CALIFORNIA BAPTIST UNIVERSITY

Riverside, California

Limited Resource Allocation Within FEMA's Hazard Mitigation Assistance Program:

An Exploration of Efficiency

A Dissertation Submitted in partial fulfillment of the
Requirements for the degree
Doctor of Public Administration

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Division of Online and Professional Studies

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October 2021

Limited Resource Allocation Within FEMA's Hazard Mitigation Assistance Program:

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Division of Online and Professional Studies at California Baptist University

in partial fulfillment of the requirements

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ABSTRACT

Purpose. The purpose of this study was to explore the relationship federal Hazard Mitigation Assistance (HMA) grant allocation has with the National Flood Insurance Program (NFIP) and the various elements closely associated with efficient spending (efficiency), estimated income per capita (equity), and historical damages and number of repetitive loss properties (effectiveness), by identifying the presence or absence of correlations.

Theoretical Framework: This study draws upon a moral framework grounded in rule consequentialism in order to establish allocative guidelines based on efficiency and effectiveness within the public sector.

Methodology. This bivariate correlation analysis examined 2,504 FEMA Region 6 communities that were eligible to receive HMA funding between the years 2000 and 2017 based upon NFIP participation and inclusion in a presidentially declared, flood-related disaster. A Pearson's correlation coefficient was conducted utilizing HMA dollars allocated as the dependent variable and historical damages, number of repetitive loss properties, and estimated income per capita as the three independent variables.

Findings. This study found a statistically significant, positive, correlation at the 99% confidence level for each of the three independent variables. However further analysis indicated that 38 outliers significantly impacted the strength of the correlations and that these outliers were associated with extraordinary, large scale, disasters.

Conclusions and Recommendations. This study concludes that based on the strength of correlation and indicated relationship between FEMA's HMA allocation and a community's historical damages and number of repetitive loss properties, FEMA is

currently allocating its limited resources in an effective and efficient manner. However, evidence suggests that this efficiency and effectiveness is reduced in smaller scale disasters. Furthermore, this study recommends additional analysis with a more holistic damage data set that captures damages beyond those recorded by the NFIP.
Keywords: Limited resource allocation, efficiency, effectiveness, public sector, public administration, rule consequentialism, Federal Emergency Management Agency, National Flood Insurance Program

ACKNOWLEDGEMENTS

I would first like to acknowledge and thank my committee chair Dr. Brett Provance for his compassion, patience, and guidance over the process of this study. Your feedback and direction were critical in the completion of this study. I would also like to thank my committee members, Dr. Riste Simnjanovski and Dr. Mark Moland, for their feedback and support throughout the process. Each of you truly helped to shape this study and ensure it met its mark.

Additionally, I would like to thank my Alpha Team comrades, Vincent Lariccia and Belona Betkolia. It was a pleasure to share the last several years with you both as we navigated the challenges of this program.

Next, I would like to thank my children Graham and Sawyer for putting up with my absences and long days where I wasn't able to give you all the attention you both deserve. And to my beautiful, funny, loving, and intelligent wife. You make my life better in every way. I am so lucky to have you by my side. Thank you for all your love and support over the past years. I could not have achieved this without you. I love you, Chelsea.

I would like to thank my brothers and sister, Austin, Jacob, and Samantha; I am lucky to have such driven and inspirational siblings, I look up to you guys all the time. To my Mom Julie, simply put, anything good about me came from you. You are the kindest most selfless person I know. Thank you for continuing to push me to continue academically; it's not about how hard you can hit but how hard you can get hit and keep going.

Lastly, I would like to thank my Dad; you have always been my role model and my compass. Whenever I need a piece of advice small or large, you are always the first person I turn to. You seem to have been around the world twice and have done everything once. Thank you for encouraging me to rise to this challenge and so many others.

DEDICATION

This paper is dedicated to the “man in the arena.” To those who run gallantly into the flame, smoke, and unknown, the masters of chaos and courage. … The protectors. The helpers.

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CHAPTER 1: INTRODUCTION

Background

In 2017 Hurricane Harvey made landfall as a Category 4 hurricane marking the first of three major hurricanes to hit the United States and its territories within less than 1 month. Hurricane Harvey was estimated to have caused over $125 billion in damages with Hurricanes Maria and Irma collectively causing another $140 billion. That is to say that the 2017 hurricane season saw over $265 billion in disaster damages (Federal Emergency Management Agency [FEMA], 2021b). As one examines the devastating effects of the 2017 hurricane season, it becomes clear that flooding is a major threat to coastal communities as well as to U.S. taxpayers. Unfortunately, hurricanes are not the only source of flooding the United States experiences. In fact, most flooding occurs as a result of rainfall, which leads to flash flooding. In 2017, there were 66 presidentially declared major flood-related disasters, 40 of which were not associated with hurricanes. This made 2017 one of the most expensive years in the history of the National Flood Insurance Program (NFIP; FEMA, 2021b). Gonick and Errett (2018) suggested that "this increase in billion-dollar disasters corresponds with an increased occurrence of climate-related hazards overall, including rising sea levels, floods, storms, extreme temperatures, droughts, and wildfires" (p. 1), which highlights a growing concern within the emergency management industry regarding climate change.

Climate change affects flooding in two distinct ways: sea level rise and increased storm activity. Rahmstorf (2017) offered, "Since satellite records began in 1993 the rate of rise is ~3 cm per decade and is also accelerating" (p. 1). This is largely due to glacier melt. However, Rahmstorf explained that "when it comes to the local sea-level rise,

which is responsible for changes in local flood risk, additional climate factors are at play: changing ocean currents, the gravity fingerprint of shrinking ice sheets, and changes in prevailing winds" (p. 1). In perhaps a more specific example, Reed et al. (2015) studied the impacts of rising sea levels and tropical cyclones on coastal inundation in New York City. They found that

> compared with the pre-anthropogenic era, flood heights have increased during the anthropogenic era not only due to relative sea level rise, but also due to changes in tropical cyclone characteristics, leading to an increased risk of coastal inundation for NYC. (Reed et al., 2015, p. 5)

Reed et al. concluded that "these results indicate the impacts of climate change on coastal inundation, and the necessity for risk management solutions" (p. 5). With evidence of worsening flooding, and the increase in annual damages, mitigation becomes a critical activity.

At the time of this study, as an emergency management professional in the public domain, I have a vested and growing interest in exploring how flood mitigation programs and use of taxpayer money align with efficient and effective flood mitigation activities. Although there are measures in place with the goal of achieving this outcome, I have found a lack of large-scale assessments and evaluations. As the impact from flooding continues to threaten the United States, it is important to ensure that mitigation activities are efficient and effective.

Statement of the Research Problem

Flooding remains the single most expensive and frequent natural disaster within the United States. According to FEMA (2010), "Flooding is the most frequent severe

weather threat and the costliest natural disaster facing the nation. Ninety percent of all natural disasters in the U.S. involve flooding" (p. 1). Building trends and sea level rise further stress the importance of proper flood mitigation projects and funding by public programs. The NFIP was created in 1968 due to the lack of private flood insurance availability (FEMA, 2005). This was a critical mitigation and resiliency step. In the aftermath of Hurricane Harvey, the average FEMA Individual Assistance grant was $7,000, yet the average payout through the NFIP was $100,000 (FEMA, 2018). That is to say that those who are impacted by a flood who have insurance are much more likely to recover than those without it. Therefore, because the NFIP enables individuals at risk to obtain flood insurance, it is a critical program. The issue arises, however, with the sustainability of this program. According to the U.S. Government Accountability Office (GAO, 2020), "The NFIP's premium rates have not provided sufficient revenue to pay claims. As a result, FEMA still owed Treasury $20.5 billion as of March 2020, despite Congress cancelling $16 billion of debt in 2017" (p. 2). The reason private insurance companies often avoid offering flood insurance and the reason the federal government had to initiate this program is because it is very difficult to generate profit in this industry. Large-scale disasters, such as Hurricane Harvey, will bankrupt most insurance companies if they choose to provide coverage. However, while the concept of the NFIP is crucial, it has failed to do any better. As Walsh (2017) pointed out, the NFIP

> has been in the red since Hurricane Katrina flooded New Orleans in 2005. It still has more than a thousand disputed claims left over from Sandy. And in October, it exhausted its $30 billion borrowing capacity and had to get a bailout just to keep paying current claims. (p. 1)

Walsh also provided an example of one house valued at $42,024 that has been repaired 19 times and cost the NFIP an estimated $912,732. This example, multiplied by the many other examples available, represents a financial drain on the federal budget.

Perhaps one of the biggest opportunities to help the NFIP is FEMA's Hazard Mitigation Assistance (HMA) program. This federal grant program provides money to states that are impacted by a presidentially declared disaster, which are then allocated to the impacted communities within the state to engage approved mitigation activity. The term *community* refers to an independent jurisdiction (further defined in the definitions section). Reoccurring instances, such as the one noted by Walsh (2017), suggest that the mitigation grants may not be going toward the most financially draining structures, which would further suggest that the federal grant programs may be ineffective through misallocation. This concern calls for the need for a programmatic analysis as to the efficiency and effectiveness of HMA spending. Therefore, the problem is that there is an existing need to explore the relationship between high-risk repetitive loss structures within the NFIP and the allocation of HMA projects to identify any possible disconnect, which would suggest inefficiencies and ineffectiveness of the federal programs.

Purpose Statement

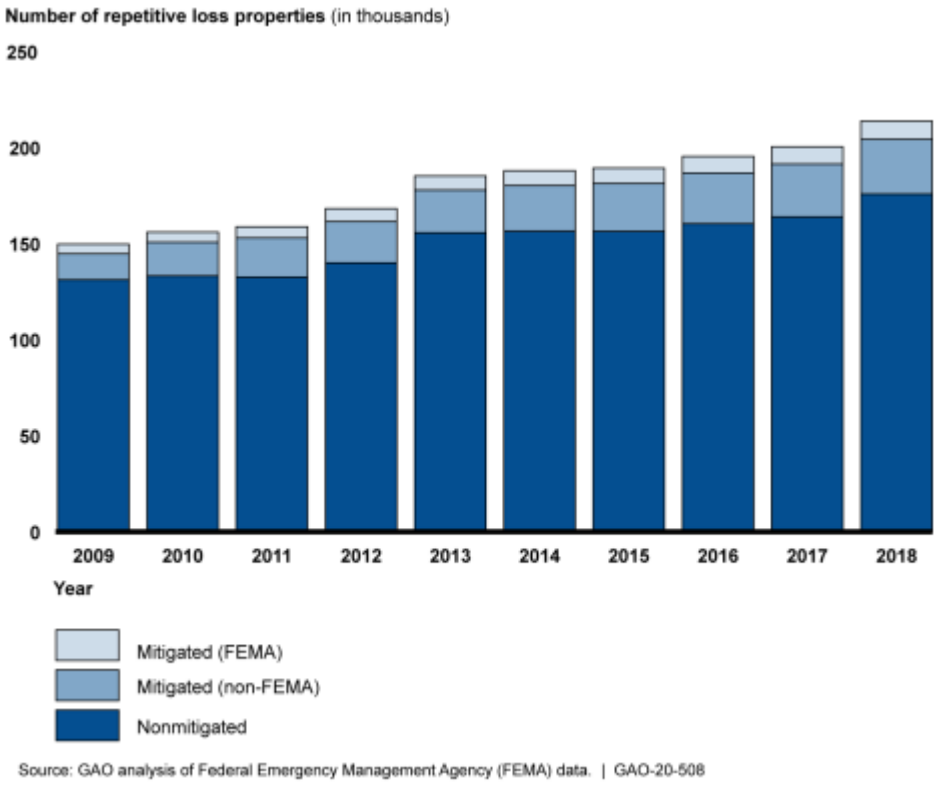
The purpose of this study was to explore the relationship that the federal HMA grant allocation has with NFIP and the various elements closely associated with efficient spending (efficiency), estimated income per capita (equity), and historical damages and number of repetitive loss properties (effectiveness) by identifying the presence or absence of correlations.

The public sector applies additional complications and considerations to the predicament the HMA program and NFIP are in. Foundational to these considerations is the fact that each program depends on congressional funding, which is generated from federal taxes. These programs must answer to the American people. In the private sector, negative performance, such as that seen by the NFIP's need for additional public funding, would likely not be tolerated long. Typically, above all else, the private sector measures the value of a program based on the profit the program can generate. In this regard, the NFIP is a losing program consistently in need of federal bailout. The 2019 High Risk Series published by the GAO has identified the NFIP as a high-risk program and has suggested that Congress should consider comprehensive reform of this program because of its ineffectiveness. The NFIP is currently in a critical position because of its inability to successfully implement its mission.

Figure 1 illustrates the extent of the NFIP's position by showing a steady rise in total *unmitigated repetitive loss* properties despite an increase in mitigation activity. Unmitigated repetitive loss properties (further defined in the definition section) refers to properties that have sustained flood damages on multiple occasions and have not had sufficient construction applied to them to reduce the flooding impact. In contrast, a *mitigated repetitive loss* structure refers to a structure that has sustained flood damages on multiple occasions but has undergone construction to reduce the flooding impact such as elevation, relocation, or demolition. Figure 1 illustrates that in addition to the rise in unmitigated repetitive loss, FEMA is not the greatest source of funding for the limited mitigation activities that have been conducted on these high-risk structures. This reality further supports a disconnect between the NFIP and the HMA program.

Figure 1

National Flood Insurance Program, Cumulative Number of Mitigated and Nonmitigated Repetitive Loss Properties, 2009–2018



Note. This figure depicts a rise in nonmitigated repetitive loss properties and the ineffectiveness of FEMA-funded mitigation. From *National Flood Insurance Program: Fiscal Exposure Persists Despite Property Acquisitions*, by U.S. Government Accountability Office, 2020, p. 25 (https://www.gao.gov/assets/710/707821.pdf).

This study serves as an early yet critical step in better understanding the complex relationships that federal disaster assistance programs have with grant allocation. The goal is to take the first step toward identifying opportunities and metrics needed to reform federal grant allocation and improve the overall efficiency and effectiveness of U.S. tax dollars in the mission of ensuring a safer more resilient homeland.

Research Questions

1. Is there a correlation between HMA projects and cumulative historical disaster damages (as informed by NFIP claims) associated with flooding?

   H_0: A community's cumulative flood damage does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's cumulative flood damage impacts the amount of HMA funding they receive, $r \neq 0$.

2. Is there a correlation between HMA projects and the number of NFIP repetitive loss and severe repetitive loss properties within a community?

   H_0: A community's number of repetitive loss properties does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's number of repetitive loss properties impacts the amount of HMA funding they receive, $r \neq 0$.

3. Is there a correlation between HMA projects and the estimated income per capita of a community?

   H_0: A community's estimated income per capita does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's estimated income per capita impacts the amount of HMA funding they receive, $r \neq 0$.

Significance of the Problem

Through the exploration of the HMA resource allocation, this study highlights the presence or absence of efficient and effective allocation. The significance of this outcome is that it identifies areas within the federal programs that need to be adjusted or

reformed. Additionally, this study identifies correlations between allocation trends and political factors that may influence future studies. The desired long-term impact of this study and those it may influence is to increase the efficiency and effectiveness of public sector limited resource allocation.

Definitions

Communities. Community means

> any state or area or political subdivision thereof, or any Indian tribe or authorized tribal organization, or Alaska Native village or authorized native organization, which has authority to adopt and enforce flood plain management regulations for the areas within its jurisdiction. (Office of the Federal Register, National Archives and Records Administration [OFR, NARA], 2013, p. 183)

Efficiency. This study, while acknowledging several variations of definitions, utilized Waldo's (1984) definition of efficiency: "The efficiency of administration is measured by the ratio of the effects actually obtained with the available resources to the maximum effects possible with the available resources" (p. 191).

Eligible community. Eligible community or participating community means a community for which the federal insurance administrator has authorized the sale of flood insurance under NFIP (OFR, NARA, 2013).

Estimated income per capita. Estimated income per capita or "Per Capita Income" is a data field utilized by the Centers for Disease Control and Prevention's Social Vulnerability Index (SVI) to partially explain a community's economic vulnerability. It is derived from the American Community Survey (ACS, 2019) by which it is defined as

> the mean income computed for every man, woman, and child in a particular group including those living in group quarters. It is derived from by dividing the aggregate income of a particular group by the total population in that group. (p. 88)

Flood damages. This term refers to the monetary damages from flood-related incidents. It is an aggregate of physical and emotional damages, from flood-related instances, as verified by FEMA, expressed as a dollar amount.

Flood related. This term is utilized to describe instances or occurrences that are directly associated with or from the natural hazard of flooding. This term is utilized to distinguish incidents that possess a flood component from incidents that do not possess a flood component. This study lists several variables and metrics that must be present for an incident to be considered flood related.

Happiness. Happiness is a term utilized in the description of utilitarianism that refers to an emotional state that is desirable or pleasurable. This study utilized this term to express an activity or practice that increases the welfare and resilience of the majority of individuals within society.

Hazard mitigation. According to FEMA (2021d), the term hazard mitigation is defined as "any action taken to reduce or eliminate long term risk to people and property from natural disasters" (para. 1). This study refined this term further by suggesting hazard mitigation encompasses activity that removes the risk from vulnerable structures representing a liability to the public and by which the mitigation of these structures reduces the financial burden for taxpayers.

Limited resources. This term refers to resources that are constrained and finite at a particular point in time. More specifically, this study utilized this term to discuss money originating from federal taxes that has been allocated to the HMA program within FEMA. This qualifies as a limited resource because the amount allocated is finite.

Mitigated repetitive loss. This term refers to both repetitive loss and severe repetitive loss structures that have undergone mitigation activity such as elevation, relocation, and in some cases wet-flood proofing to reduce the negative impacts of flooding.

Repetitive loss. This term refers to an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978.

Severe repetitive loss. This term refers to

> a residential property that is covered under an NFIP flood insurance policy and: (a) That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or (b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period and must be greater than 10 days apart. (FEMA, 2008, p. 7)

Substantial damage. Substantial damage means "damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred" (OFR, NARA, 2013, p. 190).

Small impoverished community. This is a "community of 3,000 or fewer individuals economically disadvantaged as determined by the State in which the community is located and based on criteria established by the President" (FEMA, 2019, p. 5).

Unmitigated repetitive loss. This term refers to repetitive or severe repetitive loss structures that have not undergone any mitigation activity.

Vulnerable. According to Einarsson and Rausand (1998),

> The vulnerability concept is used to characterize a system's lack of robustness or resilience with respect to various threats, both within and outside the boundaries of the system. … the term vulnerability … describe[s] the properties of an industrial system that may weaken its ability to survive and perform its mission in the presence of threats. … The properties of an industrial system; its premises, facilities, and production equipment, including its human resources, human organization, and all its software, hardware, and net-ware, that may weaken or limit its ability to endure threats and survive accidental events that originate both within and outside the system boundaries. (pp. 535–536)

Organization of the Study

This study laid a framework for evaluating the efficiency of federal grant programs, specifically FEMA's HMA program. This framework used utilitarian principles to measure the outcome described in Waldo's (1984) definition of efficiency. A quantitative examination of multiple communities within FEMA's Region 6 was conducted to highlight trends that either align or fail to align to this framework. This study examined the relationship between high-risk, taxpayer costly repetitive loss and

severe repetitive loss structures and grant project allocation. Findings of the study were combined with the correlation analysis of historical grant spending and historical flood-related damages to draw conclusions on the federal government's efficiency of limited resource allocation.

CHAPTER 2: REVIEW OF THE LITERATURE

History of the Subject Being Studied

Foundational to this study is the theoretical concept of efficiency and effectiveness within the public sector. Prior to an examination on allocative efficiency, there must be a thorough exploration of literature on efficiency and effectiveness, yet prior to an exploration of efficiency and effectiveness, there must be a moral framework in which effectiveness can be determined. Therefore, at the root of this literature review lies a need to examine the ethical theory of utilitarianism.

Historical Context

History, Mission, and Legislation Surrounding the Federal Emergency Management Agency

Skelley (2008) argued that a dichotomy exists between politics and public administration. This dichotomy describes the differences and connections between two distinct entities: politics or legislation and public administration or the method of administering legislation. Although this study explored administrative practices, specifically resource allocation, this concept is critical because it displays the importance of a thorough review of the literature regarding a public program. This literature lays out the intent and goal of the policies underlying any public sector program or practice. When discussing the efficiency and effectiveness of a program, the intent of the program must be considered. Through a review of critical legislation, key goals and objectives are extracted to establish a framework of desired program outcome. This section briefly reviews the history and mission of the Federal Emergency Management Agency (FEMA)

as well as summarizes eight congressional acts and two presidential executive orders in relation to their significance to the Hazard Mitigation Assistance (HMA) program.

Before a person can appropriately apply principles of allocative efficiency to this study, the individual must first achieve a level of understanding as to the mission of FEMA, the public sector entity distributing the resources. This understanding sheds light on the expectation or desired outcome of the public service agency that U.S. taxpayers continue to fund. Stated simply, it allows one to begin to measure performance at a macrolevel before diving into the microefficiencies of grant allocation. The various expectations set forth throughout the different pieces of legislation allow the development of a framework that possesses the ability to assess the effectiveness of the allocative systems output. This framework is critical to evaluating HMA's efficiency of resource allocation.

The mission statement of FEMA (n.d.) states, "To help people before, during, and after disasters" (p. 6). However, while most can appreciate the simplicity of this statement, it deserves some unpacking. The first segment of the statement "to help" is rather broad and provides little understanding as to what actions FEMA takes, other than implying that these actions are beneficial to people. Therefore, perhaps a better example is found within FEMA's (n.d.) first publication, explaining that its mission is "encouraging risk reduction and risk management practices of government partners so that our Nation is better prepared and more resilient, ultimately saving lives and protecting property and the environment" (p. 52) or as stated in the Post-Katrina Emergency Management Reform Act of 2006:

> The primary mission of the Agency is to reduce the loss of life and property and protect the Nation from all hazards, including natural disasters, acts of terrorism, and other man-made disasters, by leading and supporting the Nation in a risk-based, comprehensive emergency management system of preparedness, protection, response, recovery, and mitigation. (p. 3)

These additional explanations help to summarize what actions the public and its representatives in Congress expect of the agency.

Next, with FEMA's mission established, it becomes important to explore key legislation and its impact on the agency's evolution and to understand the duty owed to U.S. taxpayers. The evolution of what is today FEMA is critical to defining and measuring agency performance. Without a clear ability to decide whether an action or, in the case of this study, an allocation of a grant is aligned to the expected outcome, there is no accountability. Therefore, a brief summary of FEMA's evolution is needed. With many public entities, the passing of key legislature often marks the various growth milestones and pivot points of an agency. This phenomenon holds true for FEMA.

FEMA, as it is known today, is a relatively young agency. However, its origins can be traced back to the early 1800s where following a major fire in New Hampshire, Congress provided relief to effected merchants. The next significant evolution came in 1950 when Congress passed the Federal Disaster Relief Act (Public Law 81-875), which allowed states to seek federal assistance when their capacity or capability was exceeded (Lindsay & Murray, 2011). This legislature was the first to display the charge taxpayers expected of the federal government. That charge was to support disaster recovery with federal funding, when necessary.

In 1968, Congress passed the National Flood Insurance Act. This legislation provided perhaps the most significant piece of context to aid in this study's development of an efficiency framework. This act made flood insurance coverage available to homeowners and established a national program for flood risk reduction. This represented a desire by the American public to fund, via federal taxes, the reduction in flood risk, or to state it in another way, the American public found it worth their taxes to fund a program that protects them from, and reduces the impact of, the flooding hazard.

