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The Maui Wildfire of 2023: Response and Support by Department of Defense

December 2024

Capt Julie K. Vogel, USMC

Thesis Advisors: Dr. Aruna U. Apte, Professor
Dr. Uday M. Apte, Distinguished Professor

Department of Defense Management

Naval Postgraduate School

Prepared for the Naval Postgraduate School, Monterey, CA 93943

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ABSTRACT

In August 2023, wildfires engulfed the island of Maui, Hawaii. This wildfire was the "largest natural disaster in Hawaii state history" (Clayton et al., 2023). There was a massive relief effort, but other entities aside from local and state—specifically the Department of Defense (DoD)—were largely underutilized. The neighboring armed services units that conduct disaster training and who have protocol that allow them to respond in a crisis were not requested for support. Similarly, other federal assets were not employed until the blaze had been contained and extinguished (White House Briefings, 2024).

This lack of cross-entity cooperation is due in part to the layers of policy and bureaucracy at the local, state, and federal levels that exist in the United States regarding DoD intervention in local and national emergencies. This thesis examined the background and outcome of the wildfire through a cause-and-effect lens, specifically the areas of improvement gleaned from the after-action reports of the event. Additionally, this thesis provides information on current limitations of disaster relief support to determine gaps that may exist and their impact on response. These analyses answered a resounding yes to the root inquiry: Will policy changes on DoD humanitarian logistics interventions with current state and federal entities provide for more optimistic and effective disaster relief efforts? Further recommendations and conclusions from the analysis are also presented.

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ABOUT THE AUTHOR

Capt Julie Vogel is a Marine Corps Logistics Officer. She was commissioned in 2019 through the Officer Candidate School after receiving her Bachelor's Degree in Criminology from West Virginia University. She continued on to serve her first tour in Camp Pendleton, CA, where she attached to 1st Landing Support Battalion. In her time at 1st LSB, she held the positions of Maintenance Management Officer, Heavy Equipment Platoon Commander, and Support Company Executive Officer. Additionally, she went on an individual augment during this time to serve under the Wartime J-4 in the Joint Logistics Operations Center aboard Camp Humphries for Exercise Freedom Shield. After completing her studies at Naval Postgraduate School, she will attach to HQMC, under the Deputy Commandant of Installations and Logistics, to work in the Logistics Planning division.

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I would primarily like to acknowledge the effort and assistance of my advisors—Aruna and Uday Apte. Without their expertise in humanitarian logistics, data analysis, and encouragement, this thesis would not have been complete. Now hopefully they may officially retire and not be bound to Zoom calls by graduate students like me.

I would secondly like to acknowledge and show gratitude to my mother, Chelsea Pleasants. She kept me honest in my writing process, making sure to ask how many pages had been drafted on our weekly phone calls. Thank you for providing the nudging motivation I needed to stay on topic.

Lastly, I would like to dedicate this work to the families, emergency responders, and communities of Maui who endured the Lahaina wildfire of 2023. The recovery and road ahead for these individuals, even more than a year later, has been an effort of great proportion and pain. May you continue to receive outpouring support and resources necessary to stay #MauiStrong.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAR	After-Action Report
DHS	Department of Homeland Security
DoD	Department of Defense
DR	Disaster Relief
DSCA	Defense Support to Civil Authorities
FEMA	Federal Emergency Management Agency
FSRI	Fire Safety Research Institute
GAO	Government Accountability Office
HADR	Humanitarian Assistance and Disaster Relief
MFD	Maui Fire Department
NGO	Nongovernment Organization
USMC	United States Marine Corps

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EXECUTIVE SUMMARY

This thesis was produced with the purpose of examining the disaster relief and response conducted during the wildfire of Maui, Hawaii in 2023 and identifying gaps that could be filled with increased intervention and support from Department of Defense (DoD) entities for future natural disasters in America. The wildfire that struck the Hawaiian community of Lahaina devasted the area, leaving its residents and environment with recovery efforts that will last several years (Rafferty, 2023).

The research and analyses conducted during this thesis lead to an answer for the key inquiry of: Will policy changes on DoD humanitarian logistics interventions with current state and federal entities provide for more optimistic and effective disaster relief efforts?

The methodology for this research was heavily focused on qualitative material gathered by reviewing after-action reports that evaluated the effectiveness and responsiveness of the state, local, and federal entities who were tasked with providing disaster response services. Additional federal and state press briefings, news articles, and reports were reviewed to mitigate biases as well as fulfill information requirements for this research. Once information was reviewed and organized, a cause-and-effect analysis was created using the Wishbone or Ishikawa (Wilson & Russell, 2024) diagram that shows in Figure 1 the key variables of the wildfire being weather, climate change, agricultural environment, electrical systems, transportation network, and availability of resources. The summarized total consequences were a loss of 103 lives, more than 48 hours of uncontained fires and flames, evacuation issues and communication degradation, and high levels of damage to major infrastructure and the Lahaina environment.

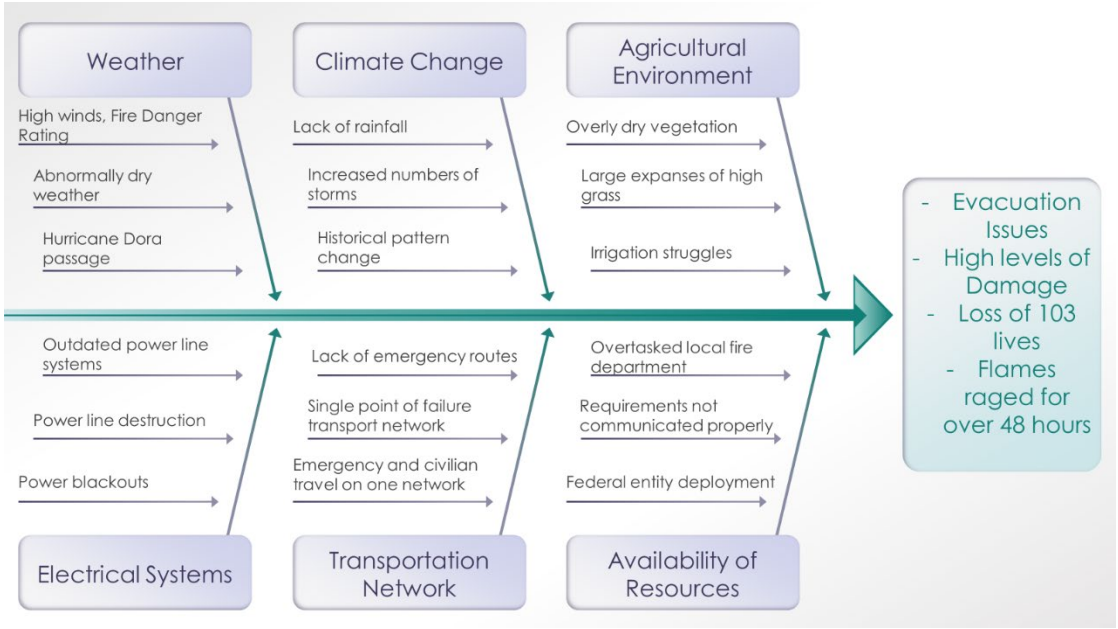

Figure 1. Fishbone Diagram Analysis

Additional analysis was conducted to review the entities responsible for the disaster relief during and after the wildfire. To effectively do this, an adequacy of response evaluation was made against each entity based on the responsibilities that were tasked to them and their effectiveness of completing these tasks. The adequate response numbers were calculated based on a point-scale created by denoting each type of action taken to a number 1–4 (see Table 2). This scale is allocated as the following:

- Identified and conducted correct actions = 1 point
- Delayed actions = 4 points
- Incorrect actions = 3 points
- Inability to support = 2 points

Overall results showed that the local and state entities were under-resourced, unable to support in effective manners, and lacking up-to-date training in emergency response situations. This led to delayed responses and incorrect actions taken by the command-and-control entities all the way down to the individual response team level. The only entities found to prove effectiveness were the minimal DoD units and assets whom were brought in to support in relief after the responsible entities had recognized the inability to do so without a request for intervention.

Due to these results, the following recommendations are suggested that support the response to the root inquiry that increased DoD intervention and response should be

established alongside increased efforts towards disaster relief and preparedness within local and state entities:

- Maui Fire Department should improve the recruitment and retention of quality staff members.
- Maui Fire Department should conduct appropriate actions to acquire more updated, essential equipment to combat wildfires and maintain its readiness.
- Maui Fire Department should revise and implement an improved training programs for chiefs and leaders on all levels to use emergency communication devices.
- HI-EMA and FEMA should overhaul their response programs, including staffing, training on specific humanitarian logistics needs, providing inter-agency support training, and streamlining emergency alert systems.
- Government should recommend policies to increase DoD involvement capabilities during a natural disaster and define roles, responsibilities, and command and control/information flow systems for all agencies involved.
- Federal, State and local government raise awareness of climate change implications, creating policy and programs that ensure participation and mitigation practices at all levels of communities.

The recommendations emphasize policy change, improved agency operations and training platforms, and increased military coordination and inclusion in natural disasters were all backed by the data analysis and information gathered regarding the incident. If DoD entities are given intervention capabilities in a natural disaster response such as wildfire, this report proves that it will increase the overall effectiveness of the response and allow for local, state, and other federal agencies to be more equipped to handle a disaster. As disasters become more frequent occurrences due to climate change, the need to reevaluate and reimagine the current disaster response program is a sounding alarm for the United States government to hear and may contribute to a more favorable stance on developing policy to include increased DoD presence during response.

References

Rafferty, J. P. (2023). Maui wildfires of 2023. In *Encyclopedia Britannica*. https://www.britannica.com/event/Maui-wildfires-of-2023

Wilson, S., Russell, P. (2024). The Quality Toolbox, Second Edition. ASQ Quality Press. https://asq.org/quality-resources/fishbone

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I. INTRODUCTION AND RESEARCH APPROACH METHODOLOGY

This portion of the thesis will introduce the specific event of the Maui wildfire of 2023 as well as include a section dedicated to describing the approach taken towards the research conducted and the methodology used to analyze and collect data and information.

A. INTRODUCTION

The wildfires that occurred in Maui, HI, during August 2023 highlighted the disaster relief response and efforts that are typical of a natural disaster that occurs in the United States. While there was an initial response, and resources were poured into the fires from the Hawaiian local and state entities (i.e., Hawaii National Guard, Red Cross, Coast Guard, community fire departments, and disaster relief nongovernment organizations [NGOs]), these organizations faced insufficient abilities as a whole to match the demand in resources and aid and were left inadequately prepared to combat the flames and allocate funds and basic needs to the citizens evacuated. Figure 1 shows an overview provided by *BBC News* of the geographical area of Maui and highlights the specific regions on the island that were affected by the August wildfire.

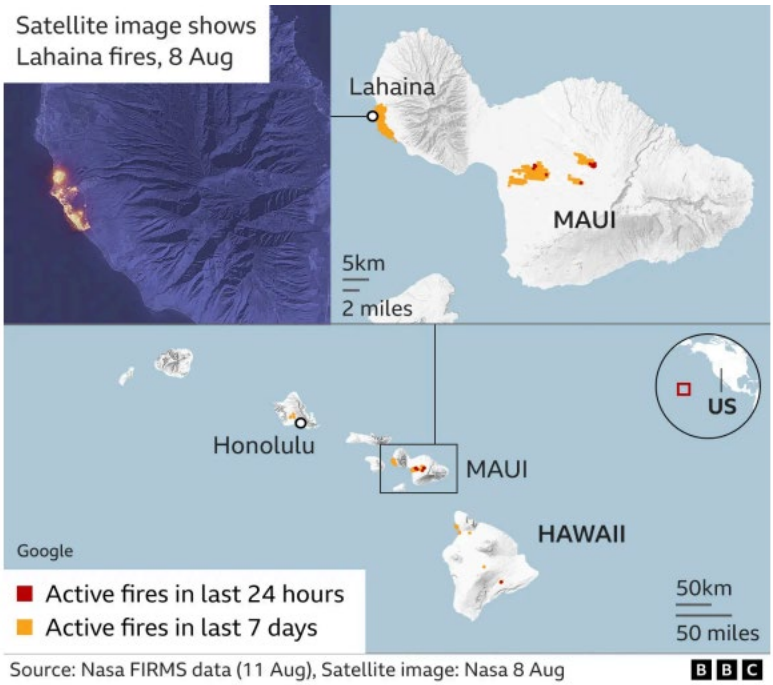

Figure 1. Map of Affected Areas. Source: BBC News (2023).

