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Capstone Portfolio

The Role of Federal Government in Disaster Response and the Impact of Funding Reductions

This semester, I will examine the federal government's role in responding to natural disasters and emergencies. Given the size of and the various geographies within the United States, it is susceptible to a number of natural disasters such as hurricanes, tornadoes, wildfires, and earthquakes. Furthermore, with the changing climate worldwide, the number and severity of natural disasters continue to rise, causing not only physical devastation but also a significant economic toll.

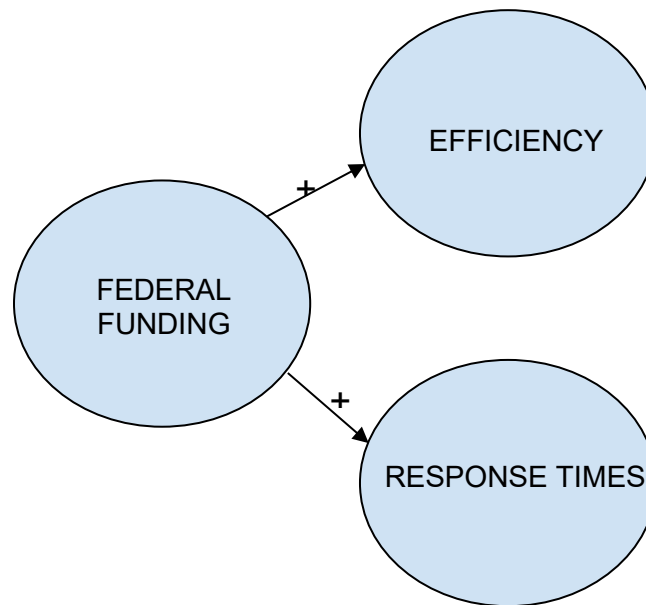
"The Federal Emergency Management Agency (FEMA) plays a pivotal role in providing immediate assistance and coordinating recovery efforts" (Taylor, 2025). The current administration has publicized and made moves toward its goal to reduce federal spending by cutting the federal workforce. President Trump also has indicated that he would like to reshape FEMA to reallocate how it spends its funds (The Associated Press, 2025). Given the catastrophic effects these disasters have on communities, infrastructure, and the economy, understanding the federal government's current role will provide insight into the possible effects of a reduction in federal funding on emergency and disaster response. However, we do not know whether cuts to event funding slow FEMA's administrative closure of disasters.

Research Questions

1. Which incident types account for the largest share of total obligations?
2. Does federal funding influence the speed/efficiency of FEMA disaster close-out?

Hypothesis

Reducing federal funding would result in delayed response times and increased inefficiency in emergencies and disaster response efforts.



Data

To test this hypothesis, one can analyze spending data from FEMA's financial statements, response time, and efficiency data from FEMA's response reports. The unit of analysis would be individual disaster or emergency events.

Limitations in Research

Several limitations may arise while analyzing FEMA's spending data and disaster response outcomes. First, there may be gaps or inconsistencies in publicly available financial and operational data, particularly for localized or smaller-scale disaster events. Additionally, reporting standards and transparency can vary over time or across different administrations.

Intervening factors that may influence response outcomes beyond federal funding levels include:

- **State and Local Government Capacity:** The effectiveness of disaster response depends heavily on the preparedness and resources of state and local governments.
- **Severity and Scale of the Disaster:** Large or catastrophic events may overwhelm agencies, regardless of funding levels.
- **Geography and Accessibility:** Remote or hard-to-reach areas may experience inherent delays.
- **Political and Administrative Factors:** Political leadership or bureaucratic structure changes can affect resource deployment and decision-making.
- **Public-Private Partnerships:** The effectiveness of coordinated efforts with contractors and non-profits can impact overall efficiency.
- **Climate Change Variables:** Multiple simultaneous events and unpredictable disasters strain FEMA's resources, making performance dependent on more than just funding levels.

Variables

1. Independent Variable – FEMA Obligations for Incidents

- *Conceptual Definition:* The financial resources FEMA allocates to incidents for disaster preparedness, response, and recovery.
- *Operationalization:* Measured by the total dollar amount FEMA obligates for each disaster event.