In 1974, the Disaster Relief Act consolidated many changes to the federal government's operations that arose in response to the particularly destructive Hurricane Agnes and the "Terrible Tuesday" tornados (FEMA, 2003, p. 57). Although this act was not substantial at the time, it was later amended to become the Stafford Act, which is a foundational piece of legislation for FEMA today. In 1978, President Carter signed two executive orders establishing FEMA with the dual mission of emergency management and civil defense (FEMA, 2003). This action not only created FEMA, but it also assigned it the responsibility of managing emergencies and civil defense. Recognizing this underlying responsibility is critical to establishing a desired or effective outcome when constructing an efficiency framework.

The Robert T. Stafford Act is perhaps FEMA's single most influential piece of legislation. This act, passed in 1988, was an amendment to the Disaster Relief Act of 1974. The purpose of this act, as stated within, is "to provide an orderly and continuing means of assistance by the Federal Government to State and local governments in carrying out their responsibilities to alleviate the suffering and damage which result from such disasters" (FEMA, 2021e, p. 1). The act lays out six declarations as to how this

should occur. For this study, two of these declarations are significant. They are as stated as follows: "encouraging hazard mitigation measures to reduce losses from disasters, including development of land use and construction regulations; and providing Federal assistance programs for both public and private losses sustained in disasters" (FEMA, 2021e, p. 1). These declarations will help define the expected outcome for resources allocated through the HMA program.

The next significant legislation affecting FEMA and the HMA mission was the Disaster Mitigation Act of 2000 (U.S. Copyright Office, 2000). This act primarily accomplished three measures. First, it established the National Pre-Disaster Mitigation Fund. This funding mechanism is for the pre-disaster mitigation (PDM) grants, one of three grant programs that make up the greater HMA program. This legislative measure acknowledges the power of mitigation and represents an early financial commitment to this acknowledgement. Second, this Act required state, local, or tribal governments to submit a mitigation plan for presidential approval as a condition of the receipt of increased federal share for hazard mitigation measures. This requirement is an early indicator that funding, specifically federal funding, should only be awarded to efficient and effective activity. The requirement of a mitigation plan was a step to ensure that there was additional thought and analysis into what activities would be pursued with mitigation funding. Finally, this legislation authorized states and local governments to receive additional assistance and directed it to "(1) support effective public-private partnerships; (2) improve the assessment of a community's natural hazards vulnerabilities; or (3) establish a community's mitigation priorities" (U.S. Copyright

Office, 2000, para. 2). The act emphasized that this activity should occur in a cost-effective manner.

Following the devastating terrorist attacks that occurred on September 11, 2001, the emergency management components of the United States undertook significant reform. In 2002, the Homeland Security Act, among many other things, created the Department of Homeland Security (DHS) as a stand-alone cabinet-level department and consolidated several federal entities, including FEMA, and placed them within the department. This realignment of forces charged DHS with

> all functions and authorities prescribed by the Robert T. Stafford Disaster Relief and Emergency Assistance Act; and a comprehensive, risk-based emergency management program of mitigation, of planning for building the emergency management profession, of response, of recovery, and of increased efficiencies. (U.S. Copyright Office, 2002, para. 100)

It also designated FEMA to remain as the lead agency for the Federal Response Plan established under Executive Orders 12148 and 12656. This reform was significant because it represented an increase in public trust and responsibility for FEMA and its programs.

In August of 2005, Hurricane Katrina, a Category 5 tropical cyclone, impacted the United States causing over $125 billion in damages and resulting in over 970 Katrina-related deaths in Louisiana alone (Brunkard et al., 2008). One of the largest contributors to this devastation was the failure of critical levees in and around the New Orleans area (U.S. Government Publishing Office, 2006). This disaster highlighted several shortcomings with the current state of federal emergency management and as a result

brought about significant reform in the shape of the Post-Katrina Emergency Management Reform Act of 2006 (U.S. Copyright Office, 2006).

This piece of legislation amended the Homeland Security Act of 2002 and established FEMA as a distinct agency within DHS, thereby creating an administrator position as head of FEMA. This reform further highlighted America's need for effective emergency management and the expectation that FEMA would be the agency to provide it. Another significant outcome of this legislation was its task to establish 10 regional offices where FEMA's mission can be better managed following a more decentralized model (U.S. Copyright Office, 2006). This change would lead to regional oversight, which would provide more intimate grants allocation to the states within. Yet, another outcome from this legislation is that it "requires state mitigation plans to identify the natural hazards, risks, and vulnerabilities of areas which substantially increase the risk of damage, hardship, loss, or suffering in the event of an emergency or major disaster" (U.S. Copyright Office, 2006, p. 1). This represents a shift in risk analysis that places more emphasis on critical infrastructure with the goal of reducing cost postevent. Finally, this legislation is significant to the HMA program because it increases the authorized percentage of federal contributions for a major disaster under the Hazard Mitigation Grant Program (HMGP), one of HMA's largest grant programs, which is discussed later in this chapter.

Further reform came several years later in the form of the Sandy Recovery Improvement Act of 2013 (U.S. Copyright Office, 2013). This act sought to reform areas of FEMA after another hurricane impacted the United States once again, causing over

$100 billion in damages in addition to killing many people. This batch of reform was significant to HMGP because it authorized the U.S. president to

> approve public assistance projects for major disasters or emergencies under alternative procedures with the goal of: (1) reducing the costs to the federal government of providing such assistance; (2) increasing flexibility in the administration of assistance; (3) expediting the provision of assistance to a state, tribal or local government, or owner or operator of a private nonprofit facility; and (4) providing financial incentives and disincentives for the timely and cost-effective completion of projects. (U.S. Copyright Office, 2013, p. 1)

This authorization displays a desire for FEMA to be more cost effective and flexible with the grants program. It is also important to note that this legislation authorized the consolidation of state, local, or tribal facilities as a single project. The project could consist of several sites spread across multiple jurisdictions and community lines.

Finally, the most recent round of significant reform was signed into law via the Disaster Recovery Reform Act of 2018 (Gaynor, 2019). This piece of legislation followed critical findings and lessons learned from Hurricane Harvey in 2017. At the time of this study, this legislation was newly passed, and although much of its administrative strategy is still in draft form, it provides several powerful changes to the HMA program. The largest change is its creation of the Building Resilient Infrastructure and Communities (BRIC) program, which will likely replace the Pre-Disaster Mitigation grant program. This change also opens 6% of federal postdisaster grant funding. Gaynor (2019), the current administrator of FEMA, stated, “The BRIC program aims to categorically shift the federal focus away from reactive disaster spending and toward

research-supported, proactive investment in community resilience" (p. 2). This paradigm shift toward research-supported investment highlights the desire to allocate resources more effectively.

From the formation of FEMA to the many evolutions and policy reforms that followed, the function of emergency management and the responsibility to protect people and property from adverse natural and man-made hazards have never ceased to be of vital importance to the American public. Foundational to many of these changes were the various legislative measures aimed at defining expectations and correcting poor performances. As mentioned at the beginning of this chapter, legislation is only part of the executive process; however, it possesses strong utility in isolating the expectations of a public program.

Within this review of legislation, several key expectations have been identified. First, the activities and outcomes expected of FEMA were defined, namely, to reduce the loss of life and property through the use of a comprehensive emergency management system, which includes preparedness, protection, response, recovery, and the primary focus of this study, the allocation of mitigation activity.

Next, several expectations were laid out through the chronology of legislation. At its earliest form, the federal government's emergency management entity was charged with providing financial relief for merchants, setting the precedent of federal disaster relief grants. Later, this expectation evolved into allowing states to request this federal assistance following the depletion of local and state resources. Then, focusing on the topic of this dissertation, the National Flood Insurance Program (NFIP) was established, which provided an avenue for citizens to have access to flood insurance. President

Carter's executive order charged FEMA with the responsibility to manage federal emergencies and civil defense. The Stafford Act was a priority shift toward mitigation and financial efficiency as it encouraged hazard mitigation measures to reduce losses from disasters by providing federal assistance programs for both public and private losses sustained in disasters. The Disaster Mitigation Act established the funding mechanism for PDM grants and required grantees to establish mitigation plans, which carefully considered and calculated risk, further reinforcing the belief in mitigation action and financial efficiencies.

Later, the Homeland Security Act and Executive Orders 12148 and 12656 created DHS, which consolidated several federal entities, including FEMA. This act designated FEMA to remain as the lead agency for the Federal Response Plan, further highlighting the public's trust in FEMA's outcomes. The Post-Katrina Emergency Management Reform Act established FEMA as a distinct agency within DHS, established FEMA's regional offices, required extensive risk analysis within state mitigation plans to increase mitigation efficiency, and increased the authorized percentage of federal contributions for a major disaster under the HMGP. Finally, the Sandy Recovery Improvement Act made a direct effort to increase financial efficiencies, and the Disaster Recovery Reform Act established the BRIC grant, which opens 6% of federal postdisaster grant funding.

The collective of these measures expresses a strong intent for federal government to possess the ability to provide financial support and relief to wide-ranging incidents that exhaust the local and state government's ability to recover. While the avenue and extent of this federal assistance continues to evolve, it is clear that legislators desire the assistance to be proactive and efficient, both financially and strategically. These

expectations served as key measurements for this study's establishment of resource efficiency and outcome effectiveness.

National Flood Insurance Program

NFIP was developed in 1968 when Congress passed the National Flood Insurance Act. This program, which now serves as a critical resiliency tool, was conceived out of necessity: "During the 1920s, the insurance industry concluded that flood insurance could not be a profitable venture because the only people who would want flood coverage would be those who lived in floodplains" (FEMA, 2005, p. 56). Flooding is a very difficult hazard for private insurance agencies to cover because structures with enough risk to warrant a policy often live in close proximity to one another. This makes it very difficult for insurance agencies to spread the policy coverage and thereby reduce the financial risk. Simply stated, if an insurance agency provides coverage for a coastal community and that community experiences a major hurricane, the insurance agency would likely go bankrupt trying to pay out all the claims. The only way for this agency to recover some of these funds would be to insure other communities not impacted by the disaster. The additional policy premiums would ideally offset the claims in the impacted community. While this diversity in coverage is difficult to do in the private sector, it is exactly what the NFIP was intended to do in the public sector (Frank, 2019). However, it is worth noting that recent advancements in flood studies and technology have increased an understanding in risk assessment, which has allowed the private market to grow within this sector.

Underlying the creation of the NFIP was an increasing and unacceptable public expense following flooding disasters. Federal taxes were funding disaster response and

recovery operations. In the case of flooding, this was not an equitable arrangement. Those who did not live in flood-prone areas had to fund the expense for those who did, often by choice. Congress found this unacceptable, so in the passing of the National Flood Insurance Act, Congress intended to

> transfer the costs of private property flood losses from the taxpayers to floodplain property owners through flood insurance premiums, provide floodplain residents and property owners with financial aid after floods, guide development away from flood hazard areas and require new and substantially improved buildings be constructed in ways that would minimize or prevent damage during a flood. (FEMA, 2005, p. 56)

These intentions were aimed at reducing the negative impact on federal taxpayers.

For this study, it was important to recognize that while the NFIP is structured to self-cover its costs by funding all activity with policy premiums, it has failed to do so. As mentioned in Chapter 1, the GAO (2020) has investigated this program and has broadcasted some stark conclusions: For example, "The NFIP's premium rates have not provided sufficient revenue to pay claims. As a result, FEMA still owed Treasury $20.5 billion as of March 2020, despite Congress cancelling $16 billion of debt in 2017" (p. 2). This finding suggests that the NFIP remains a financial burden on federal taxpayers, which undermines the very reason for its creation. Given the program's poor performance, and the need for further reform, this study presents an understanding of several waste indicators as well as a review of the primary mitigation-funding mechanism, the HMA program.

Hazard Mitigation Assistance Program

Federal grants in general exist to address any shortcomings or programmatic challenges within federal programs. They attempt to provide balance and opportunities to resolve issues. According to FEMA's (2021d) HMA Guidance, "The U.S. Department of Homeland Security (DHS) FEMA HMA programs present a critical opportunity to reduce the risk to individuals and property from natural hazards, while simultaneously reducing reliance on Federal disaster funds" (p. 1). This program's intent is just as its name suggests, to mitigate against hazards by strategically funding mitigation activity.

To best understand the HMA program, it is beneficial to discuss where its funding is derived from in the context of the federal budget. This context allows one to see how the program's efficiency and effectiveness are in the direct interest of U.S. taxpayers. To provide specific examples, this study utilized the federal budget for fiscal year 2020. The annual federal revenue for 2020 was approximately $3.7 trillion. This revenue is the sum of U.S. payroll tax, U.S. income tax, and U.S. corporate income tax. This annual revenue makes up the majority of the U.S. annual budget of $4.7 trillion. The $4.7 trillion represent the collective interest of U.S. taxpayers and is what the federal government utilizes to meet the cost for all its programs and services. The U.S. budget is then divided into two fund categories: mandatory and discretionary. Because HMA and all of FEMA's funding fall within discretionary funding, this study avoids discussing mandatory spending, but it is worth noting that mandatory spending accounts for approximately two thirds of the federal budget.

Within the discretionary funds, DHS received $51.7 billion. FEMA, a single agency within DHS, received $28.5 billion (DHS, 2020). The NFIP was allocated

$4.9 billion to include nearly $3.8 billion to its National Flood Insurance Fund (NFIF; DHS, 2020). The NFIF is a premium and fee-generated fund that supports the NFIP. This fund is designed to be largely self-funded through the collection of policy premiums, federal policy fees, and assessments and surcharges on NFIP policies. However, this fund, which exists within the NFIP, continues to receive billions in annual mandatory fees despite owing the U.S. Treasury Department $20.5 billion. In comparison, as noted within the FY 2021 Budget,

> As presently structured, the program is unable to pay this debt back in full. The program has paid over $4.6B in interest to the Treasury on NFIP debt since Hurricane Katrina in 2005 and continues to pay over $400M per year in interest on the borrowed funds. (DHS, 2020, p. 360)

This is a very problematic situation when viewed from the interest of taxpayers. The Disaster Relief Fund accounts for the other $19.5 billion in funding (DHS, 2020). This fund is authorized by the Stafford Act and serves as the primary source of FEMA's planning, response, recovery, and mitigation funding. This fund is also the funding source for the disaster grants within the HMA program, which is expanded upon later in this chapter.

HMA Considerations and Application Process

There are several conditions to the application process for HMA grants. The first condition for applicants and subapplicants is the need for a preestablished Hazard Mitigation Plan. This plan should "identify hazards and assess risk to develop wide-ranging hazard mitigation measures" (FEMA, 2021d, p. 24). All participating communities should continue to explore and develop projects that can be submitted once

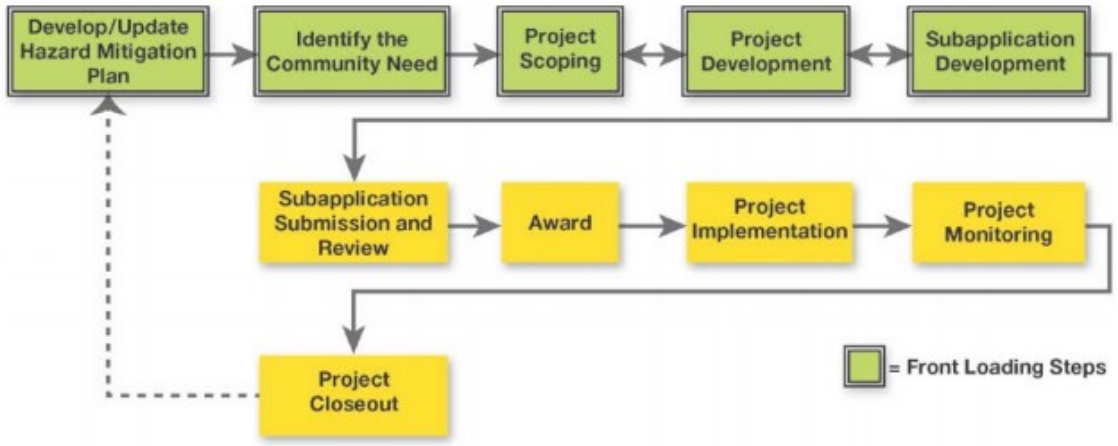
they are declared eligible for funding. Once a project is submitted to the applicant (often the state emergency management component such as the Texas Department of Emergency Management), the applicant will decide which projects will be awarded based on preestablished priorities.

Another condition, which is discussed further in the cost effectiveness versus benefit cost analysis section, is a project's need to be cost effective. Both the state and FEMA will evaluate a project's cost effectiveness prior to its award. Finally, another condition worth noting for HMA project application is its ability to provide a long-term or permanent solution. It is widely acknowledged within the profession that these conditions exist to prevent any waste of grant dollars and ensure that each individual project is deemed cost effective. Yet, while these conditions ensure that each project is both cost and technically effective, they focus too heavily on the microlevel at the sake of macrolevel analysis, which would compare project allocation on a multijurisdictional or even multistate level.

While all HMA grant programs share the similar goal of reducing risk, they are not all the same and have unique aspects worth further exploring. HMA is composed of three grant programs: the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) Program, and the Pre-Disaster Mitigation Program (PDM; see Figure 2).

Figure 2

Overall Project Cycle



Note. This figure illustrates the life cycle of an HMA project, distinguishing steps that can be accomplished prior to grant availability. From *Hazard Mitigation Assistance Grants*, by FEMA, 2021d, p. 24, U.S. Department of Homeland Security (https://www.fema.gov/grants/mitigation).

Hazard Mitigation Grant Program

The HMGP is considered a disaster grant, which means its availability and the extent of its funding rely on a community's standing within a presidentially declared disaster. After a disaster, such as a hurricane strikes, preliminary damage assessments are conducted to assess the extent and location of damages. Depending on how severe the impact is on a community, it will or will not be included within the declaration. Once a disaster had been presidentially declared as a major disaster, the HMGP is made available. These communities can then become subapplicants enabling them to submit project requests to the state, which serves as the applicant for the HMGP funding. The amount of funding depends on the total amount of federal assistance provided in response to the qualifying disaster. There is a sliding scale that determines the maximum amount

of HMGP dollars based upon this total assistance. According to Homeland Security Emergency Management (2019),

> The formula provides for up to 15 percent of the first $2 billion of estimated aggregate amounts of disaster assistance, up to 10 percent for amounts between $2 billion and $10 billion, and up to 7.5 percent for amounts between $10 billion and $35.333 billion. (p. 4)

For example, a disaster with a total amount of disaster assistance of $2 billion would be eligible to receive up to $300 million in HMGP funding.

Grants from the HMGP are often the largest funding source for mitigation projects and do not possess the NFIP policy requirement seen with FMA grants. However, this grant program is not limited to the flood hazard and can be used to fund any project that meets the eligibility requirements. To be eligible, a project must

> (1) Be in conformance with the State Mitigation Plan and Local Mitigation
>
> (2) Have a beneficial impact upon the designated disaster area, whether or not located in the designated area
>
> (3) Be in conformance with 44 CFR part 9, Floodplain Management and protection of Wetlands, and 44 CFR part 10, Environmental Considerations
>
> (4) Solve a problem independently or constitute a functional portion of a solution where there is assurance that the project as a whole will be completed. Projects that merely identify or analyze hazards or problems are not eligible.
>
> (5) Be cost-effective and substantially reduce the risk of future damage, hardship, loss, or suffering resulting from a major disaster (OFR, NARA, 2013, p. 510).

While these requirements guide the usefulness of a project from an all-hazards perspective, they do not ensure that the project addresses the hazard that made the funds available. There is no requirement that the grant be applied to the initiating hazard. Therefore, hypothetically, a community could be impacted by a hurricane causing extensive flood damages across the community, but rather than submit a project to elevate or relocate flood-prone structures, the community could submit a project to install tornado sirens or safe rooms. This freedom of project selection is problematic considering the state of the NFIP and the burden its debt places on taxpayers.

Flood Mitigation Program

The Flood Mitigation Program, also known as FMA Program, is a grant program within the greater HMA program. This grant program is considered a nondisaster grant program because it is not reliant on a disaster declaration as a prerequisite to the funding. The FMA program

> is a competitive grant program that provides funding to states, local communities, federally recognized tribes and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. (FEMA, 2021c, para. 1)

The designation of a competitive grant program means that projects and applicants compete for a finite amount of funding. That is to say that while a project or applicant might meet each of the qualifications, they might not be selected over other projects or applicants.

This grant program is unique in the aspect that all projects require the presence of an active NFIP policy. This grant program is the most aligned with the interest of the

NFIP and prioritizes projects that represent a liability to the NFIP. This is not surprising because the funding for this grant is derived from the NFIF, as described previously in this chapter. During each funding cycle, the administrator of FEMA will allocate the available funds for FMA. According to the OFR, NARA (2013),

> The total amount of FMA Project Grant funds provided during any 5-year period will not exceed $10,000,000 to any State or $3,300,000 to any community. The total amount of Project Grant funds provided to any State, including all communities located in the State will not exceed $20,000,000 during any 5-year period. (p. 377)

When analyzed from the community perspective, this grant program is quite limited in its funding ability when compared to other HMA grants. For example, while the FY 2020 Notice of Funding Opportunity (NOFO) for FMA grants was $200 million, the maximum a single community could receive over a 5-year period was $3.3 million.

Another important aspect to this grant worth discussing is the reduced cost share for certain projects. Just like the other HMA grants, the general cost share for FMA projects is 75%–25%. That is to say that while the community would have to pay for 25% of the project's expenses, FEMA would reimburse 75% of those costs. However, for certain eligible projects, this cost share is reduced. According to FEMA (2020),

> For each severe repetitive loss structure, FEMA may contribute either: (i) Up to 100 percent of all eligible costs if the activities are technically feasible and cost effective; or (ii) Up to the amount of the expected savings to the NFIP for acquisition or relocation activities; (2) For repetitive loss structures, FEMA may contribute up to 90 percent of the eligible costs. (p. 53504)

This reduction in cost share illustrates the program's recognition of these structures being financial liabilities and emphasizes the NFIP's desire to reduce them.

Pre-Disaster Mitigation

At the time of this study, the PDM grant had been replaced with a new grant known as the BRIC grant. This change occurred as a result of the Disaster Recovery Reform Act of 2018. The first funding opportunity under this new grant was released in September of 2020. However, because this study was limited to grant allocation between the years 2000 and 2017, the BRIC program was not included. Although the PDM grant has since been reformed, it was used to analyze grant allocation for this study.

The PDM grant, as its name suggests, is a nondisaster grant aimed at providing a funding mechanism to mitigate communities prior to the impact of a disaster. According to the Disaster Mitigation Act of 2000, the purpose of the PDM grant is to

> implement pre-disaster hazard mitigation measures that are cost-effective and are described in proposals approved by the President under this section; and (B) may be used—(i) to support effective public-private natural disaster hazard mitigation partnerships; (ii) to improve the assessment of a community's vulnerability to natural hazards; or (iii) to establish hazard mitigation priorities, and an appropriate hazard mitigation plan, for a community. (§ 1554)

While the scope of eligible projects under this grant program is quite broad, one of the major limiting factors is the qualifications for its subapplicants.