As the disaster ensued, many citizens fell out of the loop for information and guidance. In a *Washington Post* article reporting the event, Lisa Rein and her colleagues provided an update stating that "Emergency services and organizations that should be coordinated and organized, in the public eyes, have completely fallen through" (Rein et al., 2023, para. 3). Major dissonance between officials assisting in the disaster and the occupants of the island began early into the disaster when the emergency alarm system was not employed to notify the residents of the necessary evacuation. A formal investigation was triggered at the request of Hawaiian Governor Josh Greene to determine the rationale of the authorities to not use the emergency broadcasting system for its evacuation efforts. (Rein et al., 2023).

To further enhance complications with local authorities and citizen relations, once homes had been evacuated and communities of families and locals were displaced, the local infrastructure struggled with providing adequate resources, housing, and required medical care for those seeking aid. Additionally, Rein reported that thousands of individuals were considered missing people, and it took weeks to locate and reunite them with their families (Rein et al., 2023). Meanwhile, casualty care and collection services were overwhelmed with the search and rescue missions required to identify victims lost

to the fires a bring their bodies away from the fire-torn areas (Figure 2) for appropriate postmortem treatment and release to authorities and families (Rein et al., 2023).

Figure 2. Before and After Fire Comparison. Source: BBC News (2023).

According to Federal Emergency Management Agency (FEMA) Director Bob Fenton—who was appointed by President Biden as the chief executive in charge of the disaster response and coordination of the fires—one of the factors that limited the disaster relief assistance to rehome the displaced families was a lack of response from citizens and available housing options with viability (Fenton, 2024). Many of the families and citizens applying for lodging no longer possessed appropriate documentation and were not educated on the correct submission process that would expedite the request and get them into new living quarters (FEMA, 2023a).

In response to the disaster, The *Encyclopedia Brittanica* Author John Rafferty quoted "U.S. Pres. Joe Biden promised that 'all available Federal assets on the Islands' would assist in relief efforts" (Rafferty, 2023, para. 8). The White House issued a memo declaring the outpouring of support to the Maui wildfires, but the Marine Corps and Navy

units that were in Hawaii, which are trained in and always on standby to assist in relief efforts, were not largely employed (DoD, 2023). Getting Department of Defense (DoD) entities such as the Marine Corps and Navy involves quite a lot of pressure and agreement not only from the state involved but from the State Department. Current national disaster relief policy and regulations mandated by U.S. Code, Title 42, Chapter 15 make it almost impossible to employ DoD assets and resources without approval of a state's government system, and federal entities and NGOs must accept the additional involvement. Unfortunately, the compressed time frame of natural disaster relief and response pushes requests like these aside, as the priority is action and civilian population recovery management.

Typical wildfire is caused by many environmental factors, and oftentimes, local communities can attempt to anticipate needs and mitigate damage. When this is not done, however, the prevention methods are ineffective leaving only a window of action beginning from response to the flames. This limited opportunity leads to increased damage, stressed infrastructure and emergency response systems, and threatened civilian populations. Without proper policy and methods, state and local entities will always be left unequipped to protect their areas and homes from natural disasters like wildfires.

This is the root of what this thesis analyzes. By doing a case study analysis, I explore the 2023 wildfire disaster in Hawaii, the entities responsible for the response and relief of the incident, and how the current policies or bureaucracy hinder additional DoD support that could have potentially expedited support and relief.

B. RESEARCH AND APPROACH METHODOLOGY

In order to properly study this disaster event and the policies and procedures surrounding DoD involvement, I collected data and information from several sources including but not limited to databases (both national and international), interview transcripts, press releases, news followings, national agency reports, Government Accountability Office (GAO) reports, previous humanitarian aid and disaster relief point papers and theses, and interviews from local agency heads as well as military members who were notified of support but never activated.

All information gathered was evaluated for the level of quality, the accuracy of the information, the validity of the source, the level of bias in the language of the report or article, and the relevance to this topic. Once vetted as a viable source, each article, report, interview transcript, statement, or policy was sorted depending on its categorical importance to the report and analyzed depending on the type of information source it originated from. These sources provided all facts, details and information that fed into the analysis of the Maui wildfire and its disaster relief efforts.

The analysis of the data was conducted through analytical approaches, using a processing of information that allowed for a more informed result, conclusion, and recommendations for actions. A cause-and-effect analysis was completed utilizing the Fishbone diagram methodology to provide an in-depth look at the data and the results of the overall natural disaster event. Additionally, an analysis of performance by each responsible entity during the wildfire was conducted using a rating scale based on actions conducted and their result. This performance rating was then interpreted to determine the capability of each entity to successfully support disaster relief operations.

The results of these analyses provide the foundation for the recommendations and conclusions that support an answer to the overall objective question. These recommendations are solely based on the information and data analyzed for this report and exclude any additional outside sources or data.

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II. BACKGROUND

The purpose of the background portion of this paper is to provide material and information surrounding the wildfire that took place in Maui in 2023, to give background regarding the military and disaster relief context, and to explain the processes and policies that exist for disaster relief at the DoD, federal, and state levels.

A. WILDFIRE BACKGROUND

From August 8 to 18, 2023, a wildfire raged on the Hawaiian island of Maui, near the city of Lahaina. The cause of the fire's ignition was determined to be a combined force, involving unexpectedly high winds passing through from a nearby tropical storm, as well as downed powerlines that were impacted by these winds (Kerber & Alkonis, 2024). The strong winds and dry conditions that were created from an abnormal year of rainfall caused the fire to spread rapidly, leaving residents of the Lahaina area inhaling smoke within hours of the ignition.

> Prior to vegetation fires reported at 06:55 and 14:55 on August 8, 2023, Lahaina sustained widespread damage due to high winds. Utility poles broke in half, and some fell to the ground blocking roads. Electrical lines were draped across major egress routes, roofs were blown off structures, and matures trees were toppled to the ground. Traffic congestion through Lahaina increased throughout August 8, 2023, as roads became impassible due to downed utility poles, electrical lines, and trees. (Kerber & Alkonis, 2024, p. 43)

Flames sparked from these conditions, leading to the two-day long wildfire that ripped through the Lahaina community (Figure 3).

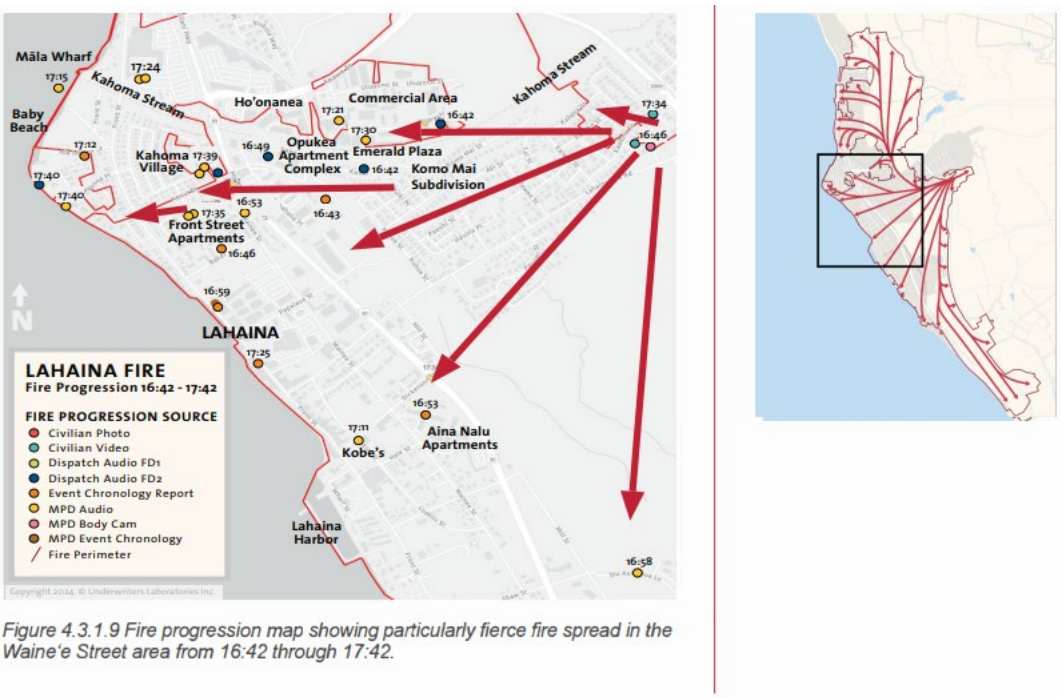

Figure 3. Fire Progression on August 8, 2023. Source: Kerber et al. (2024).

In the aftermath of the event, a total of "98 people were killed in Lahaina by the smoke and flames or by drowning, making the wildfire one of the world's deadliest on record. Almost 3,000 structures were reported to have been either damaged or destroyed by the fire" (Rafferty, 2023, para. 1). Additionally, a Congressional Research Service report stated that more than 2,200 acres of land—including neighborhoods as well as the natural surrounding area—were burned before the fire was approximately 80% contained (Congressional Research Service [CRS], 2023). This wildfire developed quickly, leaving many residents scrambling to find safety amidst the flames.

Figure 4 shows a timeline of major events that occurred throughout the first week of the disaster. It should be noted that the timeline only includes information from the day prior to the disaster and forward and was gleaned from the standpoint of the fire department's major events.

August 5-6, 2023:

- NWS issues Red Flag Warnings due to Hurricane Dora and existing drought conditions.
- MFD transmits warnings via Battalion Chiefs; no upstaffing or pre-positioning of resources.

7 August 2023:

- After Experiencing high winds from Hurricane Dora, a small brush fire ignited in Maui's Station 2 district. Contained.

8 August 2023:

- 0020: Fires break out in Olinda with 50+mph winds, causing wildfire to spread rapidly.
- 0423: Relief engines called to be staffed; crews struggle to maintain perimeter control.
- 0635: Fires reach Lahaina. Power outage is noted. Strong winds persist.
- 0852: Crews states 100% containment despite rapidly deteriorating situation.
- 1152: Kula fire started, causing delays in response equipment. Homes getting destroyed by the rapidly moving fire and winds. Air humidity decreases.
- 1500: Lahainaluna road now getting impacted with flames, MFD notified dispatch to initiate evacuations.
- 1600: Community homes, buildings, and other structures start to burn – with engine teams struggling to keep up and encountering injuries on teams.
- 1759: Pulehu fire was beginning with little to no support to fight it
- 1800: Fighting to maintain consistent radio communication as the system was overloaded. Water supplies getting low for fire departments.

9 August 2023:

- 03:00: Winds shift; crews stop forward progress of Pulehu Fire.
- 06:00: MFD Ocean Safety Bureau and Coast Guard conduct coastal searches, rescuing 17 people. Uncontrolled fire lines in Lahaina burn surrounding vegetation; crews create control lines and extinguish active fires.

10-11 August 2023:

- MFD focuses on finding survivors, regrouping, and controlling remaining fires.
- Dive team conducts underwater search and rescue; Urban Search and Rescue (USAR) team supports initial recovery operations.

Figure 4. Maui Wildfire Timeline: First Week

By the time the fire was contained, the historic town of Lahaina on Maui was devastated, with the flames that ignited in that region causing roughly $5.5 billion in damage to this community alone as reported by the Pacific Disaster center (Goering, 2023) as well as pictured in Figure 5.

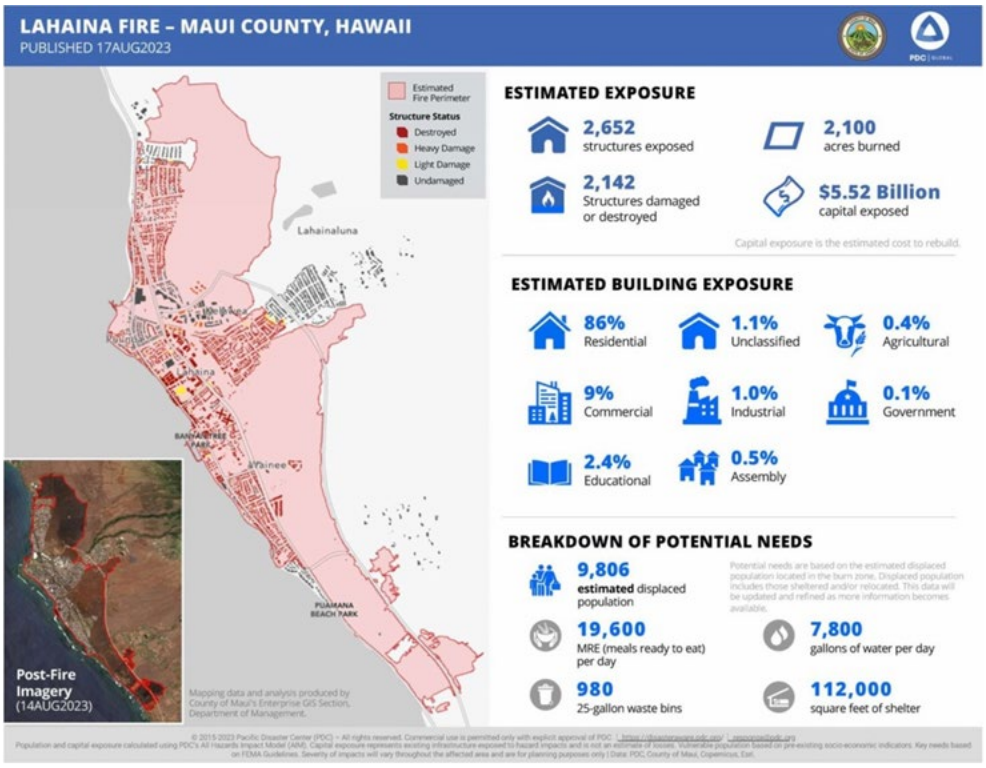

Figure 5. Costs of Fire. Source: Goering (2023).