2. Dependent Variable - Efficiency and timeliness of administrative closeout

- *Conceptual Definition:* The speed and effectiveness with which FEMA responds to disaster events
- *Operationalization:* Measured by response time (days from declaration to disaster closeout date)

Literary Review

The effectiveness of federal disaster response in the United States has been widely studied, focusing significantly on FEMA's role. Sadiq et al. emphasize that disaster response efficiency is closely linked to resource availability (Sadiq et al., 2016).

Kapucu highlights that increased federal funding enhances FEMA's ability to coordinate disaster responses and build capacity (Kapucu, 2008). Moynihan adds that well-funded agencies are better equipped to train personnel and maintain preparedness, resulting in faster response times (Moynihan, 2009).

McGuire and Silvia stress that robust funding enables FEMA to support local governments more effectively, fostering intergovernmental collaboration essential for rapid response (McGuire & Silvia, 2010). However, Sobel and Leeson caution that increased funding is not always correlated with greater efficiency due to bureaucratic challenges (Sobel & Leeson, 2006).

Political considerations also play a role in FEMA's disaster response. Garrett and Sobel demonstrate that disaster funding is often allocated based on political considerations, potentially distorting efficiency and fairness (Garrett & Sobel, 2003). Disaster severity and geography also affect FEMA's timeliness and efficiency. Cutter et al. show that larger-scale and geographically challenging disasters naturally result in delayed responses, even under strong funding conditions

(Cutter et al., 2003). Sadiq and Noonan highlight the importance of local and state partnerships and readiness, suggesting that funding alone is insufficient without local capacity (Sadiq & Noonan, 2015).

Logistical challenges also influence responsiveness. Choi and Brower argue that organizational capacity is only one piece of the puzzle, as logistical barriers can slow recovery efforts (Choi & Brower, 2006). Finally, Morss et al. note that the increasing frequency of extreme weather events strains FEMA's capacity (Morss et al., 2011).

The literature supports the hypothesis that federal funding reductions can result in delayed and less efficient disaster response. However, it also underscores the complexity of this relationship due to the role of external factors.

Data and Methods

For this research project, I will use two key datasets from FEMA to analyze the relationship between federal funding levels and the efficiency of disaster response.

1. FEMA Disaster Declarations Summary

- *Unit of Analysis:* Federally declared disaster events (individual disaster declarations).
- *Scope:* This study covers all declared disasters in the U.S., including its territories, from 1953 to the present.
- *Key variables:*
 - Disaster number
 - Declaration date
 - Disaster closeout date

- State
- Incident type
- *Dataset Link:* <https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v2>

2. FEMA Disaster Relief Fund (DRF) Monthly Reports

- *Unit of Analysis:* Monthly funding allocations by disaster event
- *Scope:* Covers financial obligations and expenditures from 2014 to 2022
- *Key variables:*
 - Disaster Number
 - Monthly Obligations (in USD).
 - Incident type
 - Reporting month and year
- *Dataset Link:* <https://www.fema.gov/about/reports-and-data/disaster-relief-fund-monthly-reports>

For the purposes of this data analysis, I downloaded the Disaster Declaration Summary CSV and aggregated the data in the Disaster Relief Fund (DRF) Monthly Reports from 2014 to 2022. I aggregated the DRF data to event-level. I then merged the data by performing an inner join of two variables, disasterNumber and incidentType. After excluding events with unreported disaster closeout dates and events which did not match DRF records, the sample size included 65 observations.

Descriptive Statistics

<i>Obligations (in USD millions)</i>		<i>responseDays</i>	
Mean	14.8030	Mean	3360.0013
Standard Error	4.2610	Standard Error	150.0671
Median	2	Median	3190.5
Mode	0	Mode	3965
Standard Deviation	34.6167	Standard Deviation	1219.1512
Range	182	Range	6917
Minimum	0	Minimum	0
Maximum	182	Maximum	6917

Figure 1. Descriptive statistics (n = 65). (Source: OpenFEMA Disaster Declarations & DRF Monthly Reports, author's calculations).

The average total obligation was \$14.8M (author's calculation from FEMA data). This distribution is right skewed as the mean is significantly greater than the median, \$2M (author's calculation from FEMA data).