This grant was intended to provide assistance to small, impoverished communities that lack the financial and technical resources to protect their property and residents from

natural hazards. The intent is for governors to identify these communities and request assistance from the president. Title 42 of the Code of Federal Regulations states,

> Minimum and maximum amounts in providing financial assistance under this section, the President shall ensure that the amount of financial assistance made available to a State (including amounts made available to local governments of the State) for a fiscal year—(A) is not less than the lesser of—(i) $575,000; or (ii) the amount that is equal to 1 percent of the total funds appropriated to carry out this section for the fiscal year; and (B) does not exceed the amount that is equal to 15 percent of the total funds appropriated to carry out this section for the fiscal year. (OFR, NARA, 2019, p. 5804)

As an example, in the FY 2019, the PDM received $250 million in funding (Federal Insurance and Mitigation Administration [FIMA], 2019).

Like the other grants within the HMA program, the typical federal cost share rate is 75%–25%; however, the president may contribute up to 90% of the total cost of a mitigation activity carried out in a small, impoverished community (FIMA, 2019). While it is widely accepted within the profession that this grant is intended to address some of the equity challenges in grant allocation, it is also clear that it has the most limited funding ability. For example, the following guidelines laid out by FIMA (2019) show how little a subapplicant can receive when compared to the HMGP and FMA Program allowances:

> The maximum federal share for PDM subapplications is as follows:
>
> • $4 million for mitigation projects

• $200,000 per applicant for Advance Assistance activities, such as project scoping

• $10 million for Resilient Infrastructure projects

• $400,000 for new mitigation plans consistent with 44 CFR Part 201

• $300,000 for state/territorial and multi-jurisdictional local or tribal mitigation plan updates consistent with 44 CFR Part 201

• $150,000 for single jurisdiction local or tribal mitigation plan updates consistent with 44 CFR Part 201

• 10 percent of plan and project sub applications for information dissemination activities, including public awareness and education (brochures, workshops, videos, etc.) related to a proposed planning or project activity (p. 1).

In review, the PDM has two primary advantages to its structure. First, it encourages mitigation activity prior to the impact of a disaster. This practice channels the very purpose of mitigation by avoiding or minimizing future damages. Second, the grants focus on areas that are otherwise financially unable to assist themselves, which advances FEMA's mission of helping people before disasters and displays an attention to equity, a foundational element of a functioning public administration. However, despite the program's advantages, the reduced-funding ability (as compared to the HMGP and FMA grants) results in limited positive outcome.

Waste Indicators

To establish the efficiency and effectiveness of a grant allocation, it is important to determine indicators of damages and liability, which the grant should, in an ideal state, seek to mitigate. Because of the unpredictable and sporadic nature of a natural disaster,

the ability to identify indicators of waste becomes critical, especially if the analysis in not limited to a single disaster or snapshot in time. Although other indicators exist, two of the most informative are repetitive loss structures and historical damages.

Repetitive Loss Structures

Within the NFIP there exists a subset of structures referred to as repetitive loss and severe repetitive loss structures. These structures represent buildings that have sustained multiple flood losses and are considered to be a greater liability than other structures participating in the program. Each subset has a very specific definition and is defined within the Code of Federal Regulations 44:

> Repetitive Loss Structure: a structure covered by a contract for flood insurance under the National Flood Insurance Program (NFIP) that has incurred flood-related damage on two occasions during a 10-year period, each resulting in at least a $1000 claim payment. (OFR, NARA, 2013, p. 523)
>
> Severe Repetitive Loss Structures: Severe Repetitive Loss Properties are defined as single or multifamily residential properties that are covered under an NFIP flood insurance policy and: (1) That have incurred flood-related damage for which 4 or more separate claims payments have been made, with the amount of each claim (including building and contents payments) exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or (2) For which at least 2 separate claims payments (building payments only) have been made under such coverage, with cumulative amount of such claims exceeding the market value of the building. (3) In both instances, at least 2 of the claims must be

> within 10 years of each other, and claims made within 10 days of each other will be counted as 1 claim. (OFR, NARA, 2013, p. 340)

Once a structure sustains flood losses in a manner that satisfies the conditions within these definitions, they are labeled a repetitive loss structure. This label has several consequences. The greatest consequence is the dramatic increase in their policy premium. This action is taken to reduce the financial burden on the NFIP. However, instances have shown that despite increasing the premium, the NFIP can still spend substantial amounts of money on future claims, failing to turn profit, or even break even. These repetitive loss structures represent a significant threat to the well-being of the NFIP. In fact, according to R. Simon (2017),

> Homes and other properties with repetitive flood losses account for just 2% of the roughly 1.5 million properties that currently have flood insurance, according to government estimates. But such properties have accounted for about 30% of flood claims paid over the program's history. (p. 1)

To put this phenomenon into perspective, R. Simon cited a single structure valued at approximately $600,000 that has flooded 22 times since 1979 and has cost the NFIP more than $1.8 million alone.

Because of their high degree of liability to the NFIP, repetitive loss structures are ideal candidates for mitigation efforts. Proper mitigation action will decrease their flood risk and lower their chance at continuing flood loss, thereby saving the NFIP significant money. Because these structures represent such a financial burden on the program, and thereby taxpayers, this study utilized them as one of the measures of allocative efficiency.

NFIP Claims (Historical Cumulative Damage)

In addition to repetitive loss structures, the NFIP must sustain the impacts of frequent flooding on high-risk areas in the form of traditional claims. As with any insurance model, when policy holders file a valid claim, the NFIP must pay the agreed-upon figure. While individual claims do not necessarily represent a significant threat to the program's well-being, cumulative claims in an area may overwhelm the program. As seen with major flooding events, such as hurricanes and tropical storms, when thousands of claims are filed within a short amount of time, the NFIP may not have the reserves to effectively pay:

> Historically, payments on claims and other expenses have exceeded receipts from premiums. Because the NFIP's claim payments are mandated by law, the NFIP is authorized to borrow money from the U.S. Treasury when premium receipts do not cover its costs. While the NFIP's shortfalls cannot be attributed to any single incident, the program borrowed significantly in the aftermath of Hurricanes Katrina in 2005 and Sandy in 2012. In 2017, it reached its borrowing cap of $30.5 billion, at which point the Congress canceled $16 billion so that the NFIP could borrow in response to Hurricanes Harvey, Irma, and Maria. Currently, the NFIP has an accumulated debt of $20.5 billion. (Peter G. Peterson Foundation, 2020, para. 1)

Therefore, areas with high numbers of historical claims represent an increased threat to the NFIP and to the federal budget. This study utilized claim history to better understand which communities possess an enhanced threat to the program and taxpayer's interest.

Efficiency and Effectiveness Theory

Utilitarianism

As with any evaluation on an action's effectiveness, there must first be designated conditions that apply value to the outcome of the action, yet below these conditions lies a moral construct, which sets the ethical rules that dictate which behaviors are desirable and which are not. This moral construct is open to subjectivity based on an individual's worldview and moral beliefs. Blackburn (2001) described this in terms of relativism, stating "the rules may be made by different people at different times" (p. 19). Blackburn suggested, "In which case it seems to follow that there is no one truth. There are only the different truths of different communities" (p. 19). With this acknowledged, this study followed the example of Groeneveld (2020) and assumed a utilitarian and consequentialist frame. This assumption, although subjective, sets a moral foundation and allows the construction of rules of value. These rules can then be used to evaluate the effectiveness and efficiency of federal grant allocation. To establish this assumption, it is necessary to review the concept of *utilitarianism*, and more specifically *outcome utilitarianism*. This review includes *consequentialism* and finally *rule consequentialism*.

Utilitarianism and Consequentialism

Utilitarianism is an ethical theory based on a consequentialist approach that supports action that produces the greatest amount of good for the greatest number of people. The theory originated from the works of Jeremy Bentham and his student John Stewart Mill in the 19th century. This theory is based on the notion that pleasure is good and pain is bad. This is also known as the principle of utility. Bentham (1790) explained, "According to the principle of utility in every branch of the art of legislation,

the object or end in view should be the production of the maximum of happiness in a given time in the community in question" (p. 1). Although utilitarianism has received sufficient criticism, claiming it is self-indulgent or pleasure seeking. Mill (2001) defended the theory by pointing out that it is not individual happiness that guides the decision-making but the happiness of everyone (the community). From the lens of public administration, the desired pleasure, or good, is not based on an individual but rather the community. Because this study explored the allocation of federal grants, the community in reference is the collective U.S. citizens or perhaps more specifically U.S. taxpayers. Additionally, because the U.S. Congress is composed of elected representatives of these people, the mission and objectives they have produced through statutes represent the values and define pleasure or good. This study referred to this community pleasure or good as public utility.

Utilitarianism can be further categorized into two separate subcategories, namely, *act utilitarianism* and *outcome utilitarianism*. Act utilitarianism suggests that the available actions in a given situation should be analyzed to determine which action would produce the most net utility. This action would then be considered the most appropriate and most moral decision. Hunter (1994) added an important distinction to this definition when he stated that the utility is expected utility as opposed to actual utility. This concept of expected utility arises from the critique that, many times, one cannot be certain of the true outcome of the action; therefore, their judgement on the net utility is expected, not actual. Feldman (2006) noted that many philosophers support this distinction and "move toward expected utility in order to defend utilitarianism against the impracticality objection" (p. 50). That is to say that act utilitarianism in its classic form is

not action guiding because of the inability for one to definitively know which alternative would produce the most net utility because of unforeseen factors and elements of chance. This approach would suggest that grant allocators should first assess every available option and release money only when a project distinguishes itself as the absolute most valid. Although there may be merit to this approach, the flood hazard is likely much too complex and dynamic to reasonably accommodate the level of analysis that would have to go into this allocative philosophy. However, by replacing actual utility with expected utility, this theory becomes more resilient and more actionable.

Different from act utilitarianism is outcome utilitarianism in which the action itself is not judged but rather the outcome it produces is judged, or to say it differently, the outcome justifies the morality of the means. For instance, if one is faced with two alternatives, and a person believes, based on the information the person has at that point in time that Option A will produce the most net utility, act utilitarianism would morally support this action. However, assume another individual when faced with the same decision chose Option B, and surprisingly, it produced more net utility for reasons unknown at the time of decision. This individual experienced a better outcome, therefore, making it the more morally correct choice according to outcome utilitarianism. In this scenario, outcome utilitarianism would say Option B is the more moral choice whereas act utilitarianism would say Option A is the more moral choice. However, as much criticism that act utilitarianism receives for its lack of actionability, outcome utilitarianism is often even less action guiding because it is very difficult to understand a problem so completely as to know what will lead to the best outcome (Sen, 1979). This is particularly true in complex problems within the realm of public administration and

more specifically floodplain management. Yet, this theory still provides support to the idea that an action, program, or allocation can ultimately be judged based upon its effectiveness.

Perhaps one of the more valid and problematic criticisms of utilitarianism and consequentialism is the lack of bounds on an agent's actions in the attempt to create the best outcome. That is to say, an agent seeking a more moral outcome could theoretically engage in an immoral action to achieve it. Rule consequentialism addresses this issue.

Rule consequentialism is a form of indirect consequentialism that invokes a set of rules to guide or even constrain the agent. Kahn (2013) and Harrod (1936) expressed that the morality of an action rests within its conformity with rules, which leads to good results. Kahn (2013) referred to these rules as the "ideal code" (p. 221). The ideal code serves as a set of parameters established by the impacted community that limits the actions available to the agent or in the case of this study the public administrator allocating the grants. Because this scenario is based on federal grant allocation within the United States, one could argue that the ideal code is already established through Congress and existing statute and regulations. However, when applying this theory to the specifics of grant allocation in floodplain management, there is a need to further refine the ideal code.

Based on a rule consequentialism approach, the following rules or ideal code should be included to evaluate the morality or effectiveness of HMA flood project allocation:

1. FEMA should allocate resources to repetitive loss structures that drain program revenue and therefore bring down public utility (sum of individual utility).

2. FEMA must allocate resources to socially vulnerable communities to maximize the effect to individual utility.
3. FEMA should not allocate resources to communities or areas that have not experienced historical damages related to the hazard that made the funds available.

If FEMA ignores Rule 1 in pursuit of Rule 2, it risks draining the program of its validity and places further burden on public utility, and taxpayers continue to foot the bill of those who chose to live in hazardous areas; additionally, if the program is financially run dry, FEMA forfeits its capacity to help the public in other domains.

Conversely, if FEMA ignores Rule 2 in pursuit of Rule 1, entire populations are left out of assistance, forfeiting the legitimacy of the program and agency, and FEMA (n.d.) risks failing to meet its core mission: "To help people before, during, and after a disaster" (p. 6). Therefore, this study's efficiency matrix is comprised of the following rules, which are used to draw conclusions on the achieved utility of the allocations:

- An allocation within Rule 1 not only is moral and effective but also is necessary as is an allocation within Rule 2.
- Additionally, one can conclude that an allocation outside of Rules 1 and 2 is inappropriate and represents true allocative waste and abuses the program, agency, and public trust.

Finally, it is worth noting for the sake of future studies that Rule 1 can be considered the health of the program, and Rule 2 can be considered the impact of the program. With that established, there perhaps exists an ideal distribution rate between

Rule 1 and Rule 2 that would naturally favor more allocation toward Rule 1 in the immediate term and move more toward Rule 2 in the long term.

Examination of Efficiency

Now that an ethical lens has been established in which efficiency can be measured, an exploration of the various interpretations and definitions of efficiency must be explored. Manzoor (2014) and Rutgers and van der Meer (2010) argued that within the context of public administration, there exist two primary schools of thought, namely, technical efficiency and allocative efficiency, the latter sometimes referred to as multi-value-based goals efficiency.

Technical Efficiency

Technical efficiency is a term used to describe perhaps the most common understanding of the concept efficiency. Technical efficiency describes the ratio of input to output with the goal of producing the most output with the least input. H. Simon (1976) stated, "To be efficient simply means to take the shortest path, the cheapest means, toward attainment of the desired goals … the attainment of maximum values with limited means … the ratio between input and output" (pp. 14, 65, 180). This definition and this concept of efficiency is most often seen in the private sector where profit is the ruling factor in most business decisions, especially concerning resource allocation. This application of efficiency is more likely to generate healthier, more sustainable programs that are less likely to produce waste or generate debt. However, this application of efficiency does not often translate well into the public sector where profit is rarely viewed as the primary goal. Instead, a more complex definition is needed.

Allocative Efficiency (Multi-Value-Based Goal Efficiency)

Allocative or multi-value-based goal efficiency is concerned with an additional layer of desired output. Efficiency in the public sector has two primary distinctions. The first is the amount of input or resources it can provide into a given problem. Because public organizations operate on strict budgets that are not as easily altered as in the private sector, there is more emphasis on the word *limited* in the term *limited resources*. It is this limitation that calls for a definition like the one provided by Wilson (1989): "Obtaining the greatest output for a given level of resources" (p. 314). While this definition offers a similar stance on the ratio of input to output, it specifically addresses a set level of the input variable.

Waldo (1984) perhaps offered the most appropriate definition of efficiency when he stated, "The efficiency of administration is measured by the ratio of the effects actually obtained with the available resources to the maximum effects possible with the available resources" (p. 191). The major distinction in this definition is the introduction of outcome over output. This distinction introduces a new variable into the efficiency discussion that is extremely important to public sector programs' actual outcome. Because public sector programs are not designed solely to generate profit, they are formed and funded to achieve some other set of goals. However, as they aim to achieve these goals, they are expected to steward the taxpayer's money and to achieve this goal in the most cost-effective means. As one examines a program such as FEMA's (2021d) HMA, the intended goal or outcome of the program is to mitigate hazards to the greatest extend possible given a limited value of funding. This program can effectively spend its entire budget mitigating structures. However, if it fails to mitigate the structures with the

most risk, is it accomplishing its original goal? In this case, the program efficiently achieved an output but failed to achieve the desired outcome. This additional variable adds a complexity to efficiency that must be addressed within the public sector.

Cost Effectiveness

It is important to recognize that cost effectiveness is not foreign to FEMA or the HMA program. In fact, HMA project approval requires analysis proving the cost-benefit ratio of a project upon submittal. If a project is found to cost more than the benefit gained, it is not accepted. According to FEMA (2021d), "Mitigation activities are required by statute and regulation to be cost effective or be in the interest of the NFIP" (p. 32). This requirement satisfies one of the components to the definition of efficiency. It establishes that all projects will have a net benefit to the allocation of funds. Every project awarded will move the needle in the right direction. However, this stops short of addressing all the concerns with efficiency. Given the limited resource nature of the problem, it is not enough to say a project is beneficial, as opposed to the most beneficial.

To establish that a project is the most beneficial, or at least closer to that mark, the following rules or ideal code previously established within this chapter must be revisited:

1. FEMA should allocate resources to repetitive loss structures that drain program revenue and therefore bring down public utility (sum of individual utility).
2. FEMA must allocate resources to socially vulnerable communities to maximize the effect to individual utility.
3. FEMA should not allocate resources to communities or areas that have not experienced historical damages related to the hazard that made the funds available.

These rules are applied to a list of possible community characteristics to illustrate the appropriateness of a potential allocation (see Table 1).

Table 1

Appropriateness of Allocation by Community Characteristics

Community characteristics	(+) HMA allocation	(0) HMA allocation
(0) Repetitive loss	×	✓
(0) Historical damages	×	✓
(0) Repetitive loss and 0 historical damages	×	✓
(+) Repetitive loss	✓	×
(+) Historical damages	✓	×
(+) Repetitive loss and (+) historical damages	✓	×

Note. HMA = Hazard Mitigation Assistance.

If a project is cost effective, which all awarded projects should be, then as long as it is allocated to meet these rules, it should be considered cost effective and appropriate within a limited resource perspective.

Equity

Largely accepted as a pillar of public administration field is the concept of equity. Equity, which was first mentioned in application to public administration by Woodrow Wilson in 1887, refers mainly to the notion that public good or service should be distributed equally among the population. Frederickson (2010) discussed the concept of equal distribution when he offered the following question: "Does a school board distribute its funds equitably to schools and to the school children in its jurisdiction, and if not, is inequity in the direction of the advantaged or disadvantaged?" (p. 13). This idea that funds should be distributed either impartial to a population's substatus or in favor of

those disadvantaged is, as Frederickson stated, a notion of "new" public administration (p. 12), suggesting that equity is a newer concept. While the concept of equity may be new in relation to the age of governance, it is widely accepted within public administration literature today.

It becomes important to examine equity whenever public goods or services are allocated at the discretion of a federal agency. In the event a population or a community is being underserved because of its demographics or social status, it would be critical to identify and address this inequity. Evidence of the political nature of disaster declarations and disaster funding have been found in several studies. Though it is unlikely any public administrators would purposely refuse public goods and services to a population based on social class, race, gender, or other demographics, it is possible political moral hazards are causing this to occur as a second order effect.

Husted and Nickerson (2014) conducted a study that examined expenditure and approval data from FEMA between 1969 and 2005 and found "executive decisions to grant disaster declarations and the conditional amount of aid allocated are affected by political incentives" (p. 1). Specifically, they found "an incumbent president is more likely to grant disaster declarations when facing reelection, particularly in states with a larger number of electoral votes and in states with a governor from the same political party as the president" (Husted & Nickerson, 2014, p. 2). This finding has a potentially profound effect in the domain of grant allocation. Because many grant programs within the greater HMA program receive funding as a direct consequence and extent of disaster declarations, this could greatly affect the amount of money available as well as who is eligible to apply for the money.

This phenomenon is further supported by the work of Garrett and Sobel (2003) who conducted a study in which they assessed FEMA disaster declarations and funding awards between 1991 and 1999 and assessed whether there were political influences at play. They found "evidence that those states politically important to the president have higher rates of disaster declaration" and "strong evidence that once a disaster is declared, disaster expenditures are higher in those states having congressional representation on FEMA oversight subcommittees" (Garrett & Sobel, 2003, p. 508). In the context of equity, this phenomenon is problematic.

Although there is enough evidence to warrant a careful and thorough examination of equity within disaster declaration and funding, this study took a much broader examination of federal allocation and spatially explored equity through the lens of social vulnerability. More specifically, utilizing a metric from the Center for Disease Control and Prevention's (CDC) Social Vulnerability Index (SVI), estimated income per capita, the study explored equity from a community wealth perspective. The CDC's SVI utilizes 15 metrics to estimate the overall vulnerability of a community. This is broken down into four smaller vulnerability categories: housing type and transportation, minority status and language, household composition and disability, and socioeconomic status. Within the socioeconomic status, Category 1 of the metrics is estimated income per capita. This metric was utilized to examine equity of allocation.

CHAPTER 3: METHODOLOGY

Purpose Statement

The purpose of this study was to explore the relationship the federal Hazard Mitigation Assistance (HMA) grant allocation has with the National Flood Insurance Program (NFIP) and the various elements closely associated with efficient spending (efficiency), estimated income per capita (equity), and historical damages and number of repetitive loss properties (effectiveness) by identifying the presence or absence of correlations.

Research Questions

1. Is there a correlation between HMA projects and cumulative historical disaster damages (as informed by NFIP claims) associated with flooding?

   H_0: A community's cumulative flood damage does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's cumulative flood damage impacts the amount of HMA funding they receive, $r \neq 0$.

2. Is there a correlation between HMA projects and the number of NFIP repetitive loss and severe repetitive loss properties within a community?

   H_0: A community's number of repetitive loss properties does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's number of repetitive loss properties impacts the amount of HMA funding they receive, $r \neq 0$.

3. Is there a correlation between HMA projects and the estimated income per capita of a community?

   H_0: A community's estimated income per capita does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's estimated income per capita impacts the amount of HMA funding they receive, $r \neq 0$.

Research Design

Although limited resource allocation is not a new or unexplored subject, when it is applied within the public sector, it becomes more complex because of the additional elements of efficiency, effectiveness, and equity. Further complicating the allocation is the magnitude of damages that need to be mitigated. According to GAO (2021),

> Since 2005, federal funding for disaster assistance has totaled at least $460 billion, which consists of obligations for disaster assistance from 2005 through 2014 totaling about $278 billion and selected appropriations for disaster assistance from 2015 through 2019 totaling $183 billion. These costs are projected to increase as certain extreme weather events become more frequent and intense due to climate change. (p. 1)

To address this growing financial demand, FEMA has "set targets to increase investment in mitigation and set a target to invest $2.4 billion dollars in hazard mitigation in fiscal year 2021" (GAO, 2021, p. 2). Yet, this problem remains more complex than simply applying more funding toward the issues; it is the combination of what is funded and where it is funded.

Maximizing the efficiency of federal grant allocation could be described as a wicked problem. Federal grant allocation is a problem that requires an extensive knowledge of multiple systems and programs. Rittel and Webber (1973) presented wicked problems as

> distinguished from problems in the natural sciences, which are definable and separable and may have solutions that are findable, [whereas] the problems of governmental planning—and especially those of social or policy planning—are ill-defined; and they rely upon elusive political judgment for resolution. (p. 160)

To effectively understand and later improve efficient grant allocation, research must be conducted in a manner conducive to exploring the relationship between the dependent and independent variables within the grant allocation process.

This study was designed to utilize a quantitative method to explore the relationship between the allocation of the dependent variable (HMA dollars allocated) and the independent variables (estimated income per capita, historical damages, and the number of repetitive loss properties) of a community. By examining areas within FEMA's Region 6, a quantitative exploration provided a more complete understanding of current and historical allocative trends. This analysis represented an early step in understanding where adjustments might take place to increase the efficiency and effectiveness of federal mitigation funds.