The wildfire's destruction and levels of damage to the impacted community's social, economic, infrastructure, and natural environments are of no small significance. Further investigation into the causes and effects of the wildfire will be done in both the literature review and analysis portion of this report.

B. LOCAL SUPPORTING ENTITIES BACKGROUND

On the day of the fires that fractured Maui communities, the Hawaiian state had the following entities at the combined federal, state, and local levels in existence who share a role in disaster and wildlife response efforts:

- Maui Wildfire Task Forces
- Maui Fire Department Fire Prevention Bureau
- State Department of Land and Natural Resources, Division of Forestry and Wildlife
- Hawaii Wildfire Management Organization
- National Weather Service
- University of Hawaii at Manoa, College of Tropical Agriculture and Human Resources

- Maui County Emergency Services and Public Safety
- Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife
- Department of the Interior
- Maui Emergency Management Agency
- Hawaii Emergency Management Agency
- Heavy equipment contractors (Kerber & Alkonis, 2024)

These entities are meant to collaborate and share responsibility should a wildfire occur, including fire prevention and forecasting, preparation for disasters, and command and control of disaster relief efforts. A formal communication network should be established between all these organizations and programs to ensure proper coverage of duties and execution of wildfire response actions.

C. FEMA BACKGROUND

The organization known as FEMA was established in 1979 via an executive order published by President Jimmy Carter. According to their informational page on their website, FEMA was given the dual mission of emergency management and civil defense (FEMA, 2024). Later, the Stafford Act was passed in 1988 further defining the roles and responsibilities of this organization, which provided "clear direction for emergency management and established the current statutory framework for disaster response and recovery through presidential disaster declarations" (FEMA, 2024, p. 1).

On the afternoon of August 8, the Hawaiian lieutenant governor issued a state of emergency (Luke, 2023) and subsequently activated the Hawaiian National Guard for assistance. On August 10, President Biden issued a presidential declaration of major disaster under the provisions of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (CRS, 2023).

This act was last updated in 1988 and "constitutes the statutory authority for most Federal disaster response activities especially as they pertain to FEMA and FEMA programs" (FEMA, 2023b, p. 1). The president of the United States has the right to declare emergencies necessary of needing national attention and provides them the ability to allocate disaster relief (DR) efforts through FEMA. This act also speaks to the policy

requirements for entities outside of FEMA and their capabilities to assist in DR efforts (FEMA, 2023b).

Aside from the aid provided from FEMA and Hawaiian DR entities, *USA Today* reported that the active-duty branch of the Army National Guard and Coast Guard were utilized in providing air mobility assets to the relief during the early days of the wildfire (Hudnall, 2023). In all, a White House press briefing informed that a total of around 700 service members were activated and utilized to assist in the search and rescue efforts, providing also potable water and hazardous waste cleanup services in response to the disaster (The White House, 2024).

At no point in the wildfire efforts were the United States Marine Corps (USMC) units that are in Hawaii enacted to support the relief, despite having many abilities and assets that would quickly mobilize and expedite the process of fire control and DR.

For a DoD entity to provide DR response and conduct activities in support of relief, the state government officials—mainly the governor—must approve the resources and the injection of active-duty military forces. Typically, the DR and response is a mission of the National Guard units that are present in the surrounding areas of a state to allow for rapid response and support when a local government and authorities cannot sustain their own operations.

The federal entity of FEMA is the typical driving force behind natural disaster relief and response and HADR events that occur in the United States. Their position as key liaison and public figurehead during these events calls much attention to the actions and decisions made when supporting disaster relief. These actions will be further analyzed in the literature review and analysis chapters of this report.

D. DOD DISASTER RELIEF BACKGROUND

The DoD has been used as an international disaster relief and humanitarian logistics response force since its establishment. While its mission set is typically more focused on national defense and tactical operations, the DoD understands the importance of the civilians that are encountered along the way and trains specific scenarios that allow

for effective and swift humanitarian aid and assistance in the wake of natural disasters such as wildfires, earthquakes, and tropical storms (Figure 6).

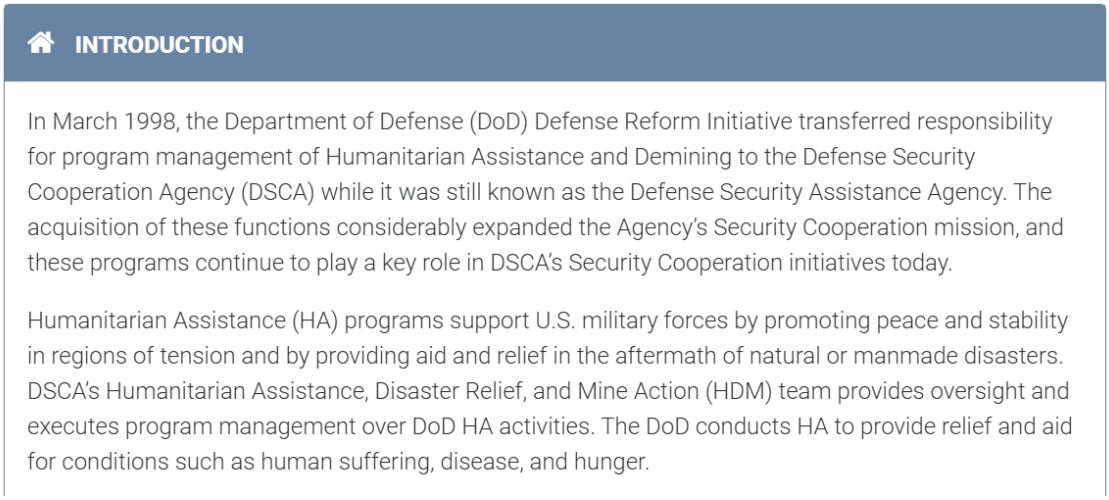

Figure 6. Defense Security Cooperation Agency Humanitarian Mission. Source: DSCA (2024).

There are written doctrinal publications regarding how the DoD responds and assists with humanitarian logistics missions such as wildfires and natural disasters. The Joint Chiefs of Staff Office has published the doctrine named Joint Publication (JP) 3–57: *Civil–Military Operations* as well as JP 3-28: *Defense Support of Civil Authorities*. These doctrines are the guide for any military forces who are involved with assistance to a multitude of activities, including disaster relief and response, supporting local and state authorities, and hazardous incidents.

Specifically, JP 3-28 lays out the military's role in these DSCA related events and how they are operating and maintain a situation and their levels of interaction with nonmilitary entities. The JP 3-57 displays a force continuum describing the conflict of support versus separate involvement regarding scaled activities. These levels on the scale range from zero conflict between local or state entities and military all-out combat environments (Figure 7). This figure is present to explain how certain situations limit the military's ability to respond and support.

Figure 7. JP 3-57 Conflict Continuum. Source: JP 3-57 (2018).

This continuum displays the conceptually positive linear relationship that the range of military operations and the conflict continuum have between each other. If the conflict continuum has a higher preference towards war, then there will be a higher preference for military operations also. Although this traditional approach to utilizing the military is still the standard with natural disasters and HADR missions, further analysis of the DoD and its involvement in these events will be conducted throughout following chapters in this report.

E. BACKGROUND SUMMARY

This background provided information and details regarding the Maui wildfire of August 2023 and its results. It additionally provided a background look into the main entities who were heavily involved in the disaster response and whom will be discussed further in this report. This background has clarified the local supporting entities and their roles, the history and intervention of FEMA with natural disasters, and the doctrine and policy that permits the use of DoD entities in the support of disaster relief.

With this background information introduced, the following chapters will analyze the information and details surrounding the natural disaster that occurred and will evaluate the overall outcomes and performance of entities involved. Combined, the

background, literature review, and analysis will guide the recommendations and conclusions surrounding the central objective question of this report.

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III. LITERATURE REVIEW

The purpose of this literature review is to provide additional information that supports the background, as well as to introduce theories and concepts that are relevant to the topic of this thesis. There are four types of sources that are being reviewed in this chapter, including wildfire after-action reports (AAR), press releases, climate change, and DoD policies.

In the wildfire AAR portion, I reviewed the AARs of an outside entity as well as a local/state entity regarding the timeline and background of the events that occurred during the blaze. These sources provide detailed information regarding entities involved with wildfire.

The press releases portion includes releases from the White House Briefing Room, the Hawaii Governor's Office, the Hawaii Emergency Management Agency (HI-EMA) Office, and FEMA. These releases include information regarding legislative and administrative actions and declarations taken during and after the disaster.

Following this, the climate change portion of the literature review looks at empirical reports, professional papers, and databases that contain information regarding the current climate situation and the future of natural disaster events such as wildfires in Hawaii and nationally.

The final section, DoD policies, contains the directives, doctrine, and publications issued to current DoD members regarding the level of involvement and policy required of military forces to participate in civil–military operations as well as disaster relief efforts. To conclude the literature review, an analysis of sources and rating of reliability and effectiveness is introduced to provide an overall picture of the information related to this topic.

A. WILDFIRE AFTER-ACTION REPORTS

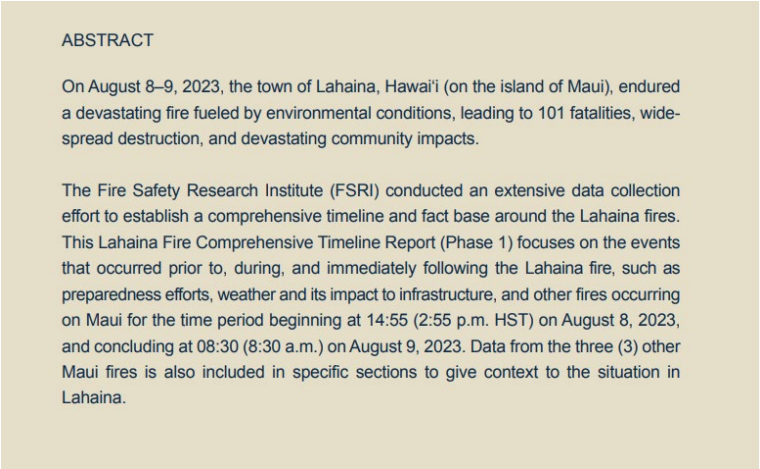
This section of the literature review will focus on the AARs that were collected from sources both internal and external to the supporting entities of the Maui wildfire. These AARs are not only a requirement after a disaster of this type has occurred, but also

an honest look into how entities may have performed to gather lessons learned and best practices for future wildfires.

1. Fire Safety Research Institute AAR

The main piece of literature that I reviewed is the AAR that was conducted by the Fire Safety Research Institute (FRSI), an entity that was tasked with providing an overall, detailed assessment of wildfire. The FSRI is a research institute backed by the broader Underwriter Laboratories Research Institutes. These institutes focus on scientific approaches to safety globally, with FSRI focusing specifically on unresolved fire safety risks and emerging dangers.

The analysis conducted by FSRI provides timelines, details, and information that summarizes the Maui wildfire in its entirety, including all responsible parties and participants throughout the disaster. A review of this source is being done to provide concrete information about the Lahaina fires and to ensure that the source is valid (i.e., not hindered or affected by any outside players). The abstract of the FSRI report is the following (Figure 8.):



ABSTRACT

On August 8–9, 2023, the town of Lahaina, Hawai'i (on the island of Maui), endured a devastating fire fueled by environmental conditions, leading to 101 fatalities, widespread destruction, and devastating community impacts.

