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Readiness Metrics to Improve the Unites States Marine Corps Humanitarian Assistance and Disaster Relief Support

December 2023

Capt. Jason A. Collins, USMC
Capt. Casey W. Svatek, USMC

Thesis Advisors: Dr. Aruna U. Apte, Professor
Bryan J. Hudgens, Senior Lecturer

Department of Defense Management

Naval Postgraduate School

Prepared for the Naval Postgraduate School, Monterey, CA 93943.

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ABSTRACT

To assess the United States Marine Corps (USMC) readiness for Humanitarian Assistance and Disaster Relief (HA/DR) missions, we examined historical data and explored the utility of readiness metrics. The USMC frequently contributes to HA/DR efforts, but evaluating their effectiveness is vital. Our research scrutinized various instances of USMC involvement in HA/DR missions, culminating in the formulation of readiness metrics for the entire USMC.

We drew upon pertinent Department of Defense literature, peer-reviewed scholarly journals, military reviews, and historical records related to past disasters where the USMC played a role in disaster response. This study spanned a 12-year timeframe, with a primary focus on the 2013 super typhoon in the Philippines and the 2015 earthquake in Nepal. By analyzing data from previous disasters, we aimed to assess the USMC's execution and identify areas for improvement, ensuring it is better prepared to address future challenges. These selected disasters were chosen for their higher degree of USMC involvement, enabling us to establish meaningful readiness metrics.

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ACKNOWLEDGMENTS

We extend our sincere appreciation to our esteemed advisors, Dr. Aruna Apte and Bryan Hudgens, whose invaluable expertise and extensive experience in the evolution of Humanitarian Assistance and Disaster Response (HA/DR) from both a global and Department of Defense perspective have played a pivotal role in shaping this thesis. Furthermore, we express gratitude to our families and friends for their unwavering support throughout the comprehensive journey of conceiving and executing this thesis. The countless hours invested, from the inception to the completion of this thesis, underscore the dedication of our loved ones. Through engaging discussions with various agencies, authors, and advisors