Population

This study examined a population consisting of and limited to a national collective of communities that have elected to participate in the NFIP. In 2017, a report published by the Community Rating System, a program that provides discounted

premiums within the NFIP for specific higher floodplain management standards, estimated that more than 22,000 communities participate in the NFIP (FEMA, 2021a). However, because this study explored the relationships these communities have with the allocation of HMA grants, this population must be further refined. Because the Hazard Mitigation Grant Program (HMGP) makes up a large portion of the overall HMA grants, and HMGP grants are only available to select communities following a presidentially declared disaster, the population of this study was reduced to communities that both participated in the NFIP and have sustained a presidentially declared disaster (also called major disaster declaration).

Finally, because the NFIP concentrates specifically on flooding, and the HMA program addresses other natural hazards as well, the population for this study was limited to communities that sustained a major declared disaster that involved a flooding element. This is distinguished with a FEMA label titled "incident type." For this study the population should include the following incident types: flood, hurricane, typhoon, tropical storm, coastal storm, dam/levee break, severe storm, and tsunami.

Sample

This study sampled communities that participated in the NFIP, were located within FEMA's Region 6, and had sustained a flood-related, incident-typed, major disaster between 2000 and 2017. This study focused on communities within the geographic boundaries of FEMA's Region 6, which include the states of Arkansas, Louisiana, New Mexico, Oklahoma, and Texas. This reduction in sample size brought the study to a much more manageable scale while continuing to focus on one of the most flood-impacted region in the nation. Additionally, as a result of policy changes in which

previous decades may no longer have data or policy protocols relevant to current measures, this study limited the date range to the most recent 2 decades of reported information. As a result, communities that met the requirements of the study but whose last flooding incident occurred more than 20 years ago were not included in the exploration of this dissertation.

Finally, recent HMA projects can remain pending or unfinished for several years; therefore, exploring or attempting to identify, analyze, report, or include any data after 2017 not only would compromise the validity and potential reliability of the study but also would compromise the generalizability that may result from the findings of the study. As a result, data after 2017, with multiple unknown variables, were not included in this study. For this study, sample population collection communities were NFIP participating communities located within FEMA's Region 6 and had sustained a flood-related, incident-typed, major disaster between 2000 and 2017.

Instrumentation

One of the primary challenges in preparing the data for analysis was to properly aggregate and categorize it. This study collected data from various departments and agencies and categorized them to the correlating community. One of the primary instruments in achieving this was the use of community identification numbers. These numbers are a unique identification number utilized by NFIP to track participating communities. These numbers act as the key for pairing and assigning the proper values to the various communities. Utilizing IBM's Statistical Package for the Social Sciences (SPSS) software, this study conducted several correlation analyses.

Data Collection

Data were collected from two federal entities, FEMA and the U.S. Census Bureau (USCB). Within FEMA, the data are housed in various programs. This study collected data from NFIP and the HMA program. NFIP provided aggregated historical claims data as well as aggregated repetitive and severe repetitive loss data. HMA provided aggregate project and grants data. FEMA also provided disaster declaration data as well as a community or jurisdictional data set in the form of a spatial layer. Finally, USCB provided the median household income. These data sets were available at various levels of aggregation as described in the next sections. To ensure a proper and thorough analysis, the study required several aggregation procedures to ensure that the data reflected that of the sample communities (discussed further in the data analysis section).

Disaster Declarations

This data set is available both on FEMA's official website and on FEMA's data library known as Open FEMA. It provides a list of all major disasters and includes the incident type for filtering those disasters that are flood related. This data source also indicates which counties or parishes received a declaration status. This was important in determining which communities were included in the sample.

Hazard Mitigation Assistance Data

This data set, which served as the study's dependent variable, is publicly available through Open FEMA but is aggregated to the county level. Therefore, it was obtained through a Freedom of Information Act (FOIA) request to receive the data at a finer aggregation such as the desired community level. The data indicated how many HMA

projects a community has been listed as the subgrantee for. It also provided a monetary amount associated with each project.

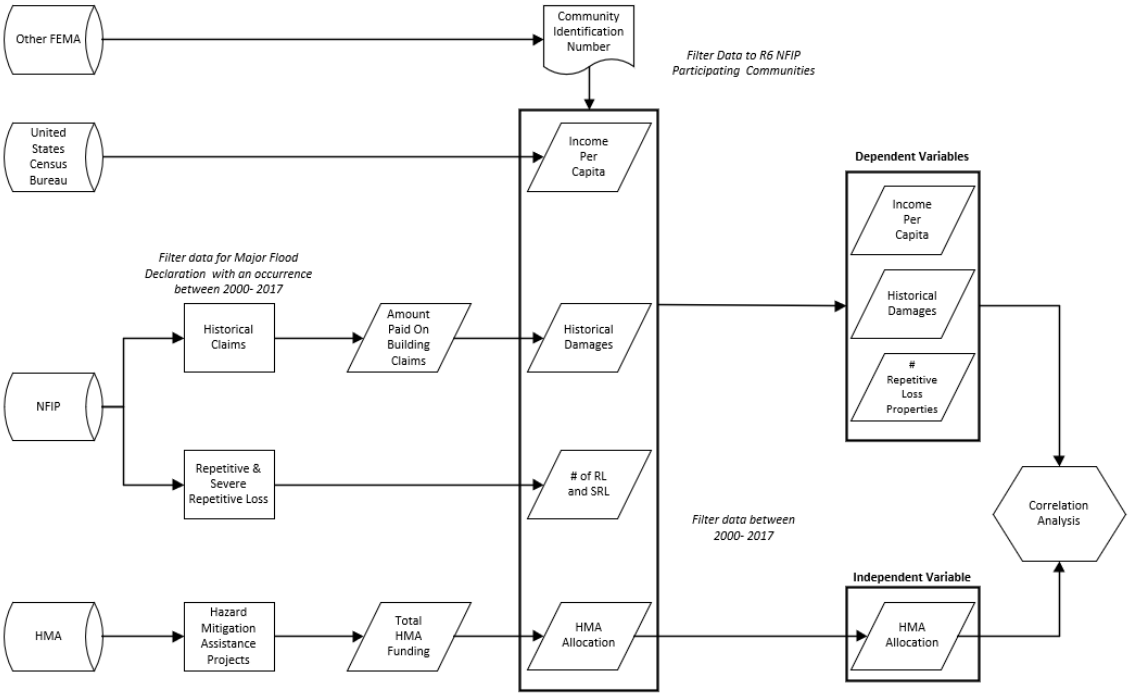
National Flood Insurance Data

This data set belongs to NFIP within FEMA and consists of several subdata sets derived from flood insurance policies and claims. This data set is inherently flood related and is used to inform historical damage, high-risk structures, and frequent flooding. It is derived from inspection and policy data that are heavily Personally Identifiable Information (PII), which FEMA and the federal government are legally responsible for safeguarding. Therefore, to avoid this factor, the data were requested via the FOIA but at a community aggregate that alleviates the PII elements. The NFIP data request consisted of the following:

1. **Claims data.** This data set was aggregated to the community level. This data set contains the monetary sum of all NFIP claims made within the constrained years, as discussed in the data analysis section, and illustrated in Figure 3. This represented the first independent variable in this study.
2. **Repetitive loss data.** This data set was aggregated to the community level and contained the number of mitigated and unmitigated repetitive loss properties within the community.
3. **Severe repetitive loss data.** This data set was aggregated to the community level and contained the number of mitigated and unmitigated severe repetitive loss properties within the community. This data set was combined with that of the mitigated and unmitigated repetitive loss properties to establish the study's second independent variable.

Figure 3

Methodology



Note. This flow chart illustrates the collection, aggregation, and analysis of this study.

Community Data

This piece of data is critical in the aggregation and categorization of the various data sets. It is what FEMA uses to distinguish where an inspection, claim, property, or grant project is located in terms of community jurisdiction. It is maintained within FEMA's Community Identification System and was requested via a FOIA request. The data set contained a unique identification number for each NFIP participating community within FEMA's Region 6 states. This identification number allowed the pairing and matching of other data sets to the various communities.

Census Data

This data set is derived from previous census and ACS (2019) response. This information is publicly available at various aggregation levels. However, it is not offered at the community level, so it was aggregated to the county level. In the instance when a community resides within the boundary of multiple counties, the county in which the majority or greatest portion of the community resides was the value assigned to the community. This data set provided the estimated income per capita for the county in which the communities reside. This data set represented the study's third independent variable for its exploratory analysis.

Data Analysis

This study examined the relationship between historical loss and grant allocation using large data sets; therefore, it was beneficial to use a correlation analysis that provided a correlation coefficient. This coefficient worked as a summary statistic capable of easily displaying the presence or lack of a relationship. Taylor (1990) suggested that "correlation analysis is one of the most widely used and reported statistical methods in summarizing medical and scientific research data" (p. 36). This study examined the historical damage data set and the HMA project allocation data set to establish the first correlation coefficient. Likewise, the second correlation coefficient was established from the aggregate repetitive loss and severe repetitive loss data set and the HMA project allocation data set. Finally, the third correlation coefficient was developed from the community average income data set and the HMA project allocation data set.

While utilizing a correlation analysis was appropriate for this study, to establish a basic understanding of the efficiency of the HMA project allocation, it was important to recognize that a correlation, even a statistically significant one, does not on its own accord result in causation. Taylor (1990) stated, "One of the most frequent and serious misuses of correlation analysis is to interpret a high correlation between variables as a cause-and-effect relationship" (p. 38). Still, because this study established that allocating resources in which historical damage and repetitive loss has occurred satisfies the definition of allocative efficiency, the presence of, or lack of, correlation between these variables provided insight into the overall output of the HMA grant program. It may not however provided adequate evidence that the achieved output was through design or happenstance.

Limitations

As with any research study, there are certain limitations. Because of the exploratory nature of this study, there were several limitations that must be disclosed. Perhaps the biggest limitation was discussed previously when it was pointed out that correlation does not necessarily imply toward causation. With that said, this study was an early attempt by the researcher to understand the relationship between federal grant allocation and elements of program efficiencies. Depending on the results of this study, further research may need to be conducted to determine causation.

Another significant limitation of this study was the lack of uniform aggregation levels of the various data sets. For example, data might be collected at a zip code level that then needs to be aggregated to a community level, and another data set may have been collected at the county level and may need to be refined to the community level.

Utilizing FEMA's community layer is a necessary method to ensure the accuracy of the grant projects, but it degrades the integrity of many of the other data sets. This extends to the U.S. Census data, which aggregated to different extents than FEMA's community layer. The census data are further limited because at the date of this study, the census was currently being conducted and analyzed. Therefore, the study leveraged older data that can in some instances be multiple years old and misrepresented the current demographics of a community. Finally, because of program and policy changes paired with lack of quality data availability, this study limited the scope of FEMA disaster and grants data to that of the years 2000–2017. Because HMA grant projects can take several years to close, this limitation is necessary to prevent inaccurate assumptions.

Summary

This chapter detailed the exploratory nature of this study to describe a relationship between federal grant allocation and various elements associated with efficiencies. Chapter 3 described a quantitative approach with the aim to explore whether there is a correlation with HMA projects and cumulative historical disaster damages associated with flooding, the number of repetitive loss and severe repetitive loss properties within a community, or the estimated income per capita of a community. This study compiled various data sets via publicly facing platforms such as Open FEMA and, when required, an official FOIA request. These data sets, once retrieved, were examined, cleaned as necessary, and paired utilizing the community identification number. They were then statistically analyzed utilizing IBM's SPSS software. Finally, although this study took exhaustive measures to ensure data integrity, there were various limitations, including but

not limited to aggregation challenges and partial data availability, that may have skewed results.

CHAPTER 4: RESEARCH, DATA COLLECTION, AND FINDINGS

Overview

The intent of this quantitative study was to explore the nature and relationship of limited resource allocation, in the form of hazard mitigation assistance (HMA) spending, with historical flood damages and with social vulnerability indicators. The study's exploration was conducted utilizing several correlation analyses. The dependent variable was 17 years of hazard mitigation assistance grant projects: federal dollars allocated per the National Flood Insurance Program (NFIP) participating community. The independent variable, historical damages, consisted of NFIP payments for the years 2000–2017. A second independent variable was the number of repetitive loss properties within each community. Last, the third dependent variable was the estimated income per capita (aggregated at the county level) as indicated by the 2014–2018 ACS (2019).

Purpose Statement

The purpose of this study was to explore the relationship that the federal HMA grant allocation has with the NFIP and the various elements closely associated with efficient spending (efficiency), estimated income per capita (equity), and historical damages and number of repetitive loss properties (effectiveness) by identifying the presence or absence of correlations.

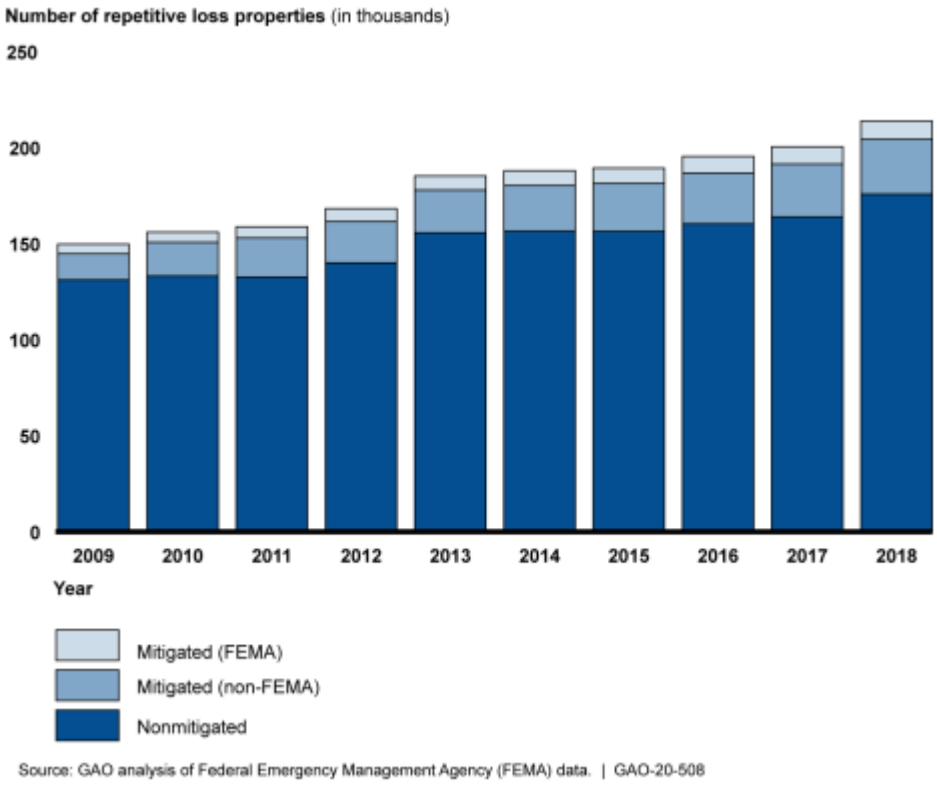
The public sector applies additional complications and considerations to the predicament the HMA program and NFIP are in. Foundational to these considerations is the fact that each program depends on congressional funding, which is generated from federal taxes. These programs must answer to the American people. In the private sector, negative performance, such as that seen by the NFIP's need for additional public

funding, would likely not be tolerated long. Typically, above all else, the private sector measures the value of a program based on the profit the program can generate. In this regard, the NFIP is a losing program constantly in need of federal bailout. The 2019 High Risk Series published by the U.S. GAO has identified the NFIP as a high-risk program and has suggested that Congress should consider comprehensive reform of this program because of its ineffectiveness. The NFIP is currently in a critical position because of its inability to successfully implement its mission.

Figure 1 illustrates the extent of NFIP's position by showing a steady rise in total unmitigated repetitive loss properties despite an increase in mitigation activity. Unmitigated repetitive loss properties (further defined in the definitions section) refers to properties that have sustained flood damages on multiple occasions and have not had sufficient construction applied to them to reduce the flooding impact. In contrast, a mitigated repetitive loss structure refers to a structure that has sustained flood damages on multiple occasions but has undergone construction to reduce the flooding impact such as elevation, relocation, or demolition. Figure 1 (repeated here for ease of reference) illustrates that in addition to the rise in unmitigated repetitive loss, FEMA is not the greatest source of funding for the limited mitigation activities that have been conducted on these high-risk structures. This reality further supports a disconnect between the NFIP and the HMA program.

Figure 1

National Flood Insurance Program, Cumulative Number of Mitigated and Nonmitigated Repetitive Loss Properties, 2009–2018



Note. This figure depicts a rise in nonmitigated repetitive loss properties and the ineffectiveness of FEMA-funded mitigation. From *National Flood Insurance Program: Fiscal Exposure Persists Despite Property Acquisitions*, by U.S. Government Accountability Office, 2020, p. 25 (https://www.gao.gov/assets/710/707821.pdf).

This study serves as an early yet critical step in better understanding the complex relationships that federal disaster assistance programs have with grant allocation. The goal is to take the first step toward identifying opportunities and metrics needed to reform federal grant allocation and improve the overall efficiency and effectiveness of U.S. tax dollars in the mission of ensuring a safer more resilient homeland.

Research Questions

To explore HMA grant allocation in terms of efficiency, effectiveness, and equity, the study will explore the following hypotheses:

1. Is there a correlation between HMA projects and cumulative historical disaster damages (as informed by NFIP claims) associated with flooding?

   H_0: A community's cumulative flood damage does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's cumulative flood damage impacts the amount of HMA funding they receive, $r \neq 0$.

2. Is there a correlation between HMA projects and the number of NFIP repetitive loss and severe repetitive loss properties within a community?

   H_0: A community's number of repetitive loss properties does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's number of repetitive loss properties impacts the amount of HMA funding they receive, $r \neq 0$.

3. Is there a correlation between HMA projects and the estimated income per capita of a community?

   H_0: A community's estimated income per capita does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's estimated income per capita impacts the amount of HMA funding they receive, $r \neq 0$.

Research Methods and Data Collection Procedures

Data Collection and Cleaning

Because this study explored federal resource allocation across thousands of communities during 17 years of emergency and disaster response, it required the use of large data sets. These data sets presented several challenges and required extensive cleaning. They also required several assumptions and decision points that are discussed in detail within this section.

Hazard Mitigation Assistance Data

This data set, which represents the study's dependent variable, was obtained through FEMA's data library known as Open FEMA. The data were stored in two separate data sets linked together through a project identification number. Each HMA grant has a unique project number that was used to tie data fields from both data sets into one. This study utilized six fields from this collective data set to prepare the dependent variable: project identifier, project type, subgrantee, community ID, program fiscal year, and federal share obligated. There were two primary challenges and resulting assumptions from this data set.

The first difficulty was isolating project types to those that directly mitigated the flooding hazard. This was both a technical challenge, as a single project could contain several project types, and a cognitive challenge when deciding which activities directly mitigate flood hazard. After reducing the national data set (which contained over 30,000 entries) to projects that occurred within FEMA's Region 6 states and filtering the projects to only those that occurred during the program years of 2000–2017, the challenge became sorting through the different project types, which leads to the first assumption.

Assumption 1. After cataloging the 3,695 remaining projects and extracting the various project types associated with them, 74 of the 150 unique project types were selected as directly mitigating the flood hazard. Appendix A provides a list of unique project types selected as those which directly mitigate the flooding hazard. Those removed either addressed other hazards such as wind or fire or at best indirectly addressed the flooding hazard such as brochures, workshops, trainings, planning, salaries, and overtime. When the 3,695 projects were filtered by the selected project types, they reduced the number of projects to 1,081.

The second difficulty with this data set was determining which community to assign the project to. Each project varied greatly in size and scope, and the data often listed multiple jurisdictions or communities as beneficiaries of the project but did not specify the specifics of the project or the division of federal share obligated among the jurisdictions.

Assumption 2. Although elements of the projects may have extended into other communities, this study applied the project to the community listed within the data set as the subgrantee. The grantee was always a state agent, which represented too high of an aggregation and would not produce the level of detail needed to understand the phenomenon. In the process of identifying which community to apply the project, 81 of the 1,081 remaining projects did not have sufficient information to properly assign. This reduced the project number to 1,000. Lastly, when filtering the communities by those that were currently actively participating in the NFIP, the 1,000 projects were reduced to 954 and represented 296 unique communities.

NFIP Flood Damages

This data set, which serves as the first independent variable for this study, was obtained through a Freedom of Information Act (FOIA) request through DHS and FEMA (2021-FEFO-00400; referenced in Appendix B). This data set contained the total net payment from the NFIP for 1,638 communities representing nearly $33 billion in NFIP payments between 2000 and 2017.

Assumption 1. The data set included eight communities representing just over $3 million in claims that did not have any community identifications associated with them. These entries were removed from the data.

Assumption 2. After pairing the community data from this data set with the list of communities actively participating in NFIP, the number of communities with NFIP claims data was reduced from 1,638 to 1,529 communities representing a total of $32,896,096,447 in historical flood damages.

NFIP Repetitive Loss Properties

This data set, which serves as one of the study's independent variables, was obtained through a FOIA request from DHS and FEMA (2021-FEFO-00402). This data set contained repetitive loss information on 1,147 communities. The data provided an extensive breakdown of repetitive loss and severe repetitive structures within these communities noted within Appendix C. Most notably, it provided two different definitions of repetitive loss and severe repetitive loss based upon the perspective of two programs: Flood Mitigation Assistance (FMA) and NFIP.

Assumption 1. Repetitive loss and severe repetitive loss are defined differently in NFIP and FMA regulation and statute. The variances in these definitions are

significant enough to impact which structures receive this label and high-risk status. Although it is not the researcher's intention to judge which definition is more universally appropriate, it is important to utilize the definition that is most applicable to the other variables and framework of this study. Because of the effectiveness problems of the NFIP discussed in Chapter 1, and the intent for this variable to be a measure of damages, this study has elected to utilize the NFIP definition of repetitive loss as well as the NFIP definition of severe repetitive loss.

Assumption 2. Although the terms severe repetitive loss and repetitive loss refer to two different loss circumstances, the researcher has elected to merge both terms into a general repetitive loss metric that represents the aggregate of each term within a community.

Assumption 3. When a repetitive loss property through a mitigation activity has been brought into compliance with the local ordinance and NFIP minimum standards, it can gain the status of mitigated repetitive loss. The original data set had distinguished mitigated repetitive loss from unmitigated repetitive loss and provided the number of structures for each of these categories. However, given that this distinction only serves as a snapshot metric of the status at the time of the data pull, and the long duration of this study, it was decided to include both statuses within the number of repetitive loss variable.

Estimated Income Per Capita

This data set, which serves as one of the study's independent variables, was obtained from CDC's Social Vulnerability Index (SVI), which identifies estimated income per capita as one of four variables that together evaluate the socioeconomic

vulnerability of a community. Although it is obtained through the CDC's SVI, the underlying data are from ACS and U.S. Census data.

Assumption 1. Utilizing the best available information at the time of this analysis, the estimated income per capita is from the years 2014–2018 (ACS, 2019).

Assumption 2. This data set was available at the county level aggregate; therefore, the value associated with the county was applied to all communities within their respective counties. It is possible some communities may have different income per capita than the county average.