The Fire Safety Research Institute (FSRI) conducted an extensive data collection effort to establish a comprehensive timeline and fact base around the Lahaina fires. This Lahaina Fire Comprehensive Timeline Report (Phase 1) focuses on the events that occurred prior to, during, and immediately following the Lahaina fire, such as preparedness efforts, weather and its impact to infrastructure, and other fires occurring on Maui for the time period beginning at 14:55 (2:55 p.m. HST) on August 8, 2023, and concluding at 08:30 (8:30 a.m.) on August 9, 2023. Data from the three (3) other Maui fires is also included in specific sections to give context to the situation in Lahaina.

Figure 8. Abstract of FSRI AAR. Source: Kerber & Alkonis (2024).

FSRI conducted their analysis in phases, with the product of Phase 1 being an extensive timeline for not only the overall wildfire, but key events and actions taken from multiple entities—including but not limited to the Maui Fire Department, the Maui Police Department, and the Maui Emergency Management Agency. Example timeline data is provided in Figure 9.

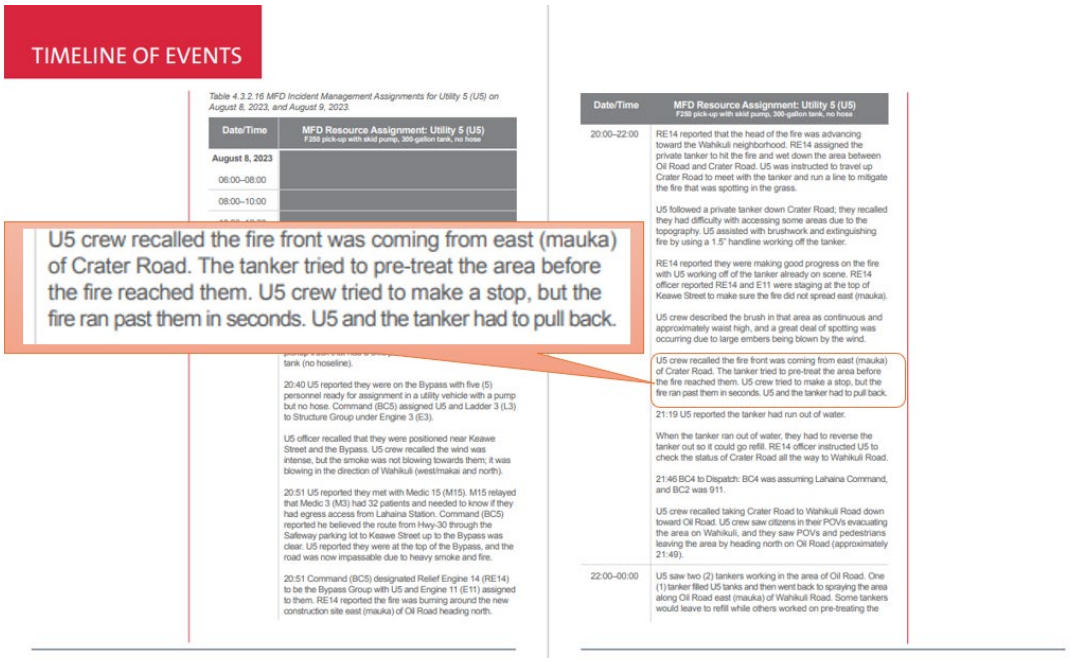


Figure 9. Example of FSRI Timeline. Source: Kerber & Alkonis (2024).

Phase 1 of the report also provided detailed information relating to the climate and weather conditions both leading up to and during the wildfire. The tropical storm by the name of Hurricane Dora had produced abnormally high winds and conditions that are believed to have contributed to the ignition of the fire.

Additionally, the report evaluated the historical and current data covering the island of Maui and its physical characteristics, rainfall, vegetation levels, agricultural activity, water collection and distribution networks, and past wildfire statistics.

Phase 2 provided an incident analysis report that looked at variables contributing to the outcome of the wildfire as well as the preparedness of all responsible parties for the disaster.

> This phase leverages science and evidence-based analyses with information from FSRI's fire dynamics research, local subject matter experts, industry standards and best practices, and the collective experiences of FSRI's team. It also includes a review and analysis of state and county policies and procedures to identify where changes or additions are needed for improved preparedness and response. (Kerber & Alkonis, 2024, p. 3)

The third and final phase of the report provided recommendations and considerations to recover from the wildfire and prevent another disaster on this scale from happening again.

> As the island and the nation mourn the lives lost, the focus must now turn to learning from this tragedy, strengthening emergency response capabilities, and building more resilient communities that can withstand the increasing challenges posed by a changing climate and the ever-present threat of wildfires. (Kerber & Alkonis, 2024, p. 3)

While Phase 1 has been released and 200 pages of timeline and background information have been reported, the FSRI is yet to complete their analysis and release Phases 2 and 3. This being the case, this source is mostly viable to provide detailed information regarding the response and efforts made by entities.

After review, this source is a highly reliable option in providing information regarding the wildfire, entities and organizations involved, and actions taken throughout the course of the disaster. The investigation team took data and gathered information in a way that shed light on the entirety of the event, keeping out any biases or potential information concealing that may have been influenced by the desire to protect the emergency response organizations and relief entities who acted and made decisions during the Maui wildfire. What this report is missing, however, is the in-depth analysis and recommendations for follow-on actions needed to repair and prevent damage for future wildfires and emergency response situations. This will require further analysis and recommendations derived from additional sources.

2. Western Fire Chiefs Association AAR

The second piece of literature that was reviewed is the AAR published on April 18, 2024, by the County of Maui Department of Fire and Public Safety (MFD). This report was directed by the MFD chief and was produced with the aid of the Western Fire Chiefs Association. The executive summary of the report is displayed in Figure 10.

This After-Action Report (AAR) focuses on the County of Maui Department of Fire and Public Safety (MFD) and was commissioned by MFD Fire Chief Bradford Ventura. The primary objective of this report is to enable future enhancements to mitigate the impacts of the next major event. While this AAR focuses on the collective Olinda, Kula, Pulehu, and Lahaina fires, the recommendations can apply to any large-scale incident.

The AAR examines the whole island's limited resources, which were extremely challenged by the scope and scale of the collective incidents. The four main wildfires, which ignited on August 8, 2023, had a catastrophic impact, claiming 101 lives, extensive property damage, and causing numerous injuries. The fires led to numerous missing persons, burned 6,721 acres, and resulted in the loss of 2,173 structures, with many more damaged. The financial toll is staggering, with property damages exceeding six billion dollars. Additionally, these fires caused the loss of historic and cultural heritage sites and led to significant economic, infrastructure, and environmental losses. The aftermath of the fires also resulted in severe housing shortages. After conducting over 200 interviews and reviewing numerous data sets, it is clear that the four major wildfires pushed the MFD to an unprecedented level of strain. Despite this, the collective actions by MFD and law enforcement saved many lives and property across the island.

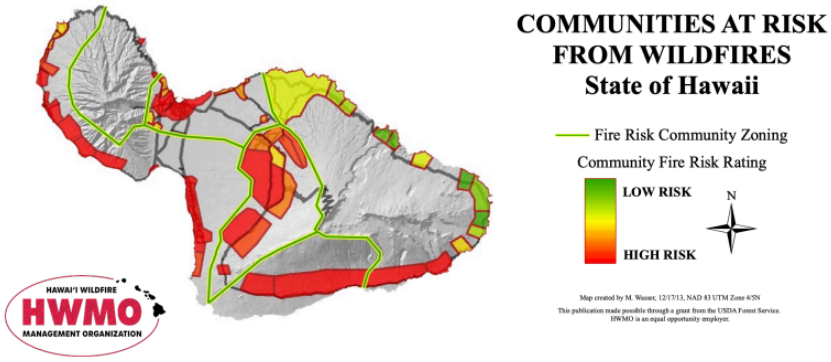
Figure 10. MFD AAR Executive Summary. Source: Fire Chiefs Association (2024).

This report includes not only a comprehensive breakdown of MFD actions and events related to the local forces and organizations responding to the Maui wildfire but also recommendations and observations that aim to provide better prevention and response efforts for the future and to identify strengths and weak points in the current response protocol.

The MFD AAR also includes information like that of the FSRI report with weather, history, and at-risk areas (Figure 11) for wildfires identified. Information regarding MFD strength, capability, and location were additionally provided (Figure 12) to establish a better view of the scope and ability of the MFD to respond during the wildfire.

APPENDIX J

MAUI WILDFIRE RISKS



Communities at Risk from Wildfires – State of Hawaii Map. Source: Hawaii Wildfire Management Organization. June 30, 2015.

Figure 11. Wildfire Risk Chart in Maui Surrounding Area. Source: Fire Chiefs Association (2024).

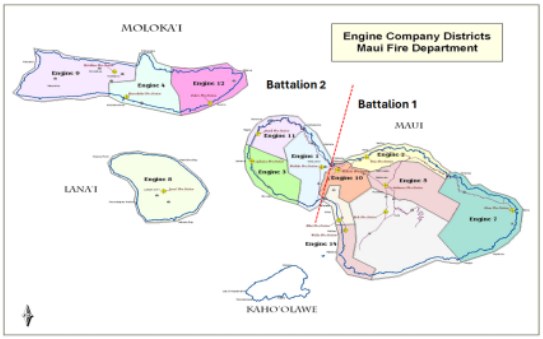
DEPARTMENT OF FIRE AND PUBLIC SAFETY

The MFD is under the authority of the County of Maui in Hawaii.[1] Maui County consists of four islands: Maui, Lana'i, Moloka'i, and Kaho'olawe. MFD is governed by the Mayor and nine members of the Fire & Public Safety Commission.[2] MFD consists of a Fire Chief, one Deputy Fire Chief, two Assistant Fire Chiefs, seven Battalion Chiefs, and 1 Fire Service Officer. The MFD has 282 personnel in Fire Operations, 63 in Ocean Safety, 11 in Fire Prevention, 3 in Health and Safety, 4 in Training, 5 in Mechanic Shop, and 20 in Administrative Support.

The department operates 14 fire stations, including one on Lana'i, three on Moloka'i, and 10 on Maui. All stations function as all-hazard, full-service fire organizations, providing collectively:

14 Engine Companies	9 Mini Pumpers
2 Ladder Companies	1 Helicopter (exclusive use contract)
1 Rescue Company	3 Rescue Boats
1 Hazmat Company	11 Rescue Watercrafts (including Ocean Safety)
6 Tankers	10 Utility Vehicles

The map below illustrates MFD's service area on Maui. A complete overview of MFD can be found in Appendix A.



www.qsl.net

Engine Company Districts. Source: MFD.

Figure 12. MFD Equipment. Source: Fire Chiefs Association (2024).

Most of the observations and recommendations speak specifically to that of the MFD and training or operational changes required to enhance response efforts. A portion of the recommendations, however, highlight the question of how to use traditional and nontraditional partners in the response of wildfires.

> Response entities may encounter challenges when facing major incidents that outmatch their capabilities. Success is contingent on establishing relationships with key entities before an incident occurs. In this case, assistance from the Navy, Army, National Guard, and Coast Guard arrived after the first operational period. These relationships and agreements are infrequently used but can be instrumental in providing surge capacity. Success in these partnerships is achieved by establishing and maintaining them before an incident and understanding that personnel on all sides may change. All involved parties must understand their roles within incident command systems and designate a liaison representative to be present at the incident command post or emergency operations center. (Western Fire Chiefs Association, 2024, p. 30)

While the overall focus of the AAR was seemingly narrow to one entity, it provided a look at the local level of how the disaster response and relief was conducted, including limitations and capabilities that are dependent on the actions and policies created by those overseeing such groups. It also provided additional detailed information in regard to the timeline and actions taken during the wildfire. This source of information is internal to the disaster relief and response network of Hawaii, but the report created, and information analyzed were approached agnostically.

B. PRESS RELEASES

For this second portion of the literature review, information that is discussed includes a collection of press releases from both FEMA and HI-EMA. These releases were made to provide the public with updates on actions that these organizations were conducting after the wildfire had struck. The HI-EMA releases were signed and issued by the acting and current governors of Hawaii, Sylvia Luke and Josh Green. The FEMA releases were published directly to FEMA's press release page, with no author specifically named.

1. White House Briefings

The two White House briefings that are reviewed in this section are the fact sheets that were published in 2023 during the wildfire efforts and 6 months after the disaster. These briefings included facts about support and continued efforts such as the following:

- "The Administration has provided more than $330 million in Federal grants and disaster loans… hundreds of personnel from across dozens of Federal departments and agencies… as it continues its long-term recovery." (White House, 2024, para. 1)
- "Department of Energy is providing $95 million through the Bipartisan Infrastructure Law to harden Hawai'i's electric grid, improve service, limit damage during future events, and help prevent failures in the future that could lead to severe events." (White House, 2023, para. 3)
- "More than 700 personnel from the Department of Defense and 119 members of the Coast Guard are actively participating in the coordinated response to the Western Maui Wildfire." (White House, 2023, para. 14)

These fact sheets provide summarized data regarding all federal entities that were used to support response efforts not controlled by the state of Hawaii.

