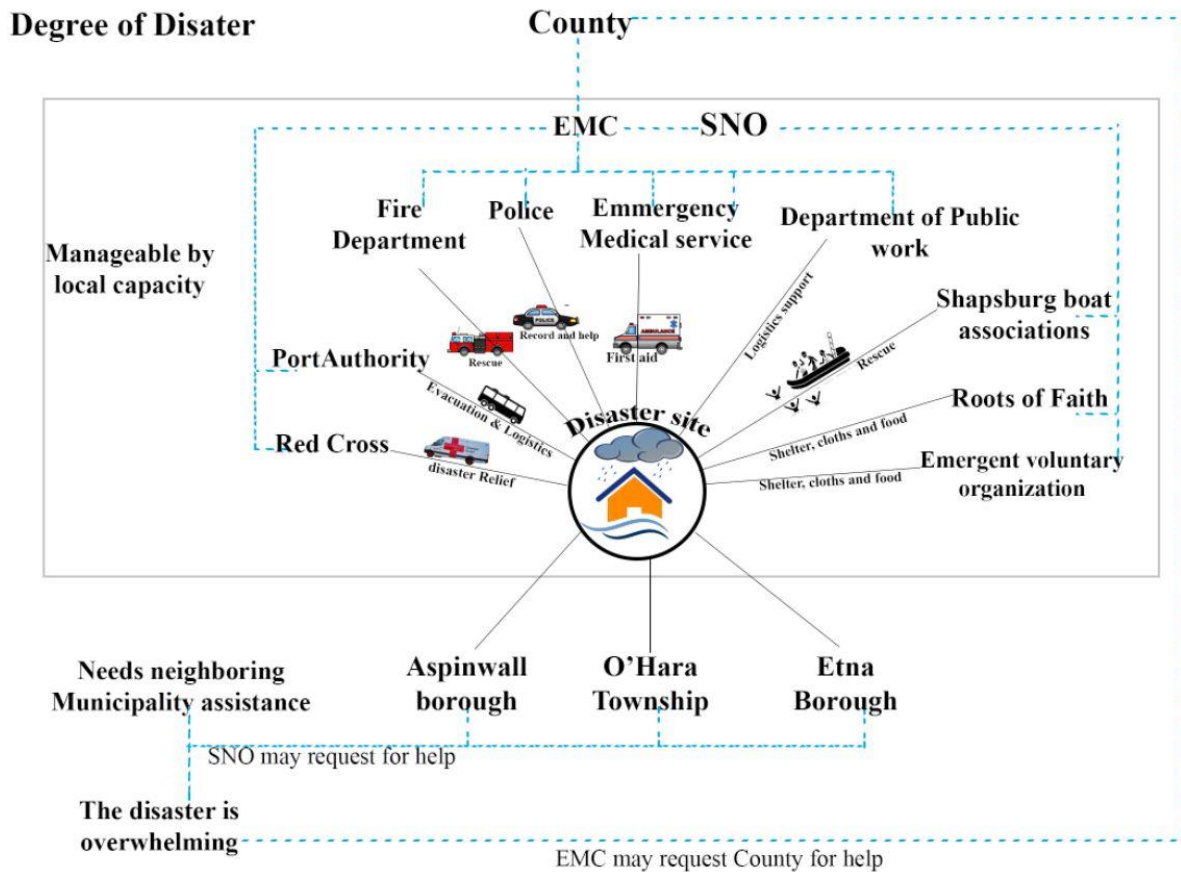


Figure 34: Recommended Emergency Operation structure and team (Source: Authors own work)

6.1.3. Step three Implementation

The implementation can be sorted out according to the prioritized action based on the urgency and need. However, it is difficult to transition to an adaptive flood governance system and its implementation, starting the change by opening up a discussion platform for everybody to participate in the issue. Clearly telling people of the risk and the stand of existing governance in handling the complexity and uncertainty of flood hazards. Hence the change in both the political and cultural norms is needed through perceived actual costs of flood risk. The organizational structure can be infilled with necessary and qualified people and exhaustively engage as many stakeholders as possible. That could help reduce vulnerability to other related developmental

A good example can be seen in the transformation of wetland governance in Sweden, which starts its implementation by preparing the system, opening a window of opportunity, managing the transition, and developing a new direction for management while building the resilience of

new governance regimes(FOLKE, C. et al.,2005). The process can also be applied to flood governance in Sharpsburg because it encourages cementing and broadening of social networks and prepares the system for changes to operationalize. Hence, trust-building among stakeholders should take priority, and recurring discussion and awareness creation may make the process less complex.