Presentation and Analysis of Data

Once all the data sets were collected, they were aggregated and applied where applicable to the list of 2,508 communities participating in NFIP within FEMA's Region 6. Of these 2,508 communities, 2,504 had received at least one flood-related, presidential disaster declaration between 2000 and 2017. This is an important distinction because it makes them eligible for HMA funding. Of the 2,504 communities eligible for HMA funding, 1,528 had recorded historical damages, 1,094 communities had repetitive loss properties, and 1,059 had both historical damages and repetitive loss properties. However, only 296 communities had received HMA flood-related funding.

To further break down the distribution of HMA allocation across the characteristics of the eligible communities, the following tables were developed. Table 2 displays the appropriateness of allocation based upon the rules set forth by this study, and the Table 3 provides the number of occurrences within each category.

Table 2

Appropriateness of Allocation by Community Characteristics

Community characteristics	(+) HMA allocation	(0) HMA allocation
(0) Repetitive loss	×	✓
(0) Historical damages	×	✓
(0) Repetitive loss & 0 historical damages	×	✓
(+) Repetitive loss	✓	×
(+) Historical damages	✓	×
(+) Repetitive loss & (+) historical damages	✓	×

Note. HMA = Hazard Mitigation Assistance

Table 3

Instances of HMA Allocation by Community Characteristics

Community characteristics	(+) HMA allocation	(0) HMA allocation
(0) Repetitive loss	42	1,368
(0) Historical damages	20	956
(0) Repetitive loss & 0 historical damages	17	923
(+) Repetitive loss	254	840
(+) Historical damages	276	1,252
(+) Repetitive loss & (+) historical damages	251	807

Note. HMA = Hazard Mitigation Assistance

This analysis identified a combined total of 4,028 appropriate scenarios and 2,978 inappropriate scenarios. These numbers are larger than the sample size due to overlap in the characteristics. However, of the 2,504 communities for repetitive loss, there were 1,622 appropriate scenarios and 882 inappropriate scenarios (this is seen by examining rows 1 and 4 of Table 11). Of the 2,504 communities for historical damages, there were 1,232 appropriate scenarios and 1,272 inappropriate scenarios (this is seen by examining rows 2 and 5 of Table 11).

Each of the study's three independent variables (historical damages, number of repetitive loss properties, and estimated income per capita) were examined against the study's dependent variable (HMA dollars allocated) utilizing a correlation analysis, specifically a Pearson correlation coefficient. All correlation analyses in this study utilized an $\alpha = .01$, representing a 99% confidence level. The *P* value, expressed simply with the letter "p," indicated the level of significance. A value lower than that of α is statistically significant at the 99% confidence level.

Hypothesis 1 (HMA Dollars Allocated and Historical Damages)

This bivariate correlation analysis examined 2,504 FEMA's Region 6 communities that were eligible to receive HMA funding between 2000 and 2017 based upon NFIP participation and inclusion in a presidentially declared disaster. The Pearson correlation coefficient showed there is a significant positive relationship between HMA dollars allocated and historical damages, $r(2{,}502) = .83$, $p < .01$. Another way to express this relationship is 69% of the variance in HMA dollars allocated can be explained by historical damages (Table 4).

Table 4

Pearson's Correlation Analysis for Historical Damages and HMA Dollars Allocated

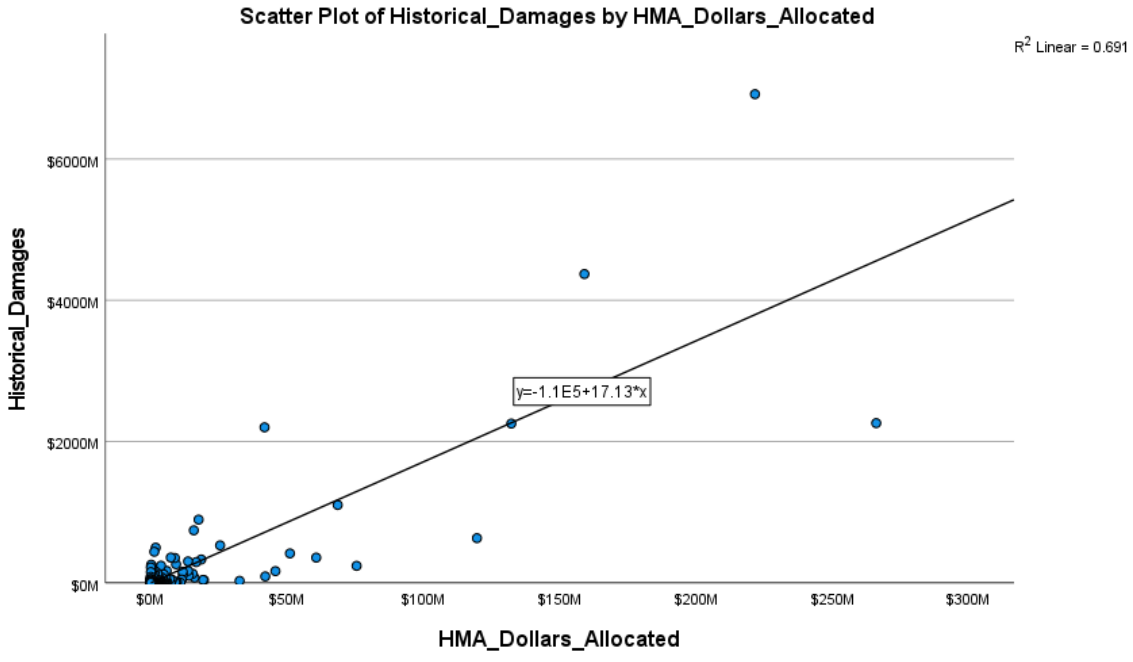
		HMA dollars allocated	Historical damages
HMA dollars allocated	Pearson correlation	1	.831[a]
	Sig. (2-tailed)		0.000
	N	2,504	2,504
Historical damages	Pearson correlation	.831[a]	1
	Sig. (2-tailed)	0.000	
	N	2,504	2,504

Note. HMA = Hazard Mitigation Assistance.
[a]Correlation is significant at the 0.01 level (2-tailed).

This suggested a very strong correlation; this was not in line with this researcher's professional experience with the program. To further explore this result, a scatter plot was created and analyzed. Figure 4 displays the relationship between these two variables. It was immediately apparent that there were several factors present that may be influencing the result of this correlation analysis. The first factor was the large amount of data at the origin of the chart, which suggested most of the communities had no HMA funding or historical damages. The second factor was the presence of extremely large outliers that appeared to heavily skew the data. Of the 296 communities that received HMA funding in FEMA's Region 6, six received 50.3% of all HMA funding ($974,246,210 of $1,936,349,774).

Figure 4

Scatter Plot of Historical Damages by Hazard Mitigation Assistance Dollars Allocated



Note. This figure depicts the amount of historical damage by the amount of HMA dollars allocated for 2,504 communities within FEMA's Region 6 between 2000 and 2017.

To further explore this phenomenon, this researcher utilized the following formula to identify and isolate outliers within the HMA dollars allocated data set:

Outliers ≥ Q3 + (1.5 * IQR)

Outliers ≥ 2,942,029.22 + (1.5 * 2,781,628.92)

Outliers ≥ 7,114,472.6

This isolated 38 communities, which upon examination all but five received funding in response to Hurricanes Katrina or Rita. This was significant because both hurricanes occurred within the program year of 2005, a year in which HMA allocated nearly half of the funds examined within this study. Once these outliers were removed from the data, the correlation analysis was repeated with a vastly different outcome (Table 5).

Table 5

Pearson's Correlation Analysis for Historical Damages and HMA Dollars Allocated (Outliers Removed)

		HMA dollars allocated	Historical damages
HMA dollars allocated	Pearson correlation	1	.269[a]
	Sig. (2-tailed)		0.000
	N	2,466	2,466
Historical damages	Pearson correlation	.269[a]	1
	Sig. (2-tailed)	0.000	
	N	2,466	2,466

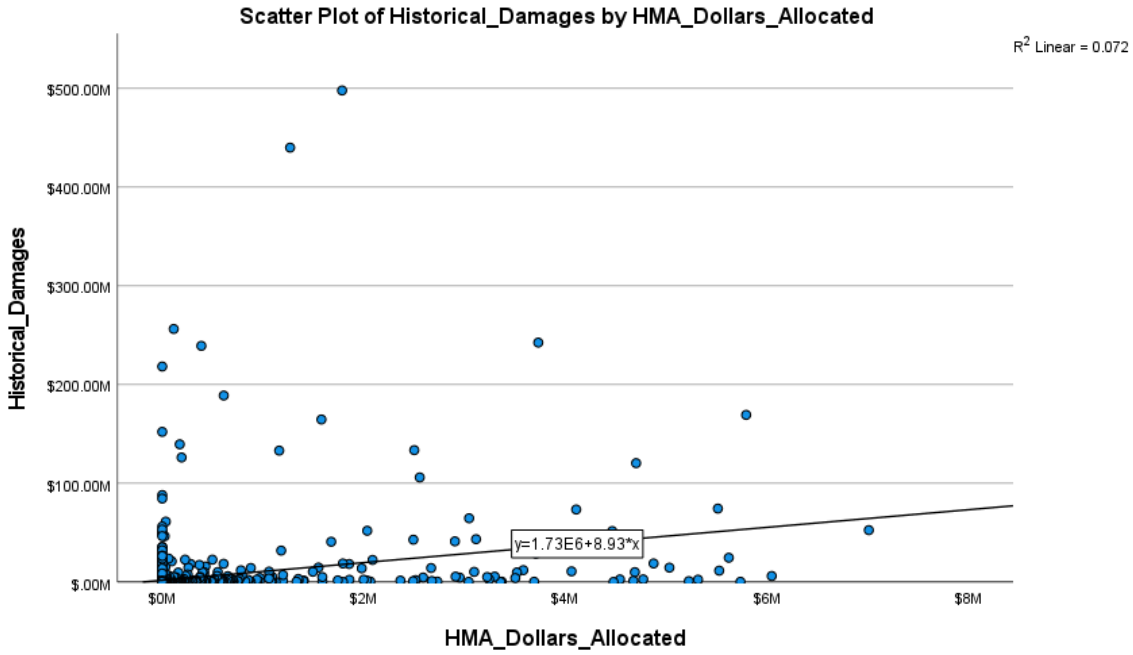
Note. HMA = Hazard Mitigation Assistance
[a]Correlation is significant at the 0.01 level (2-tailed).

As shown in Table 5 and in the scatter plot in Figure 5, the strength of the correlation decreased from .831 to .269 [$r(2,464) = .269$, $p < .01$] or from a high positive correlation to a negligible positive correlation. Expressed differently, the amount of variance in HMA dollars allocated explained by historical damages dropped from 69% to

7%. This finding may suggest a variance in allocation trends between large scale catastrophic events and smaller annual events.

Figure 5

Scatter Plot of Historical Damages by Hazard Mitigation Assistance Dollars Allocated (Outliers Removed)



Note. This figure depicts the amount of historical damages by the amount of HMA dollars allocated for 2,466 communities within FEMA's Region 6 between 2000 and 2017.

Furthermore, case-by-case evidence remains, which suggests instances of gross misallocation, for example, within this data set exists a community that sustained over $218 million in historical damages and yet received no HMA funding. Meanwhile, another community received nearly $1.8 million in HMA funding with $0 in recorded damages. Of the 296 communities that received some degree of HMA funding, 276 (or 93%) sustained historical damages whereas 20 or (7%) did not. While a 7% misallocation rate may seem insignificant, the large number of eligible communities that

did not receive any HMA funding and have sustained historical damages (1,252 of 2,504) shows ample opportunity to improve program performance by further aligning it to community damages.

Despite the evidence of questionable allocation practices, and the vast number of unfunded communities, the strength of the correlation analysis between historical damages and HMA dollars allocated remains statistically significant; therefore, the null hypothesis H_0 ($r = 0$) was rejected, and the alternative hypothesis H_1 ($r \neq 0$) was accepted.

Hypothesis 2 (HMA Dollars Allocated and Number of Repetitive Loss Properties)

This bivariate correlation analysis examined 2,504 of FEMA's Region 6 communities that were eligible to receive HMA funding between 2000 and 2017 based upon NFIP participation and inclusion in a presidentially declared disaster. The Pearson correlation coefficient showed there was a significant positive relationship between HMA dollars allocated and number of repetitive loss properties, $r(2,502) = .893$, $p < .01$. Another way to express this relationship is 80% of the variance in HMA dollars allocated can be explained by number of repetitive loss properties (Table 6).

Table 6

Pearson's Correlation Analysis for Number of RL Properties and HMA Dollars Allocated

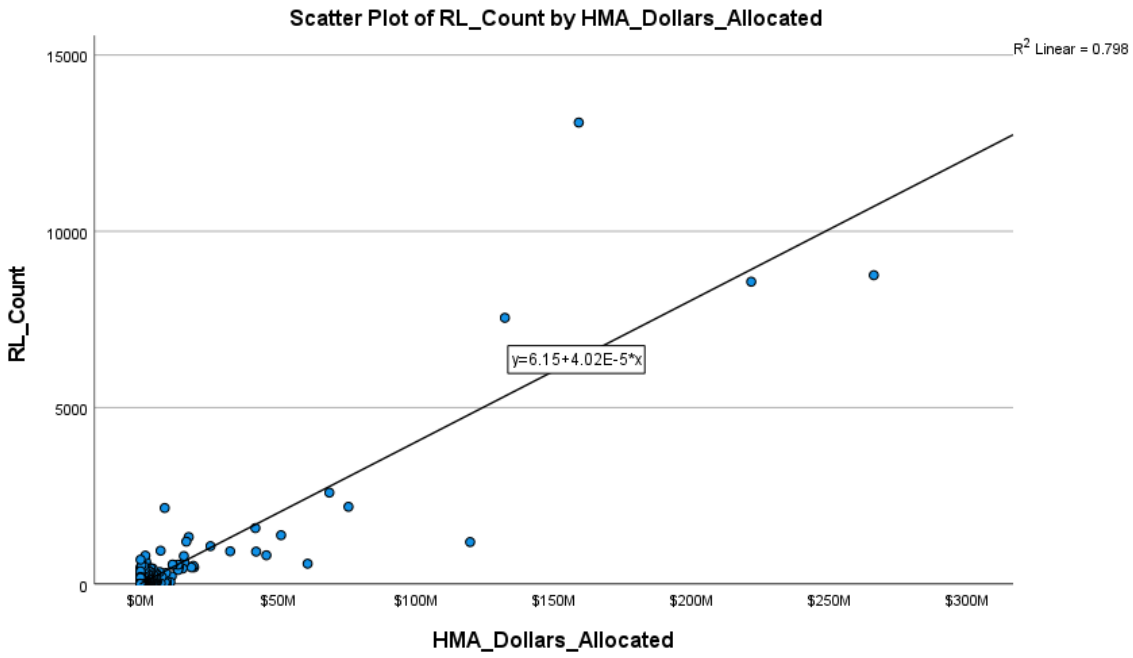
		HMA dollars allocated	RL properties
HMA dollars allocated	Pearson correlation	1	.893[a]
	Sig. (2-tailed)		0.000
	N	2,504	2,504
Number of RL properties	Pearson correlation	.893[a]	1
	Sig. (2-tailed)	0.000	
	N	2,504	2,504

Note. HMA = Hazard Mitigation Assistance; RL = repetitive loss.
[a]Correlation is significant at the 0.01 level (2-tailed).

Similar to the results from Hypothesis 1, this level of significance seemed abnormally high when compared to the experience of this researcher. To further explore the data, a scatter plot was created and analyzed. Figure 6 displays the relationship between these two variables. As was seen with the relationship between HMA dollars allocated and historical damages, the scatter plot revealed significant outliers which again skewed the output of the correlation analysis. It also revealed, as expected, a strong concentration of points at the origin of the chart.

Figure 6

Scatter Plot of Repetitive Loss Properties by Hazard Mitigation Assistance Dollars Allocated



Note. This figure depicts the amount of number of repetitive loss properties by the amount of HMA dollars allocated for 2,504 communities within FEMA's Region 6 between 2000 and 2017.

The same approach that was used to identify and remove outliers in the examination of Hypothesis 1 was utilized for this examination:

Outliers ≥ Q3 + (1.5 * IQR)

Outliers ≥ 2,942,029.22 + (1.5 * 2,781,628.92)

Outliers ≥ 7,114,472.6

This isolated 38 outliers, which were removed, and the correlation analysis was repeated with the remaining communities.

The results of the second analysis revealed a much different relationship. There were 2,466 communities that were examined, and the Pearson correlation coefficient showed there remained a significant positive relationship between HMA dollars allocated and number of repetitive loss properties, $r(2,464) = .42$, $p < .01$. However, the magnitude of the correlation was greatly reduced by .473, or expressed differently, the amount of variance in HMA dollars allocated explained by the number of repetitive loss properties count dropped from 80% to 18%. As shown in Table 7 and validated by the scatterplot in Figure 7, the correlation begins to look much less concreate dropping from a high correlation to a low correlation.

Table 7

Pearson's Correlation Analysis for Number of RL Properties and HMA Dollars Allocated (Outliers Removed)

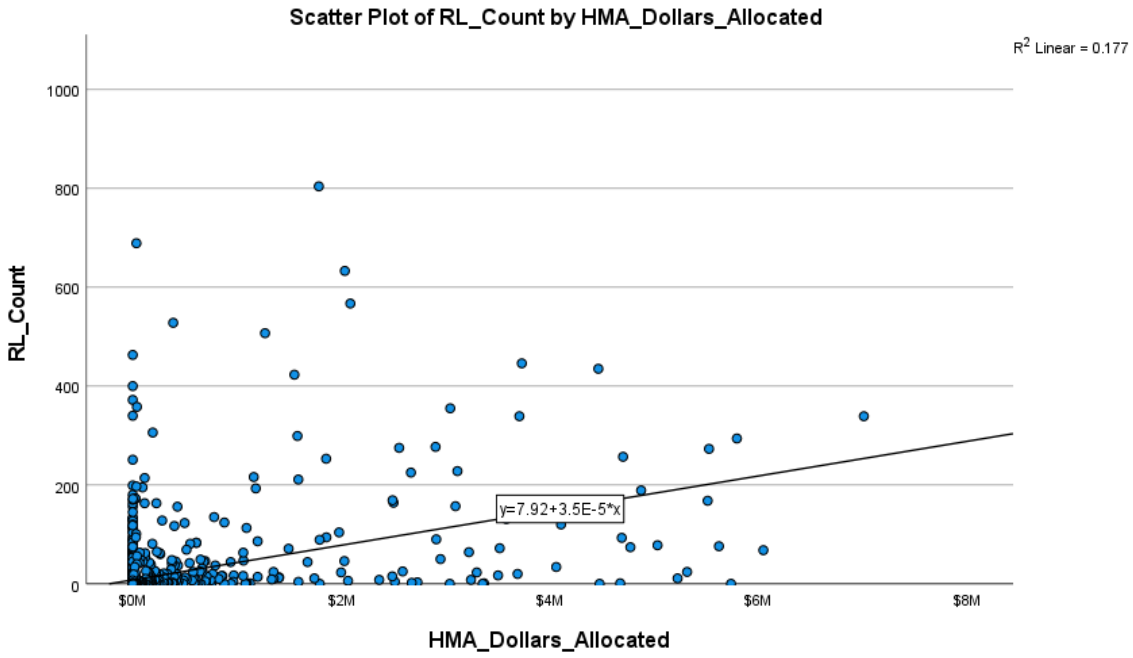
		HMA dollars allocated	RL properties
HMA dollars allocated	Pearson correlation	1	.420[a]
	Sig. (2-tailed)		0.000
	N	2,466	2,466
Number of RL properties	Pearson correlation	.420[a]	1
	Sig. (2-tailed)	0.000	
	N	2,466	2,466

Note. HMA = hazard mitigation assistance; RL = repetitive loss.
[a]Correlation is significant at the 0.01 level (2-tailed).

The results of this analysis indicated that as with the relationship between HMA dollars allocated and historical damages, the relationship between HMA dollars allocated and the number of repetitive loss properties can vary greatly depending on the size and magnitude of the disasters involved. Large scale catastrophes such as Hurricane Katrina resulted in communities with large numbers of repetitive loss properties receiving a large amount of funding through the HMA program. The disproportionate payout of these major events creates an illusion of a strong correlation across the program, but once they were removed from the data set, it became evident that the day-to-day allocation for the vast majority of communities was not as significantly correlated.

Figure 7

Scatter Plot of Number of Repetitive Loss Properties by Hazard Mitigation Assistance Dollars Allocated (Outliers Removed)



Note. This figure depicts the number of repetitive loss properties by the amount of HMA dollars allocated for 2,466 communities (outlier removed) within FEMA's Region 6 between 2000 and 2017.

Within this data set exists a community that possesses 463 instances of repetitive loss and yet received no HMA funding. Meanwhile, another community received nearly $6 million in HMA funding with no instances of repetitive loss properties. Of the 296 communities that received some degree of HMA funding, 254 (or 86%) had instances of repetitive loss properties whereas 42 or (14%) did not. Although a 14% misallocation rate may seem minimal, the large number of eligible communities that did not receive any HMA funding and have repetitive loss properties (841 of 2,504) shows ample opportunity to improve program performance by further aligning it to a community's repetitive loss properties count.

Despite the evidence of questionable allocation practices, and the vast number of unfunded communities, the strength of the correlation analysis between the number of repetitive loss properties and HMA dollars allocated remains statistically significant; therefore, the null hypothesis H_0 ($r = 0$) was rejected, and the alternative hypothesis H_1 ($r \neq 0$) was accepted.

Hypothesis 3 (HMA Dollars Allocated and Estimated Income Per Capita)

This bivariate correlation analysis examined 2,504 FEMA's Region 6 communities that were eligible to receive HMA funding between 2000 and 2017 based upon NFIP participation and inclusion in a presidentially declared disaster. As shown in Table 8 and validated in Figure 8, the Pearson correlation coefficient showed there was a significant positive relationship between HMA dollars allocated and estimated income per capita, $r(2,502) = .068$, $p < .01$. Another way to express this relationship is 0.46% of the variance in HMA dollars allocated can be explained by estimated income per capita.