While these do show a large economic and personnel footprint regarding the wildfire response, they do not include information regarding detailed DoD involvement or a timeline on how the resources provided were allocated. Additionally, they do little to address any federal efforts done in immediate response as well as mitigation prior to the blaze erupting.

2. DoD Press Release

The DoD provided a press release in 2023 regarding the Maui Wildfire and DoD response. This included a list of the nine approved missions that the DoD was tasked with for the wildfire. These missions were interisland air/sea transportation, defense coordinating element, use of Schofield Barracks and support facilities, standby aerial fire suppression, strategic transportation, U.S. Army Reserve (USAR) Center–Wailuku used as a FEMA incident support base federal staging area, DoD mortuary affairs support, fuel distribution support, and potable water distribution support (DoD, 2023). Table 1 displays the breakdown of DoD entities and their roles or activities during the Maui wildfire relief response.

Table 1. DoD Services Intervention, Maui Wildfire. Source: DoD (2023).

DoD Agencies	Army	Marine Corps	Navy	Air Force	National Guard
The Defense POW/MIA Accounting Agency deployed six forensic anthropologists to assist in gathering and identifying human remains.	Heavy Expanded Mobility Tactical Truck (HEMTT) fuelers from the Army's 25th Infantry Division (ID) were on-site and ready for fuel distribution operations to begin on August 21. The HEMTTs provided approximately 1,500 gallons of fuel daily in support of 18 generators operating along Maui's west coast.	MV-22 Osprey tiltrotor and KC-130J Super Hercules aircraft were available for materiel and personnel transport. An MQ-9 remotely piloted aircraft was available for aerial survey.	Two Navy emergency preparedness liaison officers were on the ground in Maui and Oahu, respectively, supporting interagency command and control.	An Air Force emergency preparedness liaison officer was in Oahu.	The Hawaii National Guard activated approximately 557 Army National Guard and Air National Guard personnel on state active duty.
Secretary Austin designated Army National Guard Brigadier General Stephen Logan as the dual status commander of Joint Task Force (JTF) 5–0 under U.S. Indo-Pacific Command (USINDOPACOM) on August 12.	The U.S. Army's 25th ID postured HEMTT fuelers for sealift deployment to Maui in support of U.S. Army Corps of Engineers (USACE) generator operations. The HEMTT fuelers were each capable of delivering up to 2,500 gallons of fuel.	The 3rd Marine Littoral Regiment was available to provide manpower, engineering and water purification support as needed.	Two MH-60R Seahawks and three CMV-22 Ospreys were on standby for use as needed.	Pacific Air Forces delivered two HEMTTs, two HIPPO water tanks, and six operators from the 25th ID to Maui in support of the JTF 5–0 Water Distribution Mission.	Hawaii National Guardsmen supported local law enforcement by manning traffic control points and providing area security in Lahaina. These were 24-hour operations.
JTF 5–0 was activated on August 11 and reached full operational	The U.S. Army's 402nd Army Field Support Brigade had	A USMC KC-130 Hercules was activated in support of the Mobile	Three MDSUs from Pacific Fleet were conducting sonar scans of		Two Hawaii Army National Guard CH-47 Chinooks remained on

DoD Agencies	Army	Marine Corps	Navy	Air Force	National Guard
capacity on August 16.	field service representatives on Oahu preparing and standing by for communications and logistics support to JTF 5–0 if needed.	Diving Salvage Units (MDSUs).	Lahaina Harbor in preparation for diving operations in support of the search and recovery mission.		standby for support to Maui.
Joint service staff and liaison officers were supporting JTF 5–0.	The USACE managed two operational FEMA mission assignments for debris removal and temporary power.		Navy MDSU teams from Pacific Fleet concluded their dive operations on August 28.		Hawaii National Guard provided 24-hour traffic control and area security support to local law enforcement.
The Disaster Mortuary Operational Response Team processed 15 to 20 exams per day, focusing on the examination of newly discovered remains and secondary examination of specific remains.	USACE had 27 personnel deployed (a mix of active duty and civilians), and 14 personnel provided virtual, reach-back support from offsite locations. Forty-one contractor personnel were deployed to the scene.		The Navy and Air Force had emergency preparedness liaison officers on the ground in Maui and Oahu, and 16 Navy chaplains and 11 Navy mental health providers were on 24-hour recall for grief counseling and emotional support to individuals and families impacted by the disaster.		
USINDOPACOM forces remained postured to support additional mission assignments if requested.	The USACE's 249th Battalion ("Prime Power") and Advanced Contracting Initiative (ACI) contractors supported power generation requirements and assessments.		Pacific Fleet's Navy Environmental Preventative Medicine Unit Six deployed two Sailors to Maui in support of potable water testing for the JTF Water Distribution Mission.		

DoD Agencies	Army	Marine Corps	Navy	Air Force	National Guard
	An additional 61 generators were pre-staged at Oahu.				
JTF 5–0 focused on search and recovery activities with Hawaii National Guard CBRNE CERF-P teams, Federal Bureau of Investigation, anthropologists from the Defense POW/ MIA Accounting Agency, and mortuary affairs technicians from PACAF and 25th ID.	U.S. Army rotary wing support includes aerial reconnaissance of the affected zone.				
Interisland air/ sea transportation, a defense coordinating element, was on standby for aerial fire suppression.	Eleven USAR personnel supported USAR Center–Wailuku operations as a FEMA incident support base and a federal staging area.				
Strategic air transportation, USAR Center–Wailuku was used as a FEMA incident support base federal staging area for DoD mortuary affairs support, Armed Forces Medical Examiner System	Army 25th ID's HEMTT fuelers distributed ~470 gallons of fuel over 48 hours in support of USACE temporary power operations.				

DoD Agencies	Army	Marine Corps	Navy	Air Force	National Guard
advanced forensic capabilities, and potable water distribution support.					
Since August 25, potable water teams have distributed 4,174 gallons of water in the Lahaina area.	U.S. Army Pacific executed eight approved mission assignments from FEMA.				
	USACE advanced teams were on Maui preparing to establish a long-term forward command and control center for debris removal. The county of Maui was the lead on this mission. USACE teams also worked with local officials on design plans for the establishment of a temporary school site for local children.				

3. HI-EMA Press Releases

The HI-EMA releases include the first press-issued release from the governor's office on August 8, 2023 (Figure 13), the day that the Maui fires broke out, as well as the final press release from the governor's office regarding the fire on August 19, 2023 (Figure 14). These official releases included statements that activated and called upon relief entities, funding, and direct actions required to support and relief effort from the

wildfire. Additionally, they discussed temporary legislative changes that were focused on the safety and ongoing relief effort.

NOW, THEREFORE, I, Sylvia Luke, Acting Governor of the State of Hawai'i, hereby determine that an emergency or disaster contemplated by section 127A-14, HRS, is occurring in the Counties of Maui and Hawai'i, State of Hawai'i, and do hereby authorize and invoke the following emergency provisions which are expressly invoked, if not already in effect upon this declaration of an emergency:

I. Invocation of Laws

Section 121-30, HRS, and I hereby authorize the Adjutant General to activate such units of the Hawai'i National Guard as may be necessary to assist and aid civilian authorities in disaster relief and in averting any imminent public danger and threat and to ensure the compliance with the civil laws of the State of Hawai'i.

Sections 127A-12 and 127A-13, HRS, in order for county and state agencies to provide emergency relief and engage in emergency management functions as defined in section 127A-2, HRS, as a result of and in response to this event.

Sections 127A-3, 127A-12(a)(5), 127A-13(a)(5), and 127A-13(a)(6), HRS, and the Director of Hawai'i Emergency Management and the Administrator of Emergency Management are directed to take appropriate actions to direct or control, as may be necessary for emergency management:

Figure 13. Hawaii Governor Press Release 1. Source: Luke, S. (2023).

NOW, THEREFORE, I, JOSH GREEN, M.D., Governor of the State of Hawai'i, hereby determine that an emergency or disaster contemplated by section 127A-14, HRS, is occurring in the State of Hawai'i, and do hereby authorize and invoke the following emergency provisions which are expressly invoked, if not already in effect upon this declaration of an emergency:

I. ESSENTIAL TRAVEL ONLY TO WEST MAUI

Nonessential travel to West Maui is strongly discouraged for the duration of this proclamation. Visitors have largely heeded the call to vacate West Maui, so hotels and other accommodations can be used for displaced residents and emergency workers. I order all affected State agencies to assist as needed.

Figure 14. Hawaii Governor Press Release 2 Source: Green, J. (2023).

4. FEMA Release

The FEMA press release that was analyzed was published on August 9, 2023, 24 hours after the blaze had begun. This release authorized emergency federal funds and assets under the direction of the president of the United States.

> On Aug. 9, the state of Hawaii submitted a request for a Fire Management Assistance Grant (FMAG). At the time of the request, the fire threatened an unknown number of homes in and around Lahaina, with mandatory evacuations for approximately 7,500 people. The fire also threatened local businesses, electrical transmission lines and telecommunications lines in the area. FMAGs provide federal funding for up to 75 percent of eligible firefighting costs. The Disaster Relief Fund provides allowances for FMAGs through FEMA to assist in fighting fires that threaten to become a greater incident. Eligible costs covered by FMAGs can include expenses for field camps, equipment use, materials, supplies and mobilization, and demobilization activities attributed to fighting the fire. (FEMA, 2023a, para. 2–4)

5. Releases Analysis

These releases show the relationship between local, state, and federal emergency agencies and the timeline associated with requesting and granting emergency response funding and resources. These sources were found to be reliable in their reporting, and the press releases were not meant to misinform or sway the public attention or opinions. The major consequence of reviewing these press releases is that it displayed how the higher-level authorities were tied to policy that needed to be followed before their intervention could be established and executed, although local organizations and forces were already heavily involved in combatting flames and evacuating civilians.

C. CLIMATE CHANGE CONSIDERATIONS

The following sources are reports and data that relate the current climate of Hawaii and changes that are and continue to occur that will impact the rate at which the state and other islands in the Pacific will experience wildfires and other natural disasters in the future. These sources were collected and reviewed to provide better context regarding climate change and its role in natural disasters in the United States.

1. U.S. Forest Service Report

This report was conducted to provide information and data related to the State of Hawaii and its wildfire patterns over a 100-year span. The abstract was the following:

> Wildfire is a major threat to natural resources and native species in Hawai'i, but the frequency and extent of wildfires across the archipelago has not been well quantified. Our objective was to summarize the

> available wildfire data for Hawai'i and synthesize the social and ecological dimensions of wildfire drivers, impacts, and management responses. We constructed a 110-yr span of wildfire records for the state of Hawai'i to examine historical trends (1904–2011) and summarized relationships between contemporary wildfire occurrence (2005–2011) and land use/land cover types and human population…These grass-dominated landscapes allow wildfires to propagate rapidly from areas of high ignition frequencies into the forested margins of the state's watersheds, placing native habitat, watershed integrity, and human safety at risk. There is an urgent need to better assess fire risk and impacts at landscape scales and increase the integration of prefire planning and prevention into existing land management goals. (Trauernicht et al., 2015, p. 427)

2. Journal of Climate Hawaii Report

> The Journal of Climate (JCLI) publishes research that advances basic understanding of the dynamics and physics of the climate system on large spatial scales, including variability of the atmosphere, oceans, land surface, and cryosphere; past, present, and projected future changes in the climate system; and climate simulation and prediction. (American Meteorological Society, 2024)

The journal publication being reviewed is specifically looking at the islands of Hawaii and the weather impacts that it has gone through over the past 20 years in response to climate change.

> Hawaii's high and steep topography leads to pronounced small-scale variations in climate, and this makes comprehensive modeling of the weather and climate particularly challenging. This paper describes a regional model formulation designed for simulations of the microclimates in Hawaii and then documents and analyzes an extended retrospective simulation for near-present-day conditions. Part II will apply the model to projected climate conditions near the end of the present century…is a reasonable agreement between observed and simulated mean rainfall patterns over the other islands as well. However, the simulated distribution of mean rainfall over Kauai and (most particularly) Maui and Oahu reveals some significant deficiencies, which is attributed to inadequate resolution of the topography on these islands. The 1-km simulation over Maui shows clear improvement in the mean rainfall over the 3-km version. (Zhang et al., 2016, p. 3027)

3. Center for Research on the Epidemiology of Disasters Report

The Center for Research on the Epidemiology of Disasters (CRED) Institute prepares annual briefing reports with data that detail the number of major natural

disasters the world has experienced and how it compares to that of the averages of the years prior. Overall, due in part to climate change, the number of disasters has steadily increased and continues to rise each year (Figure 15).