The average response time for administrative close-out of the incident was 3,360 days, or approximately 9.2 years (author's calculation from FEMA data). The median response time was 3,191 days or 8.7 years, and the spread or range was 0 – 6,917 days (author's calculation from FEMA data).

Figure 2 reflects the percentage of the total of each event by the incident type reflected in the frequency distribution table, Figure 3. 86 percent of the disasters in our sample are hurricanes

or severe storms, confirming the dominance of wind-water hazards in the 2014-2022 DRF reports. Rarer hazards such as earthquakes or wildfires warrant separate analyses because cost structures and timelines differ markedly.

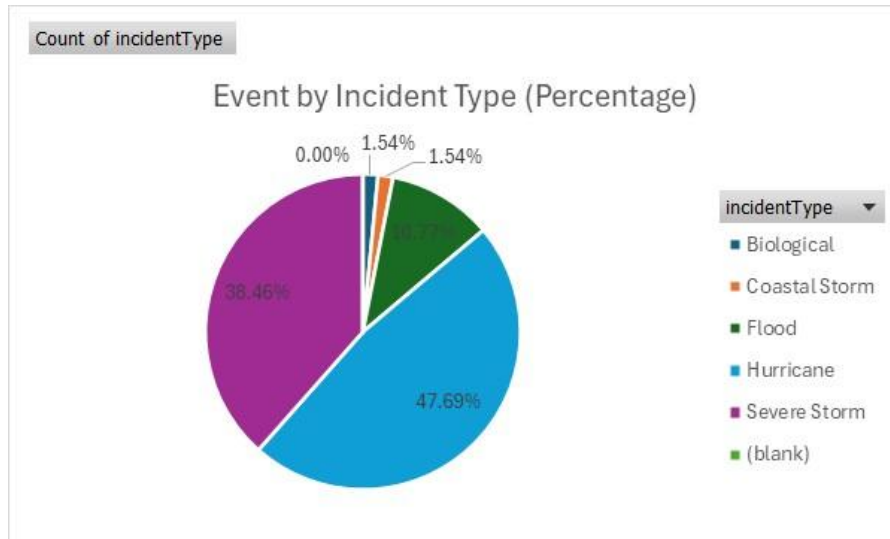


Figure 2. Percent of total events by incident type. (Source: OpenFEMA Disaster Declarations & DRF Monthly Reports, author's calculations).

Number of Events by Incident Type	
Row Labels	Count of incidentType
Biological	1
Coastal Storm	1
Flood	7
Hurricane	31
Severe Storm	25
(blank)	
Grand Total	65

Figure 3. A tabular count of disaster declarations by incident type. (Source: OpenFEMA Disaster Declarations & DRF Monthly Reports, author's calculations).

Figure 4 depicts the top 10 states with the highest number of incidents, with Alabama, Florida, and Mississippi alone accounting for one-fifth of the declarations. The concentration of

incidents along the Gulf and Atlantic coasts explains the hurricane and severe storm dominance noted above. This concentration means that a narrow band of coastal states will feel any federal staffing or budget cuts most acutely when they face the costliest hazards.



Figure 4. Top-10 states by incident count. (Source: OpenFEMA Disaster Declarations & DRF Monthly Reports, author's calculations).

Figure 5 reveals heavy-left hand clustering, with many points sitting below \$20M while spanning almost the full range of response days. This indicates that most disasters are inexpensive but take years to close administratively.

Five observations are above \$60M, and their response times range between almost 3,800 and 6,900 days. Big-ticket disasters tend to be long, but not significantly so, compared with low-cost cases. The plot suggests a mild positive correlation which indicates funding alone is not the main driver of administrative duration.