Table 8

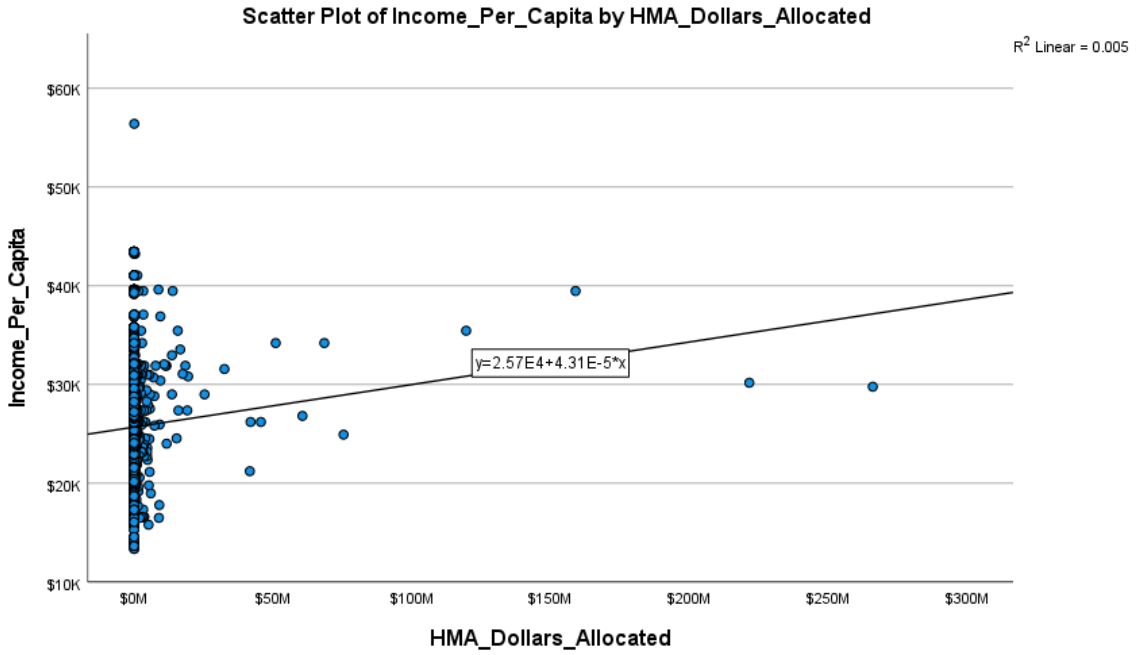
Pearson's Correlation Analysis for Estimated Income Per Capita and HMA Dollars Allocated

		HMA dollars allocated	Estimated income per capita
HMA dollars allocated	Pearson correlation	1	.068[a]
	Sig. (2-tailed)		0.001
	N	2,504	2,504
Estimated income per capita	Pearson correlation	0.068[a]	1
	Sig. (2-tailed)	0.001	
	N	2,504	2,504

Note. HMA = Hazard Mitigation Assistance.
[a]Correlation is significant at the 0.01 level (2-tailed).

Figure 8

Scatter Plot of Estimated Income Per Capita by Hazard Mitigation Assistance Dollars Allocated



Note. This figure depicts estimated income per capita by the amount of HMA dollars allocated for 2,504 communities within FEMA's Region 6 between 2000 and 2017.

Although there was no abnormally high correlation as displayed in the previous two analyses, to provide consistency within this study, the correlation analysis was repeated after removing the same previously identified outliers. The results of the second analysis revealed a noteworthy decrease in the variables' correlation significance. This analysis showed a positive relationship between HMA dollars allocated and estimated income per capita, $r(2,464) = .012$, $p > .01$. This outcome suggested that the magnitude of the correlation was further reduced by .056 and is now statistically insignificant from 0 at both the 99% confidence level as well as the 95% confidence level, or expressed differently, the amount of variance in HMA dollars allocated explained by estimated income per capita dropped from 0.46% to 0.01%. As shown in Table 9 and validated by the scatterplot in Figure 9, there appears to be no correlation at all.

Table 9

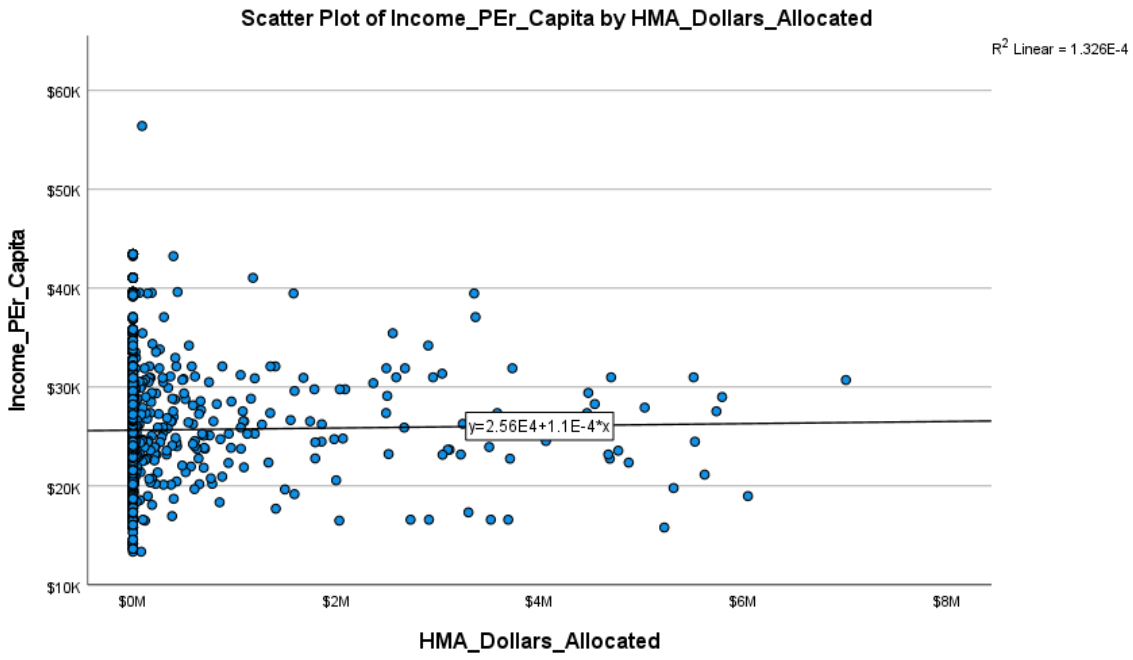
Pearson's Correlation Analysis for Estimated Income Per Capita and HMA Dollars Allocated (Outliers Removed)

		HMA dollars allocated	Estimated income per capita
HMA dollars allocated	Pearson correlation	1	0.012
	Sig. (2-tailed)		0.568
	N	2,466	2,466
Estimated income per capita	Pearson correlation	0.012	1
	Sig. (2-tailed)	0.568	
	N	2,466	2,466

Note. HMA = Hazard Mitigation Assistance.

Figure 9

Scatter Plot of Estimated Income Per Capita by Hazard Mitigation Assistance Dollars Allocated (Outliers Removed)



Note. This figure depicts estimated income per capita by the amount of HMA dollars allocated for 2,466 communities (outlier removed) within FEMA's Region 6 between 2000 and 2017.

In reference to the full data set, despite the low strength of the correlation, the analysis between estimated income per capita and HMA dollars allocated remained statistically significant; therefore, the null hypothesis H_0 ($r = 0$) was rejected, and the alternative hypothesis H_1 ($r \neq 0$) was accepted. However, when the outliers were removed, the strength of the correlation became statistically insignificant from 0. Therefore, under these circumstances, the alternative hypothesis H_1 ($r \neq 0$) was rejected and the null hypothesis H_0 ($r = 0$) was accepted.

Finally, although the correlation analysis did not provide evidence of a strong relationship between these two variables, it is worth pointing out that the average income

per capita for communities that received HMA funding was on average $1,260 higher than that of the communities that did not receive any HMA funding. Although minimal, when viewed in terms of equity, this is worthy of further research.

Summary

The purpose of this study was to explore the relationship between HMA allocation and variables associated with program efficiency, equity, and effectiveness. The dependent variable was HMA dollars allocated, and the independent variables were historical damages, number of repetitive loss properties, and estimated income per capita. Correlation analysis was conducted first on 2,504 communities where each of the three independent variables presented significant correlation with the dependent variable, resulting in the rejection of the null hypothesis for each hypothesis. However, further analysis indicated a large impact from several outliers within the HMA data set. The study utilized the formula [Q3 + (IQR * 1.5)] to identify 38 outliers within the HMA dollars allocated data set. These points were removed, and correlation analysis, utilizing the remaining 2,466 communities, was once again conducted for all three independent variables. The results of this analysis showed dramatic decreases in the strength of the correlation but remained significant for historical damages and number of number of repetitive loss properties. Estimated income per capita dropped to an insignificant level. Although these correlations are informative and provide useful analysis in the exploration of this topic, it is important to, once again, state explicitly that correlations are not the same as causation. These results must be further explored to establish causation.

Finally, Table 3 was provided to display an amount of HMA dollars allocated and lack of allocation broken down by the independent variable characteristics of the

communities. Table 3 (repeated here for ease of reference) illustrates several questionable allocation practices. Chapter 5 provides further discussion, conclusions, and future research recommendations.

Table 3

Instances of HMA Allocation by Community Characteristics

Community characteristics	(+) HMA allocation	(0) HMA allocation
(0) Repetitive loss	42	1,368
(0) Historical damages	20	956
(0) Repetitive loss & 0 historical damages	17	923
(+) Repetitive loss	254	840
(+) Historical damages	276	1,252
(+) Repetitive loss & (+) historical damages	251	807

Note. HMA = Hazard Mitigation Assistance.

CHAPTER 5: FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to explore the presence of relationships between indicators of efficient, effective, and equitable limited resource allocation and historical Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) funding. This study approached the allocation from the lens of the flood hazard because of overwhelming evidence and criticism of the performance of FEMA's National Flood Insurance Program (NFIP).

To conduct this exploration, metrics representative of efficient, effective, and equitable allocation had to be selected. This study utilized two variables, number of repetitive loss properties and historical damages payout, to represent evidence of flood damages within a community. According to the rule consequentialist framework established in Chapter 2, allocations in line with these factors would represent a degree of efficient and effective allocation. The study also used estimated income per capita to represent financial vulnerability by the NFIP community. According to this study's framework, allocations to communities with low estimated income per capita would represent equitable and therefore appropriate allocation. Together, these variables served as independent variables and were analyzed with the federal share allocated for HMA grant projects, which served as the study's dependent variable.

The study examined whether there was a relationship between the dependent variable and each of the three independent variables. To accomplish this, a Pearson correlation coefficient test was utilized. The study used the following research questions:

1. Is there a correlation between HMA projects and cumulative historical disaster damages (as informed by NFIP claims) associated with flooding?

H_0: A community's cumulative flood damage does not affect the amount of HMA funding they receive, $r = 0$.

H_1: A community's cumulative flood damage impacts the amount of HMA funding they receive, $r \neq 0$.

2. Is there a correlation between HMA projects and the number of NFIP repetitive loss and severe repetitive loss properties within a community?

   H_0: A community's number of repetitive loss properties does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's number of repetitive loss properties impacts the amount of HMA funding they receive, $r \neq 0$.

3. Is there a correlation between HMA projects and the estimated income per capita of a community?

   H_0: A community's estimated income per capita does not affect the amount of HMA funding they receive, $r = 0$.

   H_1: A community's estimated income per capita impacts the amount of HMA funding they receive, $r \neq 0$.

This study examined a population consisting of, and limited to, a national collective of communities that had elected to participate in the NFIP and had received a presidentially declared disaster related to flooding. To scale this population to a reasonable size, this study's sample consisted of communities within this population that were located within the jurisdiction of FEMA's Region 6 (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas). The sample also was limited to the program years of 2000–2017. These parameters narrowed the sample number of communities to 2,504.

During the study's correlation analysis, there were several outlying points that had a substantial impact on the Pearson correlation coefficient heavily skewing the result. Research showed that of the 296 communities that received HMA funding in FEMA's Region 6, six received 50.3% of all HMA funding. To achieve a more accurate understanding of this phenomenon, the researcher repeated the correlation analysis for all three independent variables after removing the outliers from the HMA allocation data set. The following formula was utilized to identify the outliers.

Outliers ≥ Q3 + (1.5 * IQR)

Outliers ≥ 2,942,029.22 + (1.5 * 2,781,628.92)

Outliers ≥ 7,114,472.6

This method identified and removed 38 communities from the second analysis for each independent variable. The total number of communities examined for the second analysis was 2,466.

Major Findings

This study conducted two Pearson correlation coefficient analyses for each of the three independent variables as well as an allocation examination based upon the dependent variable characteristics of the communities that made up the study's sample. There are four major findings from this study.

The first major finding comes from the examination of HMA allocation by community characteristics. This analysis investigated the distribution of HMA dollars allocated compared to a community's possession or lack of the number of repetitive loss properties and historical damages. This analysis utilized the framework of rule consequentialism established in Chapter 2 to total the number of appropriate and

inappropriate allocation instances. The examination utilized Table 10 to define appropriate allocations and inappropriate allocations. In essence, HMA dollars allocated that went to communities with the number of repetitive loss properties or historical damages were found appropriate whereas HMA dollars allocated that went to communities without these characteristics were found inappropriate. Conversely, lack of HMA dollars allocated to communities with the number of repetitive loss properties and/or historical damages was found inappropriate whereas lack of HMA dollars allocated to communities with a lack of these characteristics was found appropriate.

Table 10

Appropriateness of Allocation by Community Characteristics

Community characteristics	(+) HMA allocation	(0) HMA allocation
(0) Repetitive loss	×	✓
(0) Historical damages	×	✓
(0) Repetitive loss & 0 historical damages	×	✓
(+) Repetitive loss	✓	×
(+) Historical damages	✓	×
(+) Repetitive loss & (+) historical damages	✓	×

Note. HMA = Hazard Mitigation Assistance.

This analysis (shown in Table 11) identified a combined total of 4,028 appropriate scenarios and 2,978 inappropriate scenarios. These number are larger than the sample size due to overlap in the characteristics. However, of the 2,504 communities, for repetitive loss there were 1,622 appropriate scenarios and 882 inappropriate scenarios (this is seen by examining rows 1 and 4 of Table 11). Of the 2,504 communities, for historical damages there were 1,232 appropriate scenarios and 1,272 inappropriate scenarios (this is seen by examining rows 2 and 5 of Table 11). Although the study's

focus was on identifying the presence or absence of a correlation among these variables, this exercise was valuable to explore the various allocation scenarios and to identify instances of inappropriate allocations.

Table 11

Instances of HMA Allocation by Community Characteristics

Community characteristics	(+) HMA allocation	(0) HMA allocation
(0) Repetitive loss	42	1,368
(0) Historical damages	20	956
(0) Repetitive loss & 0 historical damages	17	923
(+) Repetitive loss	254	840
(+) Historical damages	276	1,252
(+) Repetitive loss & (+) historical damages	251	807

Note. HMA = Hazard Mitigation Assistance.

The second major finding of this study was the outcome from the first correlation analysis. This analysis utilized a Pearson correlation coefficient to explore the relationship between HMA dollars allocated and historical damages. The result of the analysis suggests a very strong positive correlation between these variables, $r(2{,}502) = .83$, $p < .01$. This correlation indicates that to a high degree, as damages increase within a community, HMA dollars allocated will also increase. This relationship is aligned with appropriate allocation practices as set forth by this study. However, 38 outliers within the dependent variable were found to have heavily skewed the correlation outcome. When the outliers were removed, the strength of the correlation coefficient dropped substantially, $r(2{,}464) = .269$, $p < .01$.

While the outcome of the second correlation analysis remains statistically significant, it raises questions as to the nature of the relationship between these two

variables at different disaster scales. It provides evidence that allocation practices may vary significantly depending on the size and scale of damages associated with the event. It would appear the larger the disaster the more influence historical damages has on HMA dollars allocated. However, even after removing the outliers and conducting the second correlation analysis, the outcome remains statistically significant, thereby indicating the null hypothesis H_0 ($r = 0$) is rejected and the alternative hypothesis H_1 ($r \neq 0$) is accepted.

The third major finding of the study was derived from the testing of the second hypothesis. This analysis utilized a Pearson's correlation coefficient to explore the relationship between HMA dollars allocated and number of repetitive loss properties. The result of the analysis suggests a very strong positive correlation between these variables, $r(2,502) = .893$, $p < .01$. This correlation indicates that as the number of repetitive loss properties within a community increase, HMA dollars allocated will also increase. This relationship is aligned with appropriate allocation practices as set forth by this study. However, just as with the first correlation analysis, 38 outliers within the dependent variable were found to have heavily skewed the correlation outcome. When the outliers were removed, the strength of the correlation coefficient dropped substantially, $r(2,464) = .42$, $p < .01$. This lends further evidence to support the notion that allocation practices may vary significantly depending on the size and scale of damages associated with the event. Despite the reduction in strength from the first analysis and the second, the outcome remains statistically significant, thereby indicating the null hypothesis H_0 ($r = 0$) is rejected, and the alternative hypothesis H_1 ($r \neq 0$) is accepted.

Lastly, the fourth major finding from this study was derived from the testing of the third hypothesis. This analysis utilized a Pearson correlation coefficient to explore the relationship between HMA dollars allocated and estimated income per capita of a community. This analysis indicates the presence of a positive relationship, $r(2,502) = .068$, $p < .01$. Therefore, the null hypothesis H_0 ($r = 0$) is rejected, and the alternative hypothesis H_1 ($r \neq 0$) is accepted. This result suggests that communities with higher estimated income per capita were skewed slightly in a positive direction and would receive more HMA dollars allocated than those with lower estimated income per capita.

Unexpected Findings

While each of the three outcomes discussed within the major findings indicates statistically significant positive correlations between the independent and dependent variables, further analysis revealed the substantial impact outliers within the dependent variable had on the outcome. The researcher followed his intuition, based upon professional experience in the field, and examined the original outcomes more closely because they did not seem to represent common occurrence. Utilizing a method to identify and remove the outliers within the data, the correlations were conducted a second time. The second round of analysis presented a noteworthy decrease in the correlation strength among each of the independent variables.

Although the correlations between HMA dollars allocated and number of repetitive loss properties, as well as HMA dollars allocated and historical damages, remained statistically significant, there was a drastic decrease in strength. More specifically, the strength of correlation between HMA dollars allocated and historical damages dropped from .831 to .269, a decrease of .562. A similar decrease was seen in

HMA dollars allocated and number of repetitive loss properties with a decrease of .473. When the outliers were removed from the analysis of HMA dollars allocated and estimated income per capita, the decrease in correlation, from .06 to .012, was sufficient enough to make the outcome statistically insignificant at both the 99% and 95% confidence level.

These reductions in correlation strength warranted a further exploration of the outliers that caused them. This exploration revealed some interesting findings. The 38 outliers (communities) accounted for $1.64 billion of nearly $1.94 billion allocated across all 2,504 eligible communities within this study, or to express this differently, 84.9% of HMA funding went to just 38 of the 2,504 communities examined. It was also determined that of the 38 outlying communities, 34 were impacted by Hurricane Harvey (2017), Hurricane Ike (2008), or Hurricane Katrina (2005), three of the costliest tropical cyclones of the century. This finding would suggest that there may be a significant variance in how allocation is handled during large-scale catastrophic events as compared to smaller flooding events.

Conclusions

This study consisted of three primary research questions aimed at better understanding the allocative trends of FEMAs HMA resource allocation. Additionally, this study draws an additional conclusion based upon the scenarios presented in the community characteristics in Table 11 (repeated for ease of reference).

Table 11

Instances of HMA Allocation by Community Characteristics

Community characteristics	(+) HMA allocation	(0) HMA allocation
(0) Repetitive loss	42	1,368
(0) Historical damages	20	956
(0) Repetitive loss & 0 historical damages	17	923
(+) Repetitive loss	254	840
(+) Historical damages	276	1,252
(+) Repetitive loss & (+) historical damages	251	807

Note. HMA = Hazard Mitigation Assistance.

The first question sought to understand the impact historical flood damages may have on FEMAs allocative discretion. The results of the correlation analysis between HMA dollars allocated and historical damages clearly indicated a statistically significant positive correlation at a 99% confidence level. As historical damages increase so does the amount of HMA allocation. This study established that resources applied to areas that represent increased risk to the health of the NFIP, as well as FEMA as an agency, is to be considered effective and efficient allocation. Therefore, this study concludes that based on the strength of correlation and indicated relationship between these two variables, FEMA's HMA allocations are effective and efficient.

The second question, much like the first, was intended to provide improved understanding as to the efficiency and effectiveness of FEMA's HMA resource allocation. It explored the relationship between HMA dollars allocated and the number of repetitive loss properties within a community. This study established that these high-risk properties represent a growing concern to the NFIP's financial health and that an allocation of resources in an effort to mitigate this risk is to be considered effective and

efficient. The results of this correlation analysis indicated a statistically significant, positive correlation at a 99% confidence level. As the number of repetitive loss properties increase within a community, the more HMA funding the community is likely to receive. This observation agrees with the conclusion from the first research question and supports the notion that HMA resource allocation is effective and efficient.

The third research question was intended to examine the HMA allocation from an equity lens. This portion of the study explored what role the estimated income per capita of a community might have on HMA dollars allocated. The study draws upon literature that suggests funds should be distributed either impartially to a population's substatus or in favor of those disadvantaged. Applied in terms of this study's correlation analysis, equitable allocation would be seen if there was no correlation between HMA dollars allocated and estimated income per capita. Furthermore, if a correlation did exist, the more equitable relationship would be represented by a negative correlation. However, the results of this study provide evidence that a statistically significant positive correlation exists at the 99% confidence level. This would indicate that not only are there inequities in HMA dollars allocated, but they also favor the advantaged.

Finally, the study's last conclusion draws from the results of the examination of instances of HMA dollars allocated by community characteristics (historical damages and number of repetitive loss properties). This element of the study, while rather straightforward, provided a method to highlight instances of appropriate and inappropriate allocation in a limited resources environment. After identifying 12 scenarios based upon the allocation status and community characteristics, six scenarios were labeled as inappropriate and six were labeled appropriate. Utilizing this framework,

this analysis identified a combined total of 4,028 appropriate scenarios and 2,978 inappropriate scenarios. The number of scenarios is larger than the sample size of 2,504 due to overlap in the characteristics. It is important to note that this examination revealed instances in which HMA dollars allocated were spent in communities that had neither historical damages nor number of repetitive loss properties. Meanwhile, communities with considerable historical damages and number of repetitive loss properties received no HMA dollars allocated. This analysis indicated two important findings. The first is that there were more appropriate allocative practices than inappropriate practices, suggesting that the program is more efficient than nonefficient. However, the second finding is that there is evidence that suggests there is ample opportunity for improvement.

Implications for Action

By design, this study was intended to be an early exploration of the relationship FEMA's HMA program has with variables indicative of efficient, effective, and equitable resource allocation. This exploration is built upon the foundation of proper public administration in which these elements serve as pillars. At its most basic level, the findings from this study are important because they validate multiple aspects of the HMA dollars allocated performance. Properly understood, this has the potential to help ensure that these elements are continually leveraged or increased to produce desirable results. Similarly, this study identifies elements of inequities and inefficiencies that should be formally addressed within the HMA program. It provides opportunity to improve upon existing allocative practices. Furthermore, this study identifies a possible variance in program application depending upon the size and scale of the disaster. This phenomenon is worthy of further exploration.

On a higher level, the impact of the study is in its ability to provide an early framework and examination method for resource allocation analysis in federal or other public agencies. This study established a moral and technical framework that defines efficiency and effectiveness within the public sector, a distinction that remains underexplored. This study lays an early groundwork for limited resource allocation within the public sector that is ripe for further exploration and advancements.

There is an additional element, foundational to proper public administration, that should be acknowledged upon the reflection of this study. This element, or pillar, of public administration is the concept of transparency. It is worth discussing as the current state of data sharing and access within FEMA is unsatisfactory. Although FEMA publishes several data sets on its Open FEMA website, many of them are difficult to navigate and download without significant tools and IT skill sets. Furthermore, these data sets are spread across multiple formats with little to no direction as to how to link the data together. Lastly, even after leveraging the Freedom of Information Act (FOIA), FEMA's information disclosure branch, and after a 6-month delay, it did not provide several of the requested data sets. This is a problematic development because it limits the public's ability to be informed on critical public administrative performance and status. It is the recommendation by this researcher that FEMA take a more proactive approach to this issue of transparency and invest in a more user-friendly, data sharing infrastructure. This would allow easier access and understanding of this critical public information and foster future exploration and analysis.

Recommendations for Further Research

Because this study was intended to be an early exploration of limited resource allocation within the public sector, there is ample room for further studies and development. Some of these future research recommendations are directly aligned with this study whereas others are more abstract.