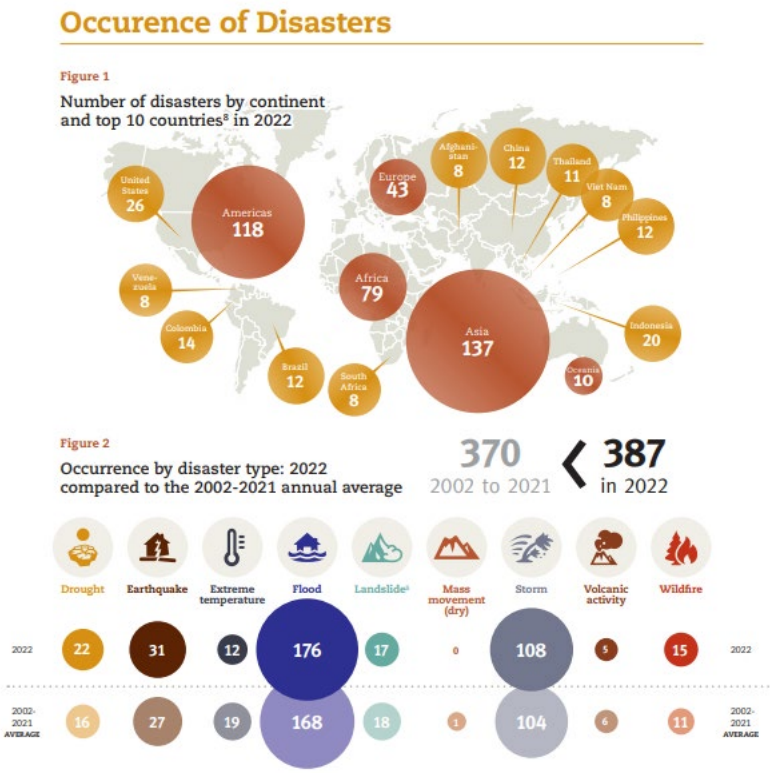


Figure 15. CRED Report. Source: Centre for Research on the Epidemiology of Disasters (CRED) (2022).

This report also reveals data that United States is affected heavily by natural disasters, accounting for 118 of the 387 that occurred worldwide in 2022 (CRED, 2022).

4. Climate Sources Summary

These sources are from validated and academically appropriate entities, aimed at only providing detailed and heavily researched information regarding the climate and future climate of the world and the State of Hawaii. One main piece of information to gather from these sources is that due to uncharacteristic humidity, rainfall, and wind levels in the Hawaiian and Pacific region, an increase in disasters such as wildfires will only increase if not properly mitigated and if steps are not taken to decrease the likelihood of a blaze being ignited.

D. LITERATURE REVIEW SUMMARY

These reports, press releases, data analyses, and guidance have been provided to not only inform the researcher of this thesis, but also ensure that the recommendations, analyses, and conclusions provided regarding the topic of military intervention and involvement in the case of a natural disaster is not done with biases or prejudice.

These reports provided information regarding the activities and events that occurred during the wildfire that struck Maui in 2023, as well as the actions and decisions made by authorities responsible for managing the disaster. While the current changing climate of the world cannot necessarily be remedied, steps can be taken to ensure that the United States and numerous other vulnerable nations are well-equipped and prepared to handle this increase in disastrous events.

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IV. ANALYSIS AND RESULTS

The analysis and results portion of this thesis details a collection of information and data gathered during the literature review and research conducted on this topic. The analysis includes a collection of cause-and-effect factors with the Maui wildfire and speaks to the current environment in regard to recovery efforts. It also examines the timelines associated with the disaster and includes entities' actions and involvement. The results portion of this thesis identifies gaps in existing protocols, preparation, and training of the entities involved in the wildfire disaster relief. Additionally, the analysis evaluates the overall effectiveness of response and relief efforts conducted in the 2023 blaze.

A. ANALYSIS

This analysis was conducted using empirical and reviewed data, information, and accounts of support. It provides a thorough cause-and-effect analysis that will determine root sources of the ignition as well as obstacles created by the fire that impacted response and intervention of responsible entities. Alongside the cause-and-effect analysis, there will be an analysis of local, state, and federal entities that participated in the disaster response. These entities are evaluated according to their actions and compliance with areas of responsibility that were required of them during the wildfire.

1. Cause-and-Effect Analysis

The first portion of the cause-and-effect analysis details a list of variables that relate to the causes of the wildfire and its overall size and zone of destruction. These variables include environmental factors such as wind, climate change, weather patterns, and agriculture of the Maui area, as well as self-induced factors such as electrical systems' operability, existence of emergency routes over primary transportation methods, availability of resources, and communication and coordination levels between entities at the time of blaze. To properly display the causes and effects of this wildfire, a fishbone diagram is used.

> A fishbone diagram is a problem-solving approach that uses a fish-shaped diagram to model possible root causes of problems and troubleshoot possible solutions. It is also called an Ishikawa diagram, after its creator,

Kaoru Ishikawa, as well as a herringbone diagram or cause-and-effect diagram. Fishbone diagrams are often used in root cause analysis, to troubleshoot issues in quality management or product development. They are also used in the fields of nursing and healthcare, or as a brainstorming and mind-mapping technique many students find helpful. (George, 2024, p. 1)

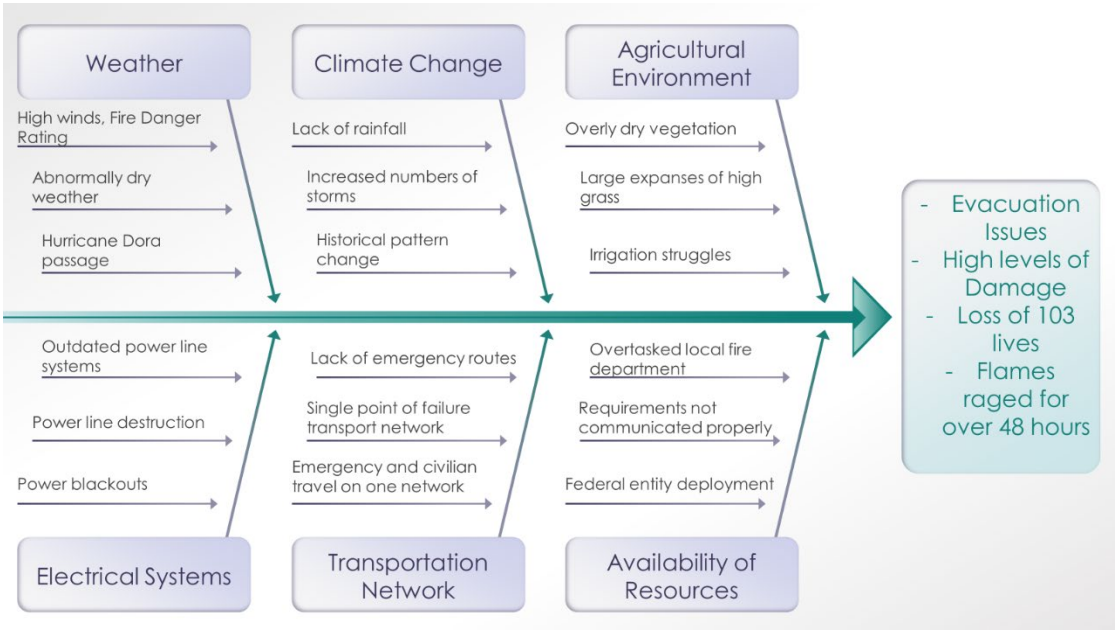

Figure 16. Cause-and-Effect Fishbone Diagram

This diagram was built to separate the categories of variables that caused the wildfire and show their relationship between one another and the final results of the disaster. Each categorical variable has their own subset of details and events that feed into the overall umbrella that these variables create. These variables create the 'fish bones' or main body of the diagram and the arrows show the flow of causes into the overall 'fish head' or effects of the wildfire. The details and information gathered for this fishbone diagram were collected using the literature review and materials previously cited or stated in the report. No new or unknown material was included in this diagram.

The variables of weather, climate change and availability of resources were greatly impactful to the overall results of the wildfire. These variables include the entities involved with supporting the disaster preparations and factors that should have been an indication of potential natural disaster occurrences. The variables of transportation

networks, electrical systems, and agricultural environment are all causes that, when combined with the event of a wildfire, provided for more difficult and damaging results.

When using a fishbone diagram, it provides the opportunity to visualize the unique, multivariate setting that not only led to the initial ignition of the wildfire in 2023, but the complex situation that was created due to all factors involved. Every natural disaster has more than one underlying issue that causes the effects, and a fishbone diagram showing this relationship between cause-and-effect displays that theme.

2. Response Evaluation

To understand potential gaps or missed requirements when handling the wildfire that the entities involved may have faced, an analysis of their actions and control of the scenario based on authority and jurisdiction was needed. To do that, a table was created that breaks down the ten most influential and heavily involved entities who acted on the overall response and relief efforts in Maui. These entities include the following:

Local:

- Maui Fire Department (MFD)
- Hawaii Emergency Management Agency (HI-EMA)
- State Department of Land and Natural Resources, Division of Forestry and Wildlife
- Hawaii Army National Guard
- Hawaiian Governor's Office

Federal:

- Federal Emergency Management Agency
- United States Coast Guard
- The Red Cross
- The White House

DoD:

- Various Marine Corps, Army, Air Force and Navy units/assets

These entities have specific and legally given authority, responsibilities, and requirements when it comes to disaster relief and response. To determine if these entities followed those requirements when performing the wildfire relief in 2023, a table and chart were created. The variables contained in the table are the name of the entity

involved, the main responsibilities they are tasked with, the actions taken, and whether the entity adequately and appropriately completed their tasks and responsibilities for the disaster.

These responsibilities include phrases such as command and control (C2), first responder and wildfire control and maintenance, evacuation and community outreach, resourcing relief, mandating actions and authorities, and supporting agency. The actions taken may be like those of the responsibilities, but also contain terms such as zero actions taken, incorrect actions taken, identified and conducted correct actions, delayed action, and inability to support.

The adequate response numbers were calculated based on a point-scale created by denoting each type of action taken to a number 1–4 (see Table 2). This scale is allocated as the following:

- Identified and conducted correct actions = 1 point
- Delayed actions = 4 points
- Incorrect actions = 3 points
- Inability to support = 2 points

Table 2. Evaluation of Entities' Response to Maui Wildfire

Entity	Main Responsibilities	Actions Taken	Adequate Response
Maui Fire Department	First Response, Wildfire Control, Active Communication	Identified and conducted correct actions, inability to support, delayed action	7
Hawaii Emergency Management Agency	Command and Control, Active Communication, Evacuation	Delayed action, incorrect actions taken, identified and conducted correct actions	8
Hawaii Department of Land and Natural Resources	Wildfire Control, Supporting Effort to MFD	Identified and conducted correct actions, inability to support	3
Hawaii Army National Guard	Supporting Effort, Resourcing Relief	Delayed action, identified and conducted correct actions	5
Hawaiian Governor's Office	Command and Control, Delegating Powers, Active Communication	Delayed action, identified and conducted correct actions	5
FEMA	Resourcing Relief, Community Outreach	Delayed action, incorrect actions taken, identified and conducted correct actions	8
USCG	Evacuation, First Responder Support	Identified and conducted correct actions, inability to support	3
The Red Cross	Community Outreach, Medical and Resource Relief	Identified and conducted correct actions, inability to support	3
The White House	Allocating Support Entities	Delayed action, identified and conducted correct actions	5
DoD Misc.	Supporting Effort, Resourcing Relief	Inability to support, identified and conducted correct actions	3

If an entity was evaluated to have conducted more than one action, then a sum of these actions was calculated to provide a properly accounted for score. For reference on understanding the scoring of the table, a lower evaluated number is meant to be favorable toward the entity's responsiveness. This means that the entity was more capable of providing an adequate and appropriate response to disaster relief.

The bar chart shown in Figure 17 was then created to show the relationship between each entity and their rating of adequacy as given from the table and response calculations conducted.