Monitoring the result

The planning teams or others may overtake the work of monitoring the result as to what worked well and what did not succeed, and where the organization fell short in the course of the process. These steps may take time to see changes in the planned action as the planning process and implementation may consume a significant time. For instance, the monitoring session may take place in the aftermath of the flooding event to assess the framework's effectiveness. So the step restarts to repair the problem and make changes where necessary based on the continuous feedback from stakeholders and the monitoring result.

6.2. Implication to practice

Safety measures against flooding should be increased in the borough. For this to happen, an adaptive institution that enables intensive cooperation with the stakeholders. In a situation where flooding is the most expensive and the threat of natural hazards in the borough, having adaptive flooding governance is essential in decreasing the risk.

Flood management supports sustainable urban development and promotes resilience. Increasing local level understanding of risk. Strengthening Flood risk governance is indicated as the second priority for action after understanding disaster risk in the Sendai Framework for DRR for the years 2015 to 2030 (Pearson, L. and Pelling, M., 2015).

Conducting the research in the US, particularly in Sharpsburg, enabled me to look into the challenges of local flood management in a decentralized flood governance system and how national policy and politics can affect the initiatives and actions at the local level. The potential of availability of different voluntary organizations active in disaster at the local level and region in assisting in response and post-flood phases was recognized but should be engaged more in the system and organized. Also, the importance of Horizontal governance would result in more preparedness at the local level and ensures resilience. Overall, an adaptive flood governance system enables all actors' inclusion and flexibility to adapt to new circumstances during uncertain events and, above all, enhances the capacity to cope with the hazard.

The lack of awareness among residents, resources, and horizontal cooperation's (with citizens and neighboring municipality) and contextualized preparedness in the borough posed challenges in effectively addressing the hazard and intuitional adaptability.

Although Sharpsburg aims to give residents centered decision in the borough flood governance system, the researchers suggest that the different entities' integration and institutional capacity is still insufficient and need to be addressed.

The neighboring municipalities are observed helping Sharpsburg in the post-flood recovery

This thesis explicitly focused on flood governance but linking with other neighborhood hazard preparedness, and developmental initiatives is necessary as the subjects are inextricably linked. The framework implication to practice are timely decisions, mutual understanding and consensus, shared responsibility, and flexible and enabling organizational structure. Overall this research shows that adaptive flood governance gives many opportunities for cooperation and networking with different stakeholders at different levels. The research also identified potentials and challenges that can be addressed to improve the governance system's flexibility and adaptability.

6.3. Implication to theory

As for the implication of the research on the theoretical knowledge, I utilized two main themes of the framework for analysis: challenges of the root causes of disaster (vulnerability issue) and Institutional adaptability and organizational structure have been presented.

The model's main assumption was that flexibility and adaptability to uncertainty require a self-organizing process and a framework in which the idea can be actualized. Additionally, addressing the borough's vulnerability issues due to flooding is inextricably tied to flood governance to deal with flooding and, ultimately, ensure resilience effectively. Managing flooding can only be accomplished by increasing the institutional governing capacity.

Although the research endorses the theoretical framework, implementing the concept on the ground could prove challenging and take more time to adapt. Due to the reactive national policy, the framework may face challenges in managing its proactive activities. Another scholar who studied flood governance made an extremely compelling point that to manage

floods in an effective, sustainable, and equitable way, major modifications to no national flood risk governance policy in the US are deeply needed (Tullos, D., 2018).

Nevertheless, as illustrated in the recommendation figure, implementing the framework in the existing structure may be seen as a promising method for transforming the community toward adaptive governance through reform. As a result of the survey conducted, there was positive feedback regarding the residents' support for the local government and their role in flood management. This implies that the people are ready to accept change. Because people are the power source, the local government can start the transformational process to ensure the community's resilience if it has the political will.

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Appendixes

Table 1: Interviewee details and date conducted

Phase	Sn	Expertise / responsibility	Date interviewed	Remark
First	Chatham University professor	Adaptive governance in climate change	30 November, 2021	
	Former Allegheny county disaster Management coordinator	Many years of Experience in Coordinating disaster response	10 April 2022	
	Chatham University professors	Governance in sustainability	30 November 2021	
	Chatham University Lecturer	Immense Ecology knowledge and practices	20 November 2021	
Second	Red cross	Decades of experience in disaster response and post-flood reconstruction	April 2022	Disaster program manager
	Allegheny county	A higher government tier that helps the municipality in all aspects	April 2022	Emergency Service division manager
	Sharpsburg borough officials	An elected official who serves the community.	April 2022	Only Mayor has been interviewed
	Sharpsburg faith-based organizations	Help in emergency response besides religious practices	April 2022	Roots of faith organization
	Sharpsburg voluntary organizations	Help community development initiatives	April 2022	