Perhaps one of the more significant limitations to this study was the inability to obtain historical damages from programs outside of NFIP, more specifically, FEMA's Individual Assistance Program. It has been this researcher's professional experience that those who register for individual assistance following a disaster are often separate from those who maintain flood insurance coverage. That is to say that although this study explored historical damages from the lens of NFIP, it could be dramatically improved with the inclusion for damages from other federal programs. This future recommended research would likely provide a more holistic understanding of historical flood damages.

Another opportunity to improve upon this study is through the exploration of additional repetitive loss categories. Although this study purposely utilized the NFIP's definition of repetitive and severe repetitive loss structures, other definitions exist with FEMA. For instance, HMA defines these terms slightly differently than NFIP, and the resulting correlation analysis utilizing this alternative definition may result in some interesting outcomes.

Perhaps the most complex yet meaningful expansion to this body of research would be to explore how the individual HMA grants align to the locations and disaster types that made the funds available. Because several of the HMA grant programs do not require projects to be applied in a particular fashion or location, the opportunity for funds

to be applied to a hazard other than that of which initiated the funding stream exists. Although this research would require access to large amounts of data, as well as careful analysis, it has the opportunity to provide a much more detailed understanding of some of the political and more qualitative elements of limited resource allocation within the public sector. This would provide more of a detailed audit of performance, which may lead toward specific policy or program reform.

Because equity was only a partial focus of this study, there is a large opportunity to expand upon the analysis utilizing complete social vulnerability indexes (SVI). This study utilized estimated income per capita as a sole indicator of socially vulnerable communities. The use of a complete SVI would allow the exploration of equitable allocation across other factors beyond financial status. This not only would be valuable to local, state, and federal emergency management agencies but also would likely have profound implications within agencies such as the Housing and Urban Development (HUD) and the U.S. Department of Agriculture (USDA) that have similar missions and responsibilities.

Another component and finding from this study that is worthy of further research is the perceived variance between allocative practices in large-scale incidents, such as Hurricanes Katrina, Ike, and Harvey, and smaller events. By enhancing the understanding of what actions or behaviors are resulting in higher efficiencies in large-scale incidents, a gap analysis may be able to identify why smaller incidents do not allocate as efficiently. This would likely inform policy or even grant program refinement.

Finally, one last element worthy of more research is the examination of the future viability of NFIP given the findings of this study. In Chapter 1, it was established that the NFIP is and has been in a problematic position given its financial performance. According to GAO (2020), "FEMA still owed [the] Treasury $20.5 billion as of March 2020, despite Congress cancelling $16 billion of debt in 2017" (p. 2). Furthermore, Figure 1 illustrates the rate in which high-risk repetitive loss properties is outpacing mitigation activity. This information, when paired with the favorable correlations of HMA allocation to NFIP historical damage and repetitive loss properties, suggests that federal grant allocation is not a large contributing factor of NFIP's ill performance. Therefore, further research is needed to explore what role and to what extent hazard mitigation has in serving as a solution to this problem. Can hazard mitigation, assuming ideal allocative practices, outpace the rate of increase in high-risk structures?

Concluding Remarks and Reflections

While correlations can help explain the relationship between two variables, they do not necessarily inform causation. This study presents evidence to suggest strong relationships between the NFIP and the HMA program; however, more analysis will need to be conducted in order to determine the causation of resource allocation.

It is important to restate the significance of FEMA's (n.d.) mission and responsibility as charged by the U.S. public: "To help people before, during, and after a disaster" (p. 6). This is an admirable and difficult task, riddled with complexities and challenges. Although this study explored elements of FEMA's NFIP and HMA program, it was not the researcher's intention to pass judgement or conviction on their performance. As a public sector entity, efficiency and effectiveness may not appear as

neatly as the more common financial and technical definitions would suggest. When evaluating the performance within this sector, consideration should be given to the extreme nature and fluidity of disaster response. This study's intent was to assist the researcher in understanding the relationship that resource allocation had with historical damages and high-risk structures. This was done in an effort to inform policy and program reform where appropriate. The results and findings of this study present a potential moral hazard that would suggest funding and resource allocation may require further evaluation, research, and possible refinement to ensure a program or agency is not unjustly protected from consequences of misallocation. It is the recommendation and hope of this researcher that this study will be expanded upon with further research regarding public sector resource allocation.

REFERENCES

American Community Survey. (2019). *American community survey and Puerto Rico community survey: 2019 subject definitions*. https://www2.census.gov/programs-surveys/acs/tech_docs/subject_definitions/2019_ACSSubjectDefinitions.pdf

Bentham, J. (1790). *A manual of political economy*. https://socialsciences.mcmaster.ca/econ/ugcm/3ll3/bentham/manualpoliticaleconomy.pdf

Blackburn, S. (2001). *Being good: A short introduction to ethics*. Oxford University Press.

Brunkard, J., Namulanda, G., & Ratard, R. (2008). Hurricane Katrina deaths, Louisiana, 2005. *Disaster Medicine and Public Health Preparedness*, *2*(4), 215–223. https://doi.org/10.1097/DMP.0b013e31818aaf55

Disaster Mitigation Act of 2000. P.L. 106-390 § 1554. https://www.congress.gov/106/plaws/publ390/PLAW-106publ390.pdf

Einarsson, S., & Rausand, M. (1998). An approach to vulnerability analysis of complex industrial systems. *Risk Analysis*, *18*(5), 535–546.

Federal Emergency Management Agency. (n.d.). *We are FEMA: Helping people before, during, and after disasters* [Publication 1]. U.S. Department of Homeland Security. https://www.fema.gov/sites/default/files/2020-03/publication-one_english_2019.pdf

Federal Emergency Management Agency, Emergency Management Institute. (2003). *A citizen's guide to disaster assistance*. U.S. Department of Homeland Security. https://training.fema.gov/emiweb/downloads/is7complete.pdf

Federal Emergency Management Agency. (2005). *National flood insurance program (NFIP) Floodplain management requirements: A study guide and desk reference for local officials*. U.S. Department of Homeland Security. https://www.fema.gov/sites/default/files/documents/fema-480_floodplain-management-study-guide_local-officials.pdf

Federal Emergency Management Agency. (2008). *Severe repetitive loss (SRL) pilot program guidance*. U.S. Department of Homeland Security.

Federal Emergency Management Agency. (2010). *Flooding – Our nation's most frequent and costly natural disaster*. U.S. Department of Homeland Security. https://www.fbiic.gov/public/2010/mar/FloodingHistoryandCausesFS.PDF

Federal Emergency Management Agency. (2018). 5 common flood insurance myths. https://www.fema.gov/blog/5-common-flood-insurance-myths

Federal Emergency Management Agency. (2019). *Stafford Act, as amended, and related authorities*. U.S. Department of Homeland Security. https://www.fema.gov/sites/default/files/2020-03/stafford-act_2019.pdf

Federal Emergency Management Agency. (2020). *Federal register*. U.S. Department of Homeland Security. https://www.govinfo.gov/content/pkg/FR-2020-08-28/pdf/2020-16004.pdf

Federal Emergency Management Agency. (2021a). *Community rating system*. U.S. Department of Homeland Security. https://www.bellairetx.gov/DocumentCenter/View/20794/NFIP-CRS-Fact-Sheet?bidId=#:~:text=in%20the%20CRS&text=Although%20CRS%20communities%20represent%20only,are%20written%20in%20CRS%20communities

Federal Emergency Management Agency. (2021b). *Disaster information*. U.S. Department of Homeland Security. http://www.fema.gov/disasters/

Federal Emergency Management Agency. (2021c). *Flood mitigation assistance (FMA) grant* U.S. Department of Homeland Security. https://www.fema.gov/grants/mitigation/floods

Federal Emergency Management Agency. (2021d). *Hazard mitigation assistance grants*. U.S. Department of Homeland Security. https://www.fema.gov/grants/mitigation

Federal Emergency Management Agency. (2021e). Stafford Act. https://www.fema.gov/disaster/stafford-act#

Federal Insurance and Mitigation Administration. (2019). *FY 2019 Pre-disaster mitigation (PDM) grant program*. Federal Emergency Management Agency. https://www.floridadisaster.org/globalassets/dem/mitigation/pre-disaster-mitigation/fy-2019-pdm-fact-sheet.pdf

Feldman, F. (2006). Actual utility, the objection from impracticality, and the move to expected utility. *Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition*, *129*(1), 49–79. https://www.jstor.org/stable/4321749

Frank, T. (2019, March 18). The private sector is returning to the flood insurance game. *E&E News*. https://www.scientificamerican.com/article/the-private-sector-is-returning-to-the-flood-insurance-game/

Frederickson, H. G. (2010). *Social equity and public administration: Origins, developments, and applications*. M.E. Sharpe.

Garrett, T. A., & Sobel, R. S. (2003). The political economy of FEMA disaster payments. *Economic Inquiry*, *41*(3), 496–509. https://doi.org/10.1093/ei/cbg023

Gaynor, P. (2019). The Disaster Recovery Reform Act has made such a big difference. The Hill. https://thehill.com/opinion/energy-environment/464520-the-disaster-recovery-reform-act-has-made-such-a-big-difference-in

Gonick, S. A., & Errett, N. A. (2018). Integrating climate change into hazard mitigation planning: A survey of state hazard mitigation officers. *Sustainability*, *10*(11), 4150. https://doi.org/10.3390/su10114150

Groeneveld, R. A. (2020.). Welfare economics and wicked problems in coastal and marine governance. *Marine Policy*, *117*. https://doi.org/10.1016 /j.marpol.2020.103945

Harrod, R. F. (1936). Utilitarianism revised. *Mind*, *45*(178), 137–156.

Homeland Security Emergency Management. (2019). *Hazard mitigation assistance (HMA) programs guidance*. New Hampshire Department of Safety. https://prd.blogs.nh.gov/dos/hsem/wp-content/uploads/2014/11/HMA-Guidance-January-2019.pdf

Hunter, D. (1994). Act utilitarianism and dynamic deliberation. *Erkenntnis (1975-)*, *41*(1), 1–35. http://www.jstor.org/stable/20012561

Husted, T., & Nickerson, D. (2014). Political economy of presidential disaster declarations and federal disaster assistance. *Public Finance Review*, *42*(1), 35–57. https://doi.org/10.1177/1091142113496131

Kahn, L. (2013). Rule consequentialism and disasters. *Philosophical Studies*, *162*(2), 219–236. https://doi.org/10.1007/s11098-011-9756-8

Lindsay, B. R., & Murray, J. (2011). *Disaster relief funding and emergency supplemental appropriations*. Congressional Research Service.

https://journalistsresource.org/wp-content/uploads/2012/10/R40708_20110412.pdf

Manzoor, A. (2014). A look at efficiency in public administration: Past and future. *SAGE Open*, *4*(4). https://doi.org/10.1177/2158244014564936

Mill, J. S. (2001). *Utilitarianism*. Electric Book Company.

Office of the Federal Register, National Archives and Records Administration. (2013). *Title 44: Emergency management and assistance.* U.S. Government Printing Office.

Office of the Federal Register, National Archives and Records Administration. (2019). *Code of federal regulations: Title 42: Public health* https://www.govinfo.gov/content/pkg/USCODE-2019-title42/pdf/USCODE-2019-title42-chap68-subchapII-sec5133.pdf

Peter G. Peterson Foundation. (2020). Budget basics: The National Flood Insurance Program. https://www.pgpf.org/budget-basics/the-national-flood-insurance-program

Post-Katrina Emergency Management Reform Act of 2006, P.L. 109-295, 6 U.S.C. § 701 (2006). https://www.doi.gov/sites/doi.gov/files/uploads/Post_Katrina_Emergency_Management_Reform_Act_pdf.pdf

Rahmstorf, S. (2017). Rising hazard of storm-surge flooding. Proceedings of the National Academy of Sciences of the United States of America. https://doi.org/10.1073/pnas.1715895114

Reed, A. J., Mann, M. E., Emanuel, K. A., Lin, N., Horton, B. P., Kemp, A. C., & Donnelly, J. P. (2015). Increased threat of tropical cyclones and coastal flooding

to New York City during the anthropogenic era. Proceedings of the National Academy of Sciences of the United States of America, *112*(41), 12610–12615. https://doi.org/10.1073/pnas.1513127112

Rittel, H. W. J., & Webber, M. W. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*(2), 155–169.

Rutgers, M. R., & van der Meer, H. (2010). The origins and restriction of efficiency in public administration: Regaining efficiency as the core value of public administration. *Administration and Society*, *42*(7), 755–779. https://doi.org/10.1177/0095399710378990

Sen, A. (1979). Utilitarianism and welfarism. *The Journal of Philosophy*, *76*(9), 463–489. https://doi.org/10.2307/2025934

Simon, R. (2017, September 15). One house, 22 floods: Repeated claims drain federal insurance program. *Wall Street Journal*. https://www.wsj.com/articles/one-house-22-floods-repeated-claims-drain-federal-insurance-program-1505467830

Simon, H. (1976). *Administrative behavior, a study of decision-making processes in administrative organization*. Free Press.

Skelley, B. D. (2008). The persistence of the politics-administration dichotomy: An additional explanation. *Public Administration Quarterly*, *32*(4), 549–570. https://www.jstor.org/stable/41288331

Taylor, R. (1990). Interpretation of the correlation coefficient: A basic review. *Journal of Diagnostic Medical Sonography*, *6*(1), 35–39. https://doi.org/10.1177/875647939000600106

U.S. Copyright Office. (2000). H.R.707. - Disaster Mitigation Act of 2000. https://www.congress.gov/bill/106th-congress/house-bill/707?q=%7B%22search%22%3A%5B%22%5C%22Disaster+mitigation+Act%5C%22%22%5D%7D&s=1&r=39

U.S. Copyright Office. (2002). H.R.5005. - Homeland Security Act of 2002. https://www.congress.gov/bill/107th-congress/house-bill/5005?q=%7B%22search%22%3A%22%5C%22107-296%5C%22%22%7D&s=9&r=2

U.S. Copyright Office. (2006). S.3721. - Post-Katrina Emergency Management Reform Act of 2006. https://www.congress.gov/bill/109th-congress/senate-bill/3721

U.S. Copyright Office. (2013). H.R.219. - Sandy Recovery Improvement Act of 2013. https://www.congress.gov/bill/113th-congress/house-bill/219?q=%7B%22search%22%3A%5B%22%5C%22sandy+recovery+improvement%5C%22%22%5D%7D&s=4&r=14

U.S. Department of Homeland Security. (2020). *FY 2020: Budget in brief*. https://www.dhs.gov/sites/default/files/publications/19_0318_MGMT_FY-2020-Budget-In-Brief.pdf

U.S. Government Accountability Office. (2019). *High-risk series: Substantial efforts needed to achieve greater progress on high-risk areas*. https://www.gao.gov/assets/700/697245.pdf

U.S. Government Accountability Office. (2020). *National flood insurance program: Fiscal exposure persists despite property acquisitions*. https://www.gao.gov/assets/710/707821.pdf

U.S. Government Accountability Office. (2021). *Disaster resilience: FEMA should take additional steps to streamline hazard mitigation grants and assess program effects*. https://www.gao.gov/assets/720/712172.pdf

U.S. Government Publishing Office. (2006). *Hurricane Katrina: A nation still unprepared: Special report of the Committee on Homeland Security and Governmental Affairs, United States Senate the Library of Congress*. https://lccn.loc.gov/2007361256

Waldo, D. (1984). *The administrative state*. Holmes & Meier.

Walsh, M. W. (2017, November 4). A broke, and broken, flood insurance program. *The New York Times*. https://www.nytimes.com/2017/11/04/business/a-broke-and-broken-flood-insurance-program.html

Wilson, J. Q. (1989). *Bureaucracy: What agencies do and why they do it*. Basic Books.

APPENDICES

APPENDIX A

HAZARD MITIGATION ASSISTANCE FLOOD HAZARD PROJECT TYPES

This appendix provide the list of unique hazard mitigation assistance (HMA) project types that were identified and selected by this study as those that directly mitigate the flood hazard.

200.1: Acquisition of Private Real Property (Structures and Land) - Riverine
200.1A: RETRO - Acquisition of Private Real Property (Structures and Land) - Riverine
200.2: Acquisition of Private Real Property (Structures and Land) - Coastal
200.3: Acquisition of Public Real Property (Structures and Land) - Riverine
200.4: Acquisition of Public Real Property (Structures and Land) - Coastal
201.1: Relocation of Private Structures - Riverine
201.3: Relocation of Public Structures - Riverine
202.1: Elevation of Private Structures - Riverine
202.1A: RETRO - Elevation of Private Structures - Riverine
202.2: Elevation of Private Structures - Coastal
202.2A: RETRO - Elevation of Private Structures - Coastal
202.3: Elevation of Public Structures - Riverine
202.4: Elevation of Public Structures - Coastal
203.3: Wet Floodproofing Public Structures - Riverine
203.4: Wet Floodproofing Public Structures - Coastal
204.1: Dry Floodproofing Private Structures - Riverine (Commercial)
204.3: Dry Floodproofing Public Structures - Riverine
204.4: Dry Floodproofing Public Structures - Coastal
207.1: Mitigation Reconstruction - PILOT
207.2: Mitigation Reconstruction
300.4: Vegetation Management - Non Coastal Shoreline Stabilization
301.1: Shoreline Stabilization (Riprap, etc.)

303.2: Floodplain and Stream Restoration
303.3: Floodplain and Stream Restoration - Post-wildfire remediation
400.1: Utility Protective Measures (Electric, Gas, etc.)
400.1A: RETRO - Utility Protective Measures (Electric, Gas, etc.)
401.1: Water and Sanitary Sewer System Protective Measures
402.1: Infrastructure Protective Measures (Roads and Bridges)
402.2: Roads and Bridges - Post-wildfire erosion and flood protection
403.1: Stormwater Management - Culverts
403.1A: RETRO - Stormwater Management - Culverts
403.2: Stormwater Management - Diversions
403.2A: RETRO - Stormwater Management - Diversions
403.3: Stormwater Management - Flapgates/Floodgates
403.4: Stormwater Management - Detention/Retention Basins
403.5: Floodwater Storage and Diversion
404.1: Localized Flood Control System to Protect Critical Facility
405.1: Other Minor Flood Control
500.1: Flood Control - Floodwall
500.2: Flood Control - Berm, Levee, or Dike
500.2A: RETRO - Flood Control - Berm, Levee, or Dike
500.3: Flood Control - Dam
403.1: Stormwater Management - Culverts
403.4: Stormwater Management - Detention/Retention Basins
202.2: Elevation of Private Structures - Coastal
400.1: Utility Protective Measures (Electric, Gas, etc.)

202.1: Elevation of Private Structures - Riverine
207.1: Mitigation Reconstruction - PILOT
202.2A: RETRO - Elevation of Private Structures - Coastal
403.3: Stormwater Management - Flapgates/Floodgates
202.1A: RETRO - Elevation of Private Structures - Riverine
202.3: Elevation of Public Structures - Riverine
403.2: Stormwater Management - Diversions
402.1: Infrastructure Protective Measures (Roads and Bridges)
500.2: Flood Control - Berm, Levee, or Dike
207.1A: RETRO - Mitigation Reconstruction - PILOT
401.1: Water and Sanitary Sewer System Protective Measures
403.4A: RETRO - Stormwater Management - Detention/Retention Basins
202.4: Elevation of Public Structures - Coastal
405.1: Other Minor Flood Control
404.1: Localized Flood Control System to Protect Critical Facility
500.1: Flood Control - Floodwall
200.2: Acquisition of Private Real Property (Structures and Land) - Coastal
405.1A: RETRO - Other Minor Flood Control
403.5: Floodwater Storage and Diversion
204.3: Dry Floodproofing Public Structures - Riverine
200.5: Acquisition of Vacant Land
207.2: Mitigation Reconstruction
403.1A: RETRO - Stormwater Management - Culverts
204.4: Dry Floodproofing Public Structures - Coastal

203.3: Wet Floodproofing Public Structures - Riverine
203.1: Wet Floodproofing Private Structures - Riverine
403.3A: RETRO - Stormwater Management - Flapgates/Floodgates
500.3: Flood Control - Dam

APPENDIX B

FREEDOM OF INFORMATION ACT REQUEST RESPONSES

This appendix contains letters of coordination with the FEMA's Office of the Chief Administrative Officer's Information Management Division Disclosure Branch to obtain the Freedom of Information Act request for data.

U.S. Department of Homeland Security
500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

June 30, 2021

SENT VIA E-MAIL TO: JohnR.Garvin@calbaptist.edu

Mr. John Ross Garvin
Doctoral Candidate
Public Administration
California Baptist University
719 Blueberry Lane
Northlake, Texas 76247

Re: **FEMA FOIA Case Number 2021-FEFO-00392**

Dear Mr. Garvin:

This is an interim response to your Freedom of Information Act (FOIA) request to the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), dated February 27, 2021 and received in this office on March 1, 2021.

You are seeking the most recent Community Identification Layer. Furthermore, you mention you are seeking a "layer which identifies the jurisdictional boundaries" for the National Flood Insurance Program's (NFIP) participating communities "as understood by" the Federal Insurance Management Administration (FIMA) and the Community Information System (CIS).

The data fields you are seeking are as follows:

1. The Community Name;
2. Community Identification Number (CID);
3. Spatial Boundary; and,
4. NFIP Participation Status.

You further mentioned that the request can be limited to FEMA's Region VI, but a national layer would also satisfy this request. The date range associated with your request is January 1, 2000 through February 27, 2021.

A search was conducted of FEMA's Office of Resilience, FIMA program for responsive information. Currently, the search has produced a total of one (1) excel spreadsheet, which is enclosed in full. The spreadsheet includes information pertaining to items one (1), two (2), and four (4) of your FOIA request. The spreadsheet consists of the following data fields for Region VI.

U.S. Department of Homeland Security
500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

- State
- CID
- Community Name
- County
- Status

In regard to item three (3) of your FOIA request, we consulted with FIMA and we are providing a direct link to the webpage "Accessing the National Flood Hazard Layer" https://www.fema.gov/flood-maps/national-flood-hazard-layer, which contains a "NFHL ArcGIS Viewer to view, download, and print current local digital effective flood hazard data in an ArcGIS map." Furthermore, please note according to FIMA's representatives with CIS, "spatial boundary data is not maintained or stored within CIS."

No later than July 14, 2021, please provide confirmation if the records you requested have been satisfied by this response. If not, then please provide additional details about what you are seeking so that we can conduct a search for those records. Please email the assigned FOIA specialist at nicholas.santos@fema.dhs.gov. If we do not receive your reply by this stated dated, then we will move forward with issuing the final response on or near July 15, 2021.

As part of the 2007 amendments, the Office of Government Information Services (OGIS) was created to offer mediation services to resolve disputes between FOIA requesters and Federal agencies. You may contact OGIS in any of the following ways:

Office of Government Information Services
National Archives and Records Administration
8601 Adelphi Road- OGIS
College Park, MD 20740-6001
E-mail: ogis@nara.gov
Web: https://ogis.archives.gov
Telephone: 202-741-5770/Toll-free: 1-877-684-6448
Facsimile: 202-741-5769

Because your request is still open, I ask that your refrain from appealing any determination made on this interim response until the final determination has been made. Instructions on how to file an appeal will be included in our final response letter.