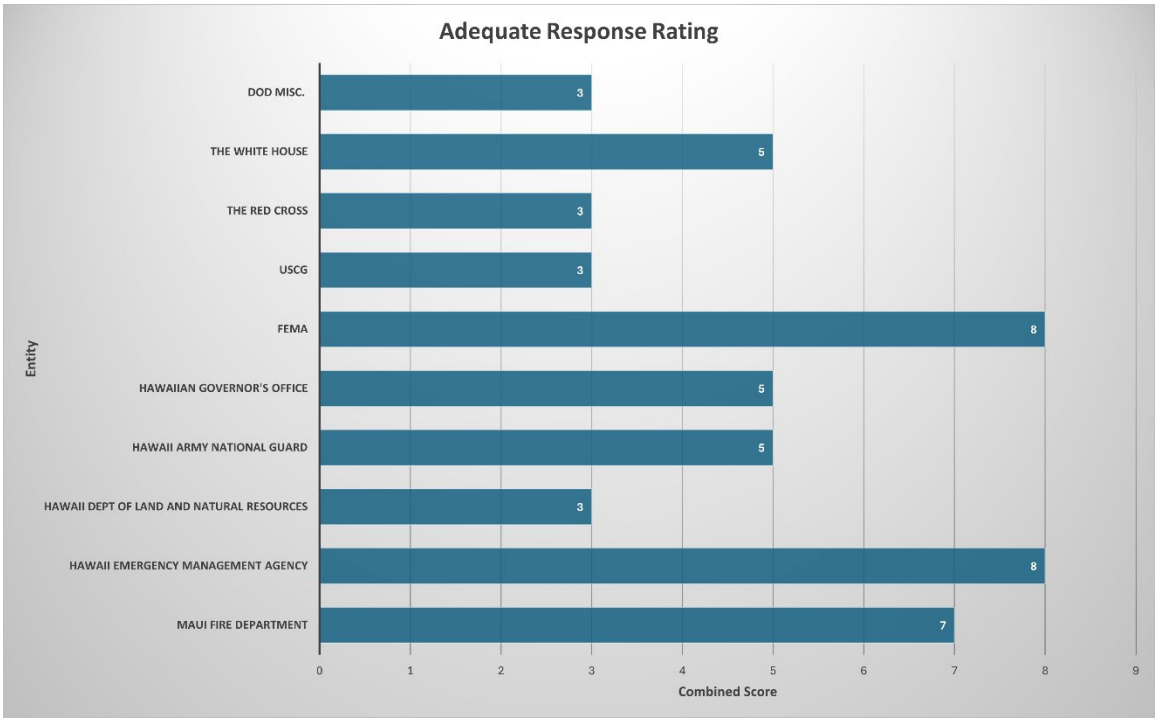

Figure 17. Response Rating Bar Chart

Only information and data collected from the literature review and prior introduced sources were used to create these products. No outside sources were evaluated, and the results are subjective to the author and their interpretation of the data in after-action reports and all other sources reviewed.

B. RESULTS

Overall, the results of this data analysis, including both the cause-and-effect and adequacy scoring, provide insight into the ability of current disaster relief and response entities. There are successful and appropriate actions as well as gaps in functions and capabilities that need to be identified and discussed to understand the encompassing picture of HADR in the United States, specifically in the State of Hawaii.

1. Cause-and-Effect Results

The fishbone diagram and analysis of all the variables involved (weather, climate change, agricultural environment, electrical systems, transportation networks, and availability of resources) highlight two main points:

1. A combination of causes of the wildfire not only contributed to the ignition of the flames but also set the scene for any number of natural disasters to occur.
2. The effects of the wildfire were exacerbated by a lack of coordination, poor infrastructure between organizations and responsible parties, and limited resources at the time of necessary action.

The environmental causes of the wildfire were greatly attributed to climate change and weather. The Hawaiian Island of Maui had experienced record-breaking low amounts of rainfall, higher winds and gusts that were remnants from a violent tropical storm (now an increased occurrence each year in the Pacific region), and temperature ranges that were uncommon based on historical data. These increases in storms and changing regional environments were monitored, but little could be done to prevent such events from occurring.

The agricultural environment has shifted in Maui over the last several decades, and an increasing number of open, plain-type fields have dominated the acres of the island that were once forested or used for small-scale farming. The need to provide water to these fields has redirected naturally occurring hydration systems, leaving the areas deemed not vital to these farms and communities with a decreased water supply and thus leading to dry, tinder-type scrub and grasses. This horticultural scenario allowed for the rapid spread of flames as the wildfire consumed the dry and expansive fields and open areas.

The electrical system and transportation networks that existed on the island were outdated and not equipped to handle the effects of increased environmental changes and population on Maui. The powerlines were mostly above ground, and with damaging winds, fallen trees and strong gusts not only knocked the powerlines down, but caused surges of electricity to the surrounding areas on the ground and roads—many of which contained dry foliage that was easily ignited by the charges. Once the wildfire was ablaze, it became apparent that the road networks in use could not handle the influx of emergency response and rescue vehicles and equipment. As evacuation became a priority for all citizens in the affected area, the single point of ingress and egress became congested. The lack of emergency routes and detours due to the flames consuming

portions of the main route limited the effectiveness and response time of many entities supporting the wildfire effort.

The final key variable to this analysis was the lack of resources available at the time of the wildfire. The fire department was between shifts and undermanned as they began fighting the multiple small fires that ignited throughout the Lahaina area. Much of the equipment was being overtasked and was found to be quickly degraded, leaving the firefighters and emergency responders scrambling to combat the raging fire. Additionally, other entities such as the HI-EMA and Red Cross were limited in their ability to respond in a timely manner due to communication and coordination issues for resources and during the commanding of the response effort.

All these variables, or causes, became the foundation upon which the results, or effects, of the wildfire were laid. While some of these variables are not the result of human intervention and were simply just additional factors to be considered with the wildfire situation, the lack of communication, resources, properly maintained agricultural areas, and protected electrical and transportation networks were all human factors that contributed to the destruction and overall devastating results of the Maui wildfire. The loss of 103 lives, entire communities disrupted and displaced as their homes, workplaces, and schools were burned, and the financial burden that is involved with a natural disaster relief effort are all effects that cannot be taken lightly. The scale on which these effects occurred could have been mitigated or decreased if improvements to any one of these human variables was made. Further discussion on the specific changes that may have been beneficial in disaster relief is presented in the recommendations portion of this report.

2. Response Evaluation Results

The adequacy scoring analysis was conducted in order to determine whether there were gaps or problem areas between an entity and their ability to execute their responsibilities. The actions taken varied between each entity that supported wildfire relief, but the most common response issues were a delayed response or action and an inability to support.

As noted in the analysis portion of this chapter, a lower score actually indicates that an entity was more successful in conducting its support and actions in alignment with its designated responsibilities and requirements. For visibility and understanding, a list of the entities with their scores ranking highest (least adequate) to lowest (most adequate) is found below:

- Hawaii Emergency Management Agency = 8 points
- FEMA = 8 points
- Maui Fire Department = 7 points
- Hawaii Army National Guard = 5 points
- Hawaiian Governor's Office = 5 points
- The White House = 5 points
- Hawaii Department of Land and Natural Resources = 3 points
- USCG = 3 points
- The Red Cross = 3 points
- DoD Misc. = 3 points

To reiterate the formulation of these points, all information and data that was collected from the literature review and sources only listed in this paper were considered in the analysis of each entity. The AARs reviewed provided detailed information regarding these entities and their involvement in the wildfire disaster relief. The rating scale was set to have the lower scoring entities deemed (in quantifiable terms) as more able and adequate at their ability to respond.

The three entities that were found to be least adequate (HI-EMA, FEMA, and MFD) were all able to conduct the majority of their disaster relief responsibilities and required actions, but were found to do so with higher levels of delayed response, incorrect actions taken initially, and inability to support throughout the entire response event. It is important to note that this result does not mean that these entities were entirely unsuccessful in their efforts, but that there may be gaps in their response protocols and actions that hindered their effectiveness.

The three entities that have the most adequate rating (USCG, the Red Cross, and DoD Misc.) were found to be so for two reasons. First, while they were supporting the effort, they were largely uninvolved with the entire relief effort, and therefore were left unable to support in many cases. Second, their areas of responsibility depend greatly on

whether the higher entities who control disaster relief employ them. Therefore, if these entities were only utilized in minimal roles, they were able to procure a more favorable scoring as they could adequately conduct their areas of responsibility.

The remaining entities (the White House, Hawaii Governor's Office, Hawaii Army National Guard, and the Department of Natural Resources) have what can be explained as mid-grade rating scores. These entities, like those of the most adequate group, have more hands-off responsibilities and required actions than those of the least adequate group. They are only tasked with allocating support or resources, which they were mostly successful in doing. Potential gaps were found, however, in the Governor's Office and the White House that led to delayed action that mitigated the ability of other entities involved to conduct their disaster relief.

This adequacy score rating reveals that the state and federal Emergency Management Agencies have gaps in their ability to respond and conduct relief efforts in a timely and correct manner. This also identifies that local entities who are not trained or well-versed in large-scale relief efforts may lack the ability to support and may have limited resources and an overall slower reaction time. Finally, although certain entities may be deemed adequate at conducting their responsible activities during relief, their inability to engage without direct authority given limits the scope in which these entities can be analyzed.

3. Analysis and Results Summary

The purpose of the analysis was to determine the causes and effects of the Maui wildfire, as well as evaluate the entities who acted in support of the relief to disclose any potential problem areas. With combining factors such as climate change, environmental hazards, limited and outdated resource networks, and inefficient emergency response plans or organizations, it is evident that the results and devastation of the Maui wildfire were great. It is also evident that if gaps and inabilities were to be discovered and corrected, then future wildfire and HADR efforts in the United States could be better equipped and qualified, which could prevent delayed response actions. The solutions and recommendations to fill these gaps and inabilities are discussed in the following chapter.

V. CONCLUSION AND RECOMMENDATIONS

This chapter contains recommendations based on the data and analysis that was conducted for this paper as well as an overall conclusion to the key inquiry that led this research: Will policy changes on DoD interventions with current state and federal levels provide for more optimistic and effective disaster relief efforts? This chapter answers this question and provides a solution to remedy an appropriate outcome.

A. CONCLUSION

The Maui wildfire that raged through the historic Lahaina area in August 2023 left a scar on the community and nation that will take years to heal. "Much of the town ended up in flames as a result of nonnative grasslands in the area and dry air. The wildfire further spun out of control after being exposed to winds from a passing hurricane" (Mehta, 2023, para. 2). While the impacts and effects of the wildfire cannot be decreased from this report, the case of this wildfire provides insight into the current United States disaster relief program and the state of Hawaii's ability to support its own natural disasters.

After-action reports and information gathered to analyze this disaster displayed a need for change within the current federal and local disaster response program. A gap in manpower, wildfire fighting equipment and resources, unused support networks, mismanaged communication networks, and the inability to maintain accurate command and control of the initial response and relief efforts led to the overall impacts and effects of the wildfire. These were all factors that could have been eliminated to mitigate the damage done by the flames that blazed on Maui.

The recommendations provide that emphasize policy change, improved agency operations and training platforms, and increased military coordination and inclusion in natural disasters were all backed by the data analysis and information gathered regarding the incident. If DoD entities are given intervention capabilities in a natural disaster response such as wildfire, this report proves that it will increase the overall effectiveness of the response and allow for local, state, and other federal agencies to be more equipped to handle a disaster. As disasters become more frequent occurrences due to climate

change, the need to reevaluate and reimagine the current disaster response program is a sounding alarm for the United States government to hear and may contribute to a more favorable stance on developing policy to include increased DoD presence during response.

B. RECOMMENDATIONS

The recommendations are based on the data analysis conducted and the outcomes of that review of information. The recommendations are discussed in accordance with the following themes: disaster relief entities, military intervention, and climate change consideration. The discussion of each theme identifies the key capability gaps and provides a potential solution to the issues at hand. An overall list of recommendations is the following:

- Maui Fire Department should improve the recruitment and retention of quality staff members.
- Maui Fire Department should conduct appropriate actions to acquire more updated, essential equipment to combat wildfires and maintain its readiness.
- Maui Fire Department should revise and implement an improved training programs for chiefs and leaders on all levels to use emergency communication devices.
- HI-EMA and FEMA should overhaul their response programs, including staffing, training on specific humanitarian logistics needs, providing inter-agency support training, and streamlining emergency alert systems.
- Government should recommend policies to increase DoD involvement capabilities during a natural disaster and define roles, responsibilities, and command and control/information flow systems for all agencies involved.
- Federal, State and local government raise awareness of climate change implications, creating policy and programs that ensure participation and mitigation practices at all levels of communities.

These recommendations are broken out based on the topic or theme they fall within and are discussed at depth in the following sections.

1. Disaster Relief Entities

The after-action reports from both the Western Fire Chiefs Association and Fire Research Safety Institute identified mishandled actions, delayed response efforts, and overwhelmed response agencies when encountering the Maui wildfire. Several agencies

faced these issues including the Maui Fire Department, the HI-EMA, and FEMA. These agencies are tasked with a large portion of the disaster relief effort and were highly visible when making decisions and enacting response plans and activities.

a. Maui Fire Department Recommendations

In regard to the MFD and their capability gaps identified in the previous chapter, they showed issues in the key areas of personnel readiness, equipment operability and availability, and command and control of wildfire operations and disaster relief. The recommendations for this entity were developed by evaluating the results of the data analysis (mainly the AARs from sources) as well as investigating similar recommendations from regarded sources.