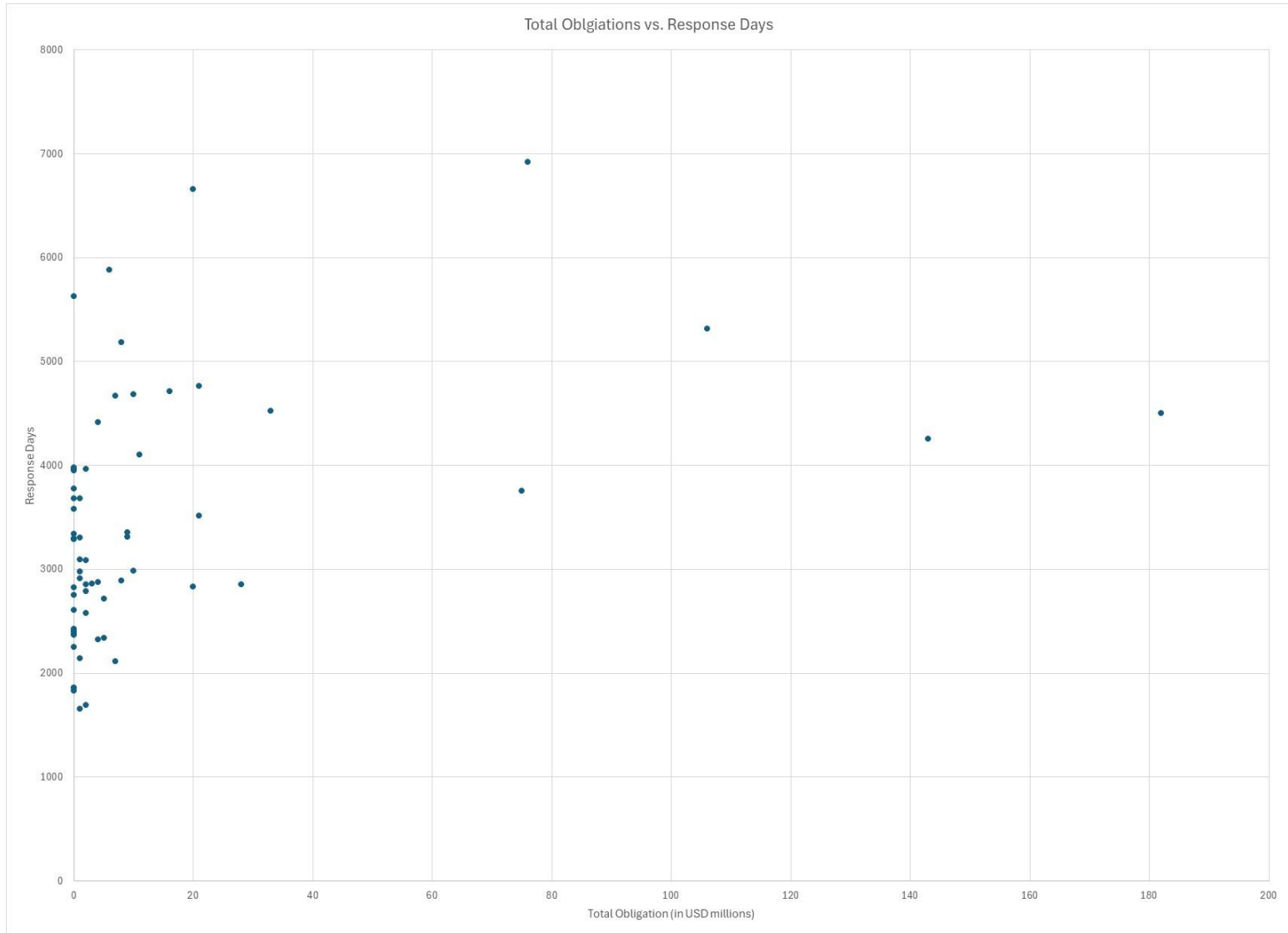


Figure 5. Administrative close-out days vs. total obligations vs. response days (Source: OpenFEMA Disaster Declarations & DRF Monthly Reports, author's calculations).

Regression Analysis

I conducted one multiple regression analysis (Figure 6) with the following variables:

- **responseDays** – refers to the number of days between disaster declaration and the disaster closeout dates
- **yearDeclared** – the year the disaster event was declared

- **obligation_Eventlevel.total obligations** – refers to the total obligation per event in USD millions.