If you need any further assistance or would like to discuss any aspect of your request, please contact the assigned FOIA Specialist at nicholas.santos@fema.dhs.gov and refer to FOIA case number 2021-FEFO-00392.

U.S. Department of Homeland Security
500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

You may also contact someone at fema-foia@fema.dhs.gov, or (202) 646-3323, and you may contact our FOIA Public Liaison in the same manner. For a faster response please email the assigned FOIA specialist directly.

Sincerely,

BROOKE E NICHOLAS

Digitally signed by BROOKE E NICHOLAS
Date: 2021.06.30 14:57:16 -04'00'

Brooke Nicholas
Lead Government Information Specialist
Disclosure Branch
Information Management Division
Office of the Chief Administrative Officer
Federal Emergency Management Agency
U.S. Department of Homeland Security

Enclosure: 1 Excel Spreadsheet

U.S. Department of Homeland Security
500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

July 26, 2021

SENT VIA E-MAIL TO: JohnR.Garvin@calbaptist.edu

Mr. John Ross Garvin
Doctoral Candidate
Public Administration
California Baptist University
719 Blueberry Lane
Northlake, Texas 76247

Re: **FEMA FOIA Case Number 2021-FEFO-00392**

Dear Mr. Garvin:

This is the final response to your Freedom of Information Act (FOIA) request to the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), dated February 27, 2021 and received in this office on March 1, 2021.

You are seeking the most recent Community Identification Layer. Furthermore, you mentioned you are seeking a "layer which identifies the jurisdictional boundaries" for the National Flood Insurance Program's (NFIP) participating communities "as understood by" the Federal Insurance Management Administration (FIMA) and the Community Information System (CIS).

The data fields you are seeking are as follows:

1. The Community Name;
2. Community Identification Number (CID);
3. Spatial Boundary; and,
4. NFIP Participation Status.

In our interim response letter dated June 30, 2021, we asked that you please provide confirmation if the records you requested have been satisfied by the interim response; and, if not, to please provide additional details about what records you are seeking. We have not heard from you with any additional details. Therefore, pursuant to our June 30, 2021 letter, there are no additional records responsive to your request.

As part of the 2007 amendments, the Office of Government Information Services (OGIS) was created to offer mediation services to resolve disputes between FOIA requesters and Federal agencies.

You may contact OGIS in any of the following ways:

U.S. Department of Homeland Security
500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

Office of Government Information Services
National Archives and Records Administration
8601 Adelphi Road- OGIS
College Park, MD 20740-6001
E-mail: ogis@nara.gov
Web: https://ogis.archives.gov
Telephone: 202-741-5770/Toll-free: 1-877-684-6448
Facsimile: 202-741-5769

You have the right to appeal if you disagree with FEMA's response. The procedure for administrative appeals is outlined in the DHS regulations at 6 C.F.R. § 5.8. In the event you wish to submit an appeal, we encourage you to both state the reason(s) you believe FEMA's initial determination on your FOIA request was erroneous in your correspondence, and include a copy of this letter with your appeal. Should you wish to do so, you must send your appeal within 90 working days from the date of this letter to fema-foia@fema.dhs.gov, or alternatively, via mail at the following address:

FEMA
Office of the Chief Administrative Officer
Information Management Division (FOIA Appeals)
500 C Street, SW, Seventh Floor, Mail Stop 3172
Washington, D.C. 20472-3172

There is no charge for this FOIA request. As this concludes the processing of your request, it will be closed.

If you need any further assistance or would like to discuss any aspect of your request, please contact the assigned FOIA Specialist at nicholas.santos@fema.dhs.gov and refer to FOIA case number 2021-FEFO-00392. You may also contact someone at fema-foia@fema.dhs.gov, or (202) 646-3323, and you may contact our FOIA Public Liaison in the same manner. For a faster response please email the assigned FOIA specialist directly.

Sincerely, BROOKE E NICHOLAS Digitally signed by BROOKE E NICHOLAS Date: 2021.07.26 15:59:13 -04'00'

Brooke Nicholas
Lead Government Information Specialist
Disclosure Branch
Information Management Division
Office of the Chief Administrative Officer
Federal Emergency Management Agency
U.S. Department of Homeland Security

U.S. Department of Homeland Security
500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

July 15, 2021

SENT VIA E-MAIL TO: JohnR.Garvin@calbaptist.edu

John Ross Garvin
Doctoral Candidate
California Baptist University - Public Administration
719 Blueberry Lane
Northlake, Texas 76247

Re: **FEMA FOIA Case Number 2021-FEFO-00394**

Dear Mr. Garvin:

This is the final response to your Freedom of Information Act (FOIA) request to the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), dated and received on March 1, 2021. You are seeking certain information about the Office of Resilience, Federal Insurance and Mitigation Agency's (FIMA), Hazard Mitigation Assistance Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA) grant programs for Region VI covering specific disaster numbers.

Specifically, you are seeking the following data.

1. Project number;
2. Disaster Number, for HMGP projects;
3. Community Identification Number of sub awardee;
4. Community Name of sub awardee;
5. Number of Project sites per award;
6. Dollar amount of federal share obligated; and,
7. Project Status.

The date range associated with your request for documents is between January 1, 2000 through December 31, 2017.

In regards to the Hazard and Mitigation Assistance Grant data you are seeking, information responsive to your request can be accessed online in OpenFEMA's by cross referencing both the Hazard Mitigation Assistance Project – v2 Data Set, at https://www.fema.gov/openfema-data-page/hazard-mitigation-assistance-projects-v2 and the Hazard Mitigation Assistance Projects by NFIP CRS Communities – v1 data set, at https://www.fema.gov/openfema-data-page/hazard-mitigation-assistance-projects-nfip-crs-communities-v1. The Federal Insurance and Mitigation Administration indicates that both data sets can be joined based on the "Project Identifier" data field found in both data sets. Please note that FIMA indicates that the Hazard Mitigation

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Assitance Project – v2 Data Set contains information that is responsive items 1, 2, 5, 6, and 7 of your request. Furthermore, the Hazard Mitigation Assistance Projects by NFIP CRS Communities – v1 Data Set contains information responsive to portions 1, 3, and 4 of your request.

Furthermore, please note that after further review no data exists for disaster numbers 1514, 1521, 1668, 1685, 1690, and 4352.

Pursuant to 5 United States Code §§552(a)(1) and (a)(2), FEMA need not make available under the FOIA, records that are published elsewhere.

As part of the 2007 amendments, the Office of Government Information Services (OGIS) was created to offer mediation services to resolve disputes between FOIA requesters and Federal agencies. You may contact OGIS in any of the following ways:

Office of Government Information Services
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You have the right to appeal if you disagree with FEMA's response. The procedure for administrative appeals is outlined in the DHS regulations at 6 C.F.R. § 5.8. In the event you wish to submit an appeal, we encourage you to both state the reason(s) you believe FEMA's initial determination on your FOIA request was erroneous in your correspondence, and include a copy of this letter with your appeal. Should you wish to do so, you must send your appeal within 90 working days from the date of this letter to fema-foia@fema.dhs.gov, or alternatively, via mail at the following address:

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If you need any further assistance or would like to discuss any aspect of your request, please contact the assigned FOIA Specialist at nicholas.santos@fema.dhs.gov and refer to FOIA case number 2021-FEFO-00394. You may also contact someone at fema-foia@fema.dhs.gov, or (202) 646-3323, and you may contact our FOIA Public Liaison in the same manner. For a faster response please email the assigned FOIA specialist directly.

Sincerely,

Gregory Bridges
Chief
Disclosure Branch
Information Management Division
Office of the Chief Administrative Officer
Federal Emergency Management Agency
U.S. Department of Homeland Security

U.S. Department of Homeland Security
500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

July 27, 2021

SENT VIA E-MAIL TO: JohnR.Garvin@calbaptist.edu

John Ross Garvin
Doctoral Candidate
California Baptist University - Public Administration
719 Blueberry Lane
Northlake, Texas 76247-1703

Re: **FEMA FOIA Case Number 2021-FEFO-00399**

Dear Mr. Garvin:

This is the final response to your Freedom of Information Act (FOIA) request to the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), dated and received March 2, 2021. You are seeking the total Dollar figure associated with experienced FEMA verified loss from the IA inspections associated with the disasters included in your original request.

Specifically, you are seeking the following data.

1. Disaster Number;
2. Community Identification Number;
3. Community Name; and,
4. The dollar amount of total FEMA Verified Loss per community.

The date range is between January 1, 2000 through December 31, 2017.

In regard to information about the total dollar figure associated with FEMA verified loss from Individual Assistance inspections, information responsive to your request can be accessed online at Individuals and Households Program - Valid Registrations - v1 | FEMA.gov. Pursuant to 5 United States Code §§552(a)(1) and (a)(2), FEMA need not make available under the FOIA, records that are published elsewhere.

Please note that Individual Assistance does not track this information based on NFIP Communities; however, Individual Assistance does track zip code, city, county, and state information related verified losses occurrences. Individual Assistance does not maintain fields 2 and 3 of your request, so there are no responsive documents responsive to those parts. Furthermore, Individual Assistance states that to calculate the Total FEMA Verified Loss (FVL) of an entry, one simple needs to add the Real Property FEMA Verified Loss (RPFVL) and the Personal Property FEMA Verified Loss (PPFVL) fields.

As part of the 2007 amendments, the Office of Government Information Services (OGIS) was created to offer mediation services to resolve disputes between FOIA requesters and Federal agencies. You may contact OGIS in any of the following ways:

Office of Government Information Services
National Archives and Records Administration
8601 Adelphi Road- OGIS
College Park, MD 20740-6001
E-mail: ogis@nara.gov
Web: https://ogis.archives.gov
Telephone: 202-741-5770/Toll-free: 1-877-684-6448
Facsimile: 202-741-5769

You have the right to appeal if you disagree with FEMA's response. The procedure for administrative appeals is outlined in the DHS regulations at 6 C.F.R. § 5.8. In the event you wish to submit an appeal, we encourage you to both state the reason(s) you believe FEMA's initial determination on your FOIA request was erroneous in your correspondence, and include a copy of this letter with your appeal. Should you wish to do so, you must send your appeal within 90 working days from the date of this letter to fema-foia@fema.dhs.gov, or alternatively, via mail at the following address:

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Information Management Division (FOIA Appeals)
500 C Street, SW, Seventh Floor, Mail Stop 3172
Washington, D.C. 20472-3172

There is no charge for this FOIA request. As this concludes the processing of your request, it will be closed.

If you need any further assistance or would like to discuss any aspect of your request, please contact the assigned FOIA Specialist at nicholas.santos@fema.dhs.gov and refer to FOIA case number 2021-FEFO-00399. You may also contact someone at fema-foia@fema.dhs.gov, or (202) 646-3323, and you may contact our FOIA Public Liaison in the same manner. For a faster response please email the assigned FOIA specialist directly.

Sincerely,

Gregory Bridges
Chief
Disclosure Branch
Information Management Division
Office of the Chief Administrative Officer
Federal Emergency Management Agency
U.S. Department of Homeland Security

U.S. Department of Homeland Security
500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

April 19, 2021

SENT VIA E-MAIL TO: JohnR.Garvin@calbaptist.edu

Mr. John Ross Garvin
Doctoral Candidate
California Baptist University
Public Administration
719 Blueberry Lane
Northlake, TX 76247

Re: **FEMA FOIA Case Number 2021-FEFO-00400**

Dear Mr. Garvin:

This is the final response to your Freedom of Information Act (FOIA) request to the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), dated and received in this office on March 2, 2021. You are seeking the total paid, consisting of building cost, content cost, and increased cost of compliance, from the National Flood Insurance (NFIP) claims for NFIP participating Communities within the geographical boundary of FEMA's Region 6. Specifically, you are seeking the following data fields.

- Year
- Community Identification Number
- Community Name
- Total Paid

The date range associated with your request for documents is between January 1, 2000 through December 31, 2017.

A search was conducted of FEMA's Office of Resilience, Federal Insurance and Mitigation Administration for documents responsive to your request. The search produced a total of one (1) excel document containing all the data fields you requested, which is enclosed in full.

As part of the 2007 amendments, the Office of Government Information Services (OGIS) was created to offer mediation services to resolve disputes between FOIA requesters and Federal agencies.

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Washington, DC 20472-3172

FEMA

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College Park, MD 20740-6001
E-mail: ogis@nara.gov
Web: https://ogis.archives.gov
Telephone: 202-741-5770/Toll-free: 1-877-684-6448
Facsimile: 202-741-5769

You have the right to appeal if you disagree with FEMA's response. The procedure for administrative appeals is outlined in the DHS regulations at 6 C.F.R. § 5.8. In the event you wish to submit an appeal, we encourage you to both state the reason(s) you believe FEMA's initial determination on your FOIA request was erroneous in your correspondence, and include a copy of this letter with your appeal. Should you wish to do so, you must send your appeal within 90 working days from the date of this letter to fema-foia@fema.dhs.gov, or alternatively, via mail at the following address:

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Information Management Division (FOIA Appeals)
500 C Street, SW, Seventh Floor, Mail Stop 3172
Washington, D.C. 20472-3172

There is no charge for this FOIA request. As this concludes the processing of your request, it will be closed.

If you need any further assistance or would like to discuss any aspect of your request, please contact the assigned FOIA Specialist at nicholas.santos@associates.fema.ds.gov and refer to FOIA case number 2021-FEFO-00400.

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Washington, DC 20472-3172

FEMA

You may also contact someone at fema-foia@fema.dhs.gov, or (202) 646-3323, and you may contact our FOIA Public Liaison in the same manner. For a faster response please email the assigned FOIA specialist directly.

Sincerely,

BROOKE E NICHOLAS

Digitally signed by BROOKE E NICHOLAS
Date: 2021.04.19 11:20:33 -04'00'

Brooke Nicholas
Lead Government Information Specialist
Disclosure Branch
Information Management Division
Office of the Chief Administrative Officer
Federal Emergency Management Agency
U.S. Department of Homeland Security

Enclosure: Responsive Record (1 Responsive Spreadsheet)

U.S. Department of Homeland Security
500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

July 15, 2021

SENT VIA E-MAIL TO: JohnR.Garvin@calbaptist.edu

John Ross Garvin
Doctoral Candidate
California Baptist University - Public Administration
719 Blueberry Lane
Northlake, Texas 76247

Re: **FEMA FOIA Case Number 2021-FEFO-00402**

Dear Mr. Garvin:

This is the final response to your Freedom of Information Act (FOIA) request to the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), dated and received March 2, 2021. You are seeking the total number of Repetitive Loss (RL) and Severe Repetitive Loss Structures (SRL) in each Region 6 NFIP community. You are seeking the following data fields in response to your request:

1. Community Identification Number;
2. Community Name;
3. Total RL; and,
4. Total SRL.

The date range associated with your request for documents is between February 1, 2021 through March 2, 2021.

A search was conducted of FEMA's Federal Insurance Management Administration (FIMA) for documents responsive to your request. The search produced a total of 4 pages and 1 excel document, which are enclosed in full. The responsive excel document consists of the following data fields:

- State
- NFIP Community #
- NFIP Community Name
- Mitigation Status
- Insurance Status
- National Flood Insurance Program Repetitive Loss (NFIP RL)
- National Flood Insurance Program Severe Repetitive Loss (NFIP SRL)
- Flood Mitigation Assistance Repetitive Loss (FMA RL)
- Flood Mitigation Assistance Severe Repetitive Loss (FMA SRL)

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500 C Street, S.W. Mail Stop 3172
Washington, DC 20472-3172

FEMA

Furthermore, FIMA also included a field to indicate whether a property is mitigated/unmitigated and insured/uninsured along with the property counts for each of the four categories because this is how their program tracks the status of the Repetitive Loss and Severe Repetitive Loss properties. Additionally, FIMA has requested that we provide you with a document entitled "FEMA Repetitive Loss and Severe Repetitive Loss Fact Sheet (DRAFT)" which further describes the differences between different definitions of repetitive loss and severe repetitive loss in the context of FEMA. The cut-off date for the search is March 2, 2021.

As part of the 2007 amendments, the Office of Government Information Services (OGIS) was created to offer mediation services to resolve disputes between FOIA requesters and Federal agencies. You may contact OGIS in any of the following ways:

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National Archives and Records Administration
8601 Adelphi Road- OGIS
College Park, MD 20740-6001
E-mail: ogis@nara.gov
Web: https://ogis.archives.gov
Telephone: 202-741-5770/Toll-free: 1-877-684-6448
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There is no charge for this FOIA request. As this concludes the processing of your request, it will be closed.

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500 C Street, S.W. Mail Stop 3172
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FEMA

If you need any further assistance or would like to discuss any aspect of your request, please contact the assigned FOIA Specialist at nicholas.santos@fema.dhs.gov and refer to FOIA case number 2021-FEFO-00402. You may also contact someone at fema-foia@fema.dhs.gov, or (202) 646-3323, and you may contact our FOIA Public Liaison in the same manner. For a faster response please email the assigned FOIA specialist directly.

Sincerely,

Gregory Bridges
Chief
Disclosure Branch
Information Management Division
Office of the Chief Administrative Officer
Federal Emergency Management Agency
U.S. Department of Homeland Security

Enclosure: 2021-FEFO-00402 Responsive Spreadsheet (1 Excel Document)
2021-FEFO-00402 Responsive Record (4 Pages)

APPENDIX C

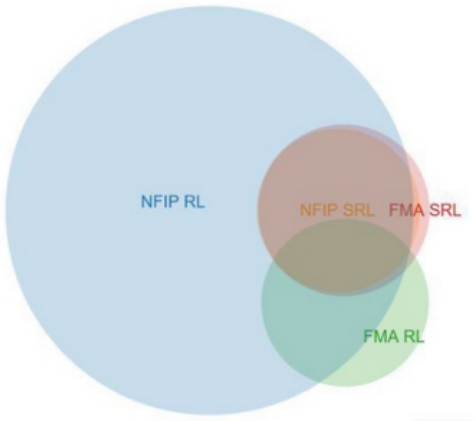
REPETITIVE LOSS AND SEVERE REPETITIVE LOSS ADDITIONAL INFORMATION

This appendix contains additional information and definitions for repetitive loss and severe repetitive loss properties. These additional data accompanied the repetitive loss data set provided by FEMA in the delivery of FOIA 2021-FEFO-00402.

FEMA Repetitive Loss and Severe Repetitive Loss Fact Sheet (DRAFT)

Background

There is no single Repetitive Loss or Severe Repetitive Loss list, but rather a database of structures with NFIP flood insurance claim characteristics that meet different definitions and program requirements for four repetitive loss categories. FEMA generally uses two definitions of Repetitive Loss (RL) and two definitions for Severe Repetitive Loss (SRL). The two definitions for SRL (FMA SRL and NFIP SRL) are similar, while the two for RL (FMA RL and NFIP RL) are somewhat different, as described below. Official definitions of RL and SRL can be found in statute and regulation. Structures within the four categories of repetitive loss overlap roughly like this:



The definitions may be slightly modified to suit the needs of each program. Variations on these official definitions may be found in programmatic documents, trainings, and FEMA websites. Modification of the official definitions has been done to account for data quality (e.g. poor data prior to 1978), precision (e.g. two losses within 10 days count as one), and to serve the specific needs of a program.

By the official definitions, a property must be *insured* to be considered a repetitive loss property, though uninsured properties are still tracked as they may become insured in the future. Although *mitigated* structures are not typically still considered to be a liability to the flood insurance fund, mitigated properties are still tracked for several reasons, such as to demonstrate FEMA's progress with mitigation. Depending on the purpose of specific FEMA program areas, mitigated and uninsured structures may be omitted from the list. For example, the FMA program would omit these structures from a list of repetitive loss structures considered eligible for the increased federal cost share under FMA funding.

Since RL property definitions vary by program and use, there is no single "official" list of criteria for each of the two RL categories. Each program should be familiar with their own repetitive loss definitions and intended use of the data. When provided a repetitive loss list, users need to carefully analyze the data in each column to ensure that it meets their intended use.

How does FEMA use RL and SRL data?

1) NFIP SRL data are used to determine which policies are administered by NFIP Direct vs. WYO companies (SRL properties are supposed to be administered at the NFIP Direct, but not always are);
2) Repetitive Loss status can affect Increased Cost of Compliance eligibility;
3) RL and SRL properties are addressed in local hazard mitigation plans;
4) SRL properties are subject to higher flood insurance rates;
5) CRS tracks NFIP RL and SRL properties by community and gives points for the mitigation of these properties;
6) RL and SRL lists are used to direct grant monies; and
7) RL and SRL data is used in development of success stories and best practices.

The following sections describe each of the three broad categories of Repetitive Loss, which we will describe as Mitigation (FMA) RL, NFIP RL, and SRL.

Mitigation Repetitive Loss (FMA RL)

Definition:

From FIRA 2004:

"(7) the term 'repetitive loss structure' means a structure covered by a contract for flood insurance that—

"(A) has incurred flood-related damage on 2 occasions, in which the cost of repair, on the average, equaled or exceeded 25 percent of the value of the structure at the time of each such flood event; and

"(B) at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage."

Uses: Grant eligibility and increased federal cost share; ICC eligibility.

NFIP Repetitive Loss (NFIP RL)

Definition:

From 44 CFR 209.2 – Definitions
Repetitive Loss Structure means a structure covered by a contract for flood insurance under the National Flood Insurance Program (NFIP) that has incurred flood-related damage on two occasions during a 10-year period, each resulting in at least a $1000 claim payment;

Uses: CRS, local Hazard Mitigation Plans, PRP/IA eligibility (this last is not specifically termed "Repetitive Loss" but uses that definition.

Mitigation/NFIP Severe Repetitive Loss (FMA SRL/NFIP SRL)

Definition:

There are different definitions in both the Insurance and Mitigation sections of statute. They are similar except that the Insurance (NFIP SRL) section includes only residential structures, while the Mitigation (FMA SRL) section includes all structures. *In the Flood Insurance Manual and in practice, NFIP SRL properties must have two losses within 10 years (making them NFIP RL), while FMA SRL properties do not have to meet this requirement. NFIP SRL status is used for rate-setting and determining which NFIP policies are administered by FEMA's Special Direct Facility. FMA SRL status is used for determining grant eligibility and cost share. The community Rating System uses the NFIP SRL definition.*

From BW12

SEC. 100225. MITIGATION.

(h) Definitions
(3) Severe repetitive loss structure. --The term `severe repetitive loss structure' means a structure that—
"(A) is covered under a contract for flood insurance made available under this title; and
"(B) has incurred flood-related damage—

> "(i) for which 4 or more separate claims payments have been made under flood insurance coverage under this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or
>
> "(ii) for which at least 2 separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the value of the insured structure."

Uses:
Grant Eligibility and cost share (FMA SRL); CRS, WYO vs. Direct, Insurance Rates (NFIP SRL)

August 2020 Updates

The current NFIP System of Record (PIVOT) became responsible for maintaining and reporting repetitive loss statistics for all four categories in late August 2020. There remain data quality errors, such as inaccurate property values used to determine FMA RL and SRL, but in general the data is considered to be superior to the data that was available from the legacy system, and more transparent.

Counts of Repetitive Loss Structures from PIVOT as of August 31, 2020:

	NFIP RL	NFIP SRL	FMA RL	FMA SRL
Total	231,924	38,578	30,575	41,653
Insured	101,866	17,508	17,425	19,204
Insured Unmitigated	92,371	14,788	15,567	16,317
Insured Unmitigated Residential	86,792	13,394	15,209	14,891