In 2023 the Government Accountability Office (GAO) investigated a review on the federal agencies responsible for hiring and maintaining the firefighter workforce and the issues that they had with attaining proper staffing of firefighters. In the report, they found several factors that led to the recruitment and retention status that existed. The report announced that the seven main barriers "to the recruitment and retention of federal wildland firefighters: (1) low pay, (2) career advancement challenges, (3) poor work-life balance, (4) mental health challenges, (5) remote or expensive duty stations, (6) limited workforce diversity, and (7) hiring process challenges" (GAO, 2023, p. 2).

This issue of recruitment and retention is a problem that affected the local MFD, especially during the wildfire that raged in 2023. One main recommendation to combat these barriers to a strong firefighting workforce is to develop a robust recruitment campaign that not only informs the local community and potential employees of job vacancies but provides additional opportunities for applicants to engage with and comprehend the material required to become an employee of a fire department. Local engagement will ensure that the fire department can establish a more efficient and equitable training program and hiring process.

A second recommendation for the MFD to minimize future manpower challenges is to continually provide training and opportunities for their staff to be equipped to handle not only typical firefighting practices, but unique scenarios such as wildland fires or

massive disaster response. Maintaining a staff that is diverse, well-trained, and capable will ensure that in an emergency, any team could be called in to assist in the efforts required.

In regard to the equipment readiness and availability issue, there is a single recommendation as a solution that is a two-step process. First and foremost, MFD figureheads need to meet with local and state officials regarding the funding and acquisition of appropriate equipment to fill in gaps or update systems that meet the demands of a wide range of firefighting needs so that the department can be flexible and properly responsive in any emergency environment. Second, they need to develop and carry out a comprehensive maintenance program on such equipment to ensure the actual readiness and operability of items for when a disaster or fire occurs. Taking these steps will allow for an overall better equipped firefighting staff and department.

The MFD was found to have had communication and command and control issues throughout the wildfire. While they personally owned First Due software that allows for effective communication and guidance, "many resources were unaccounted for during the wildfire siege, raising operational and safety concerns" (Western Fire Chiefs Association, 2024, p. 28) because of a lack of staff that were trained in the technology that existed. The recommendation to solve the command-and-control issues is that commanders at each echelon of leadership in the department receive training in proper communication and tracking technology. This will provide for an across-the-board awareness and capability of the staff and help maintain situational awareness and control during an emergency.

b. HI-EMA and FEMA Recommendations

The emergency management agencies that exist at both the state and federal levels, while maintaining slightly different roles in a disaster, were found to have the same types of issues and gaps when responding to the wildfire in Lahaina. The lack of coordination and communication between agencies and entities, delayed response, training and correct actions were all displayed by both agencies. There are several recommendations to be made to attempt to eradicate them for future disasters.

A GAO report that was published in 2024 regarding the federal response in wildfire disasters identified similar problems that exist within FEMA and other emergency agencies.

> GAO's prior work identified opportunities for improved interagency coordination in managing risks from wildfire smoke and in federal disaster recovery efforts. In March 2023, GAO made recommendations to help strengthen federal coordination between the Environmental Protection Agency and land management agencies in reducing risks to air quality and public health from wildfire smoke. As of March 2024, four of the six recommendations were partially addressed. Additionally, in November 2022, GAO reported that the federal approach to disaster recovery is fragmented across more than 30 federal agencies and departments and at least 32 congressional committees. GAO recommended that agencies identify and take steps to better manage this fragmentation and that Congress consider establishing an independent commission to recommend reforms to the federal government's approach to disaster recovery. As of March 2024, a commission has not been established. (GAO, 2024, p.1)

This report is one of many that has highlighted the same issues that organizations such as FEMA face during a disaster. While federal emergency response agencies have conducted changes to legislation regarding response staffing and capabilities of administrative staff to work both before and after a disaster, such as the Post-Katrina Emergency Management Reform Act of 2006 (Bea, 2007), they still face many problems with interagency coordination and effective management during an emergency.

The main recommendation developed encompasses all the capability gaps identified previously for both HI-EMA and FEMA: a robust revamping, retraining, recertifying, and reestablishment of policies, programs, and operating procedures be conducted. This includes looking at the administrative and manpower branches of each agency and eliminating or adding positions that prove essential to disaster relief and response. The need for a critical review of such personnel is emphasized in the following quote:

> The logistics and supply-chain personnel working within humanitarian organizations fulfil a critical role in this regard, and require a set of skills and competencies that matches the environment they work in. Understanding the required competencies, and how they vary throughout the course of their career, is therefore essential to designing education and

> training programmes that meet the needs of the humanitarian sector personnel. (Allen et al., 2013, p. 130)

This recommendation also includes a heavy emphasis on training that should be focused on interagency communication and coordination in simulated emergency environments. This training should be conducted with representatives from all agencies and entities who would traditionally be involved in these efforts to ensure streamlined understanding of the actions and activities that must be accomplished. The training should additionally provide management positions with crisis response training that allows them to create a set of procedures and actions that they must be responsible for, should a disaster occur.

This training must be done continuously to allow for updates that may develop from training lessons learned or discoveries that are the outcomes of training drills. If the training is implemented correctly, the result will be a highly experienced and prepared workforce that can appropriately manage and control other agencies and administer disaster response accordingly.

An example of executing this recommendation occurred when, as an after-action, HI-EMA planned a test of their emergency alert system. "FEMA and the FCC are coordinating with EAS participants, wireless providers, emergency managers and other stakeholders in preparation for this national test to minimize confusion and to maximize the public safety value of the test" (Weintraub, 2023, para. 5). This may not be a complete overhaul as suggested but shows that these agencies are also heavily invested in getting disaster relief and response right.

2. Military Intervention

The recommendation that DoD entities should be allowed to intervene more effectively and without hindrance from policy and regulations is a hard argument, but one supported by the results of the data analysis and research conducted for this report. Overall, the main issue that was determined for any DoD or other military supporting agencies (U.S. Coast Guard and Army National Guard) was a lack of action and an inability to support wildfire relief efforts. This was due to the delayed activation of such

entities or the overall exclusion of the capabilities or resources readily available for assistance.

Support for such a change in disaster relief has grown over the last few decades as depicted in this quote from a 2005 New York Times article: "President Bush suggested in September that the active military ought to have a greater role in responding to disasters. He said its training, command structure and resources put it in a better position to lead recovery efforts" (The Associated Press, 2005, para. 5). However, there are implications that Congress and other Federal agencies do not wish to tamper with.

Having the DoD involved means that military officials are also making calls in a disaster setting and could be seen as threatening to other local or state agencies who own a piece in the disaster response pie. The threats of losing authority only exist due to current policy and a misunderstanding that further policy would not be developed and enacted to change before the DoD could increase its involvement. Only after a policy change would this occur, and even then, it would be heavily regulated and maintained to avoid military takeover of response efforts. However, "the overlap between DoD and civilian agencies will continue unless American society decides that either law enforcement capabilities will expand, or military authorities will be assigned a greater domestic role" (Notes from the Editor, 2006, para. 3).

One way to mitigate the overstepping of DoD involvement is to employ a Joint Operations Center (JOC) as a central facet to the updated policy. While this term may be more well-known as a command-and-control function with global and international support, a JOC will allow for multiagency and entity coordination and provide a centralized point from which leading decision-makers of all parties involved can sync and coordinate efforts where seen to best fit. The information sharing process will improve (Figure 18) and allow for faster decision-making when in a limited emergency response situation.

Figure 18. Information-Sharing Process. Source: Center for Excellence in Disaster Management and Humanitarian Assistance (2022).

A main positive attribute to having the military and DoD entities more involved in the response to disasters is the ability to combine civilian and military logistics command centers, amplifying capabilities, resources, and responsiveness to overall disaster relief. An example of a framework that could be created to establish roles and synchronized efforts of both DoD and other federal, local entities is provided in Figure 19 and produced from a similar research analysis.

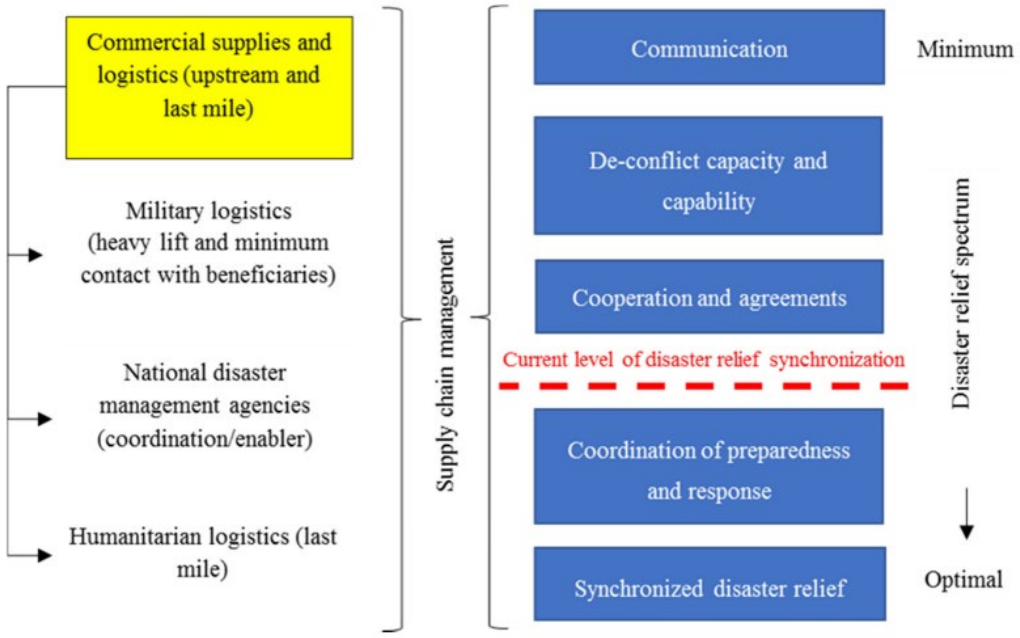

Figure 19. Synchronized Disaster Efforts. Source: Yuste et al. (2019).

Overall, the recommendation that military and DoD entities shall be allotted more involvement and intervention capabilities with natural disasters and response efforts

stems from the understanding that gets formulated from the data and research showing that it will only improve the capacity and responsiveness to such disasters.

> The military brings strong competency in movement, transportation, material management, rapidly deployable state-of-the art trauma and general medical care, and strong intra-organizational communication systems. Non-military HOs typically have a deeper understanding of the dynamics on the ground and know the types of assistance necessary to ensure social and institutional restoration as quickly and effectively as possible. (Apte et al., 2016, p. 253)

The unique humanitarian logistics missions that the military can provide, combined with the highly skilled and trained federal and local emergency agencies means a more cooperative and effective disaster response program for the United States.

3. Climate Change Consideration

Conducting the data analysis and reviewing the cause-and-effect fishbone diagram revealed a direct relationship between climate change and the impacts of the Maui wildfire of 2023. These main impacts had to deal with an evolving Pacific Island environment and climate, one with an overall increase in natural disasters such as hurricanes and typhoons, but that also experiences an unprecedented level of high winds, decreased rainfall each year, and an aggressively drying island. Like that of the military involvement recommendation, there is a single and central recommendation to mitigate capability gaps due to climate change.

This first part of the sole recommendation is that officials and local areas must recognize that climate change is impacting their lives and will continue to do so. Second, once that has been recognized, there needs to be deliberate planning and preparation for future climate change as well as mitigation efforts to limit the impact on the islands of Hawaii.

Developing policies and plans that recognize and establish climate change regulations and strategies will help communities understand their roles and responsibilities in this matter and allow them to take initiative to limit damage done when increased natural disasters occur because of climate change. Local and state agencies in Hawaii can use plans such as the Climate Change and Environmental Degradation

Database (United Nations Network on Migration, 2023) to review the adaptation plans and mitigation efforts of other nations or islands in their geographic region and use them as a guideline to develop their own.

Climate change is a significant occurrence that will continue to impact the nation and local communities everywhere. By following the recommendations of enhancing awareness and adjusting based on the changes occurring in unique areas, then states such as Hawaii will be better equipped to face the future challenges that climate change may bring.

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Acquisition Research Program
Naval Postgraduate School
555 Dyer Road, Ingersoll Hall
Monterey, CA 93943

www.acquisitionresearch.net