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.6520							
R Square	0.4252							
Adjusted R Square	0.4066							
Standard Error	888.5201							
Observations	65							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	2	36201129.2210	18100564.6105	22.9276	0.0000			
Residual	62	48947008.8812	789467.8852					
Total	64	85148138.1022						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	422734.3424	77645.2926	5.4444	0.0000	267523.6141	577945.0707	267523.6141	577945.0707
yearDeclared	-208.7299	38.6331	-5.4029	0.0000	-285.9564	-131.5033	-285.9564	-131.5033
Obligations_EventLevel.totalObligations	14.1265	3.3768	4.1834	0.0001	7.3763	20.8766	7.3763	20.8766

Figure 6. Multiple regression statistics (Source: OpenFEMA Disaster Declarations & DRF Monthly Reports, author's calculations).

The linear equation is $Y = 422734.34 - 208.73x_1 + 14.13x_2$. The unadjusted R^2 of 42.52% is artificially inflated due to the existence of multiple independent variables. The total obligation and the year declared explain 40.66% of the variance in the administrative close-out duration. Other factors, such as incident type and state capacity, still drive more than half of the variation.

For the intercept, given the p-value of $0.0000 < 0.05$, this model is statistically significant in explaining overall administrative closeout duration variation. If all independent variables take the value of 0, the administration closeout duration is expected to be 422,734 days or about 1,159 years.

For the year-declared variable, the administrative closeout duration decreases by approximately 209 days with each additional calendar year, keeping all else constant. This suggests that efficiency has been improving over time. Given a P-value of $0.0000 < 0.05$, this variable is statistically significant.

For the total obligation variable, every additional \$1M in obligation adds approximately 14 days to the administrative closeout duration. This suggests that more costly events take longer to close out. Given a P-value of $0.0001 < 0.05$, this variable is statistically significant.

Conclusion

This research set out to answer two central questions: (1) Which type of disaster incidents account for the largest share of FEMA's total obligations?; and (2) Does the level of federal funding influence the efficiency and speed of FEMA's disaster closeout process? These questions are particularly relevant in light of proposed federal budget cuts and administrative restructuring efforts that may affect FEMA's operations.

The literature supports the idea that resource availability is key to disaster response effectiveness. Scholars such as Kapucu and Moynihan argue that sufficient federal funding enhances coordination, preparedness, and efficiency (Kapucu, 2008; Moynihan, 2009). However, literature from Sobel and Leeson and Garrett and Sobel adds complexity by pointing out that increased funding does not always translate to efficiency due to bureaucratic inefficiencies and political distortions (Sobel & Leeson, 2006; Garrett & Sobel, 2003). Furthermore, external factors such as disaster severity, geography, and state capacity often interact with funding to shape outcomes, as noted by Cutter et al. and Sadiq and Noonan (Cutter et al., 2003; Sadiq & Noonan, 2015).

The analysis of 65 disaster events using FEMA's Disaster Declaration Summary and Disaster Relief Fund Monthly Reports from 2014 to 2022 revealed several important insights. First, hurricanes and severe storms account for 86% of the events in the sample, confirming the dominance of wind-water events in FEMA's recent portfolio. These types of disasters are

particularly concentrated in the Gulf and Atlantic Coast states, such as Florida, Mississippi, and Alabama, suggesting that these regions may disproportionately experience the impacts of federal funding changes.

Second, the average disaster closeout period was over 9 years, significantly varying across events. The regression analysis revealed a statistically significant, though modest, relationship between total obligations and administrative closeout time. Specifically, each additional \$1 million in funding is associated with a 14-day increase in administrative closeout duration. This result suggests that while more funding is associated with longer response timelines, likely due to the complexity and scope of larger disasters, it is not the sole determinant of efficiency.

Additionally, the year of disaster declaration was negatively associated with closeout duration, indicating FEMA's efficiency may improve over time, possibly due to technological improvements or policy reforms. However, the adjusted R^2 value of 40.66% confirms that funding and year alone explain less than half of the variation in administrative efficiency, reaffirming that other contextual variables such as local capacity, geography, and organizational structure play substantial roles.

In summary, while federal funding is essential to FEMA's disaster response outcomes, it is not the sole driver of efficiency. The findings support the hypothesis that reductions in federal funding could impair FEMA's ability to respond quickly and effectively, especially in regions that experience frequent, high-cost disasters. However, improving administrative efficiency also requires addressing systemic barriers, intergovernmental coordination, and adaptive capacity. Future policy decisions must account for these complexities to ensure resilient disaster response systems nationwide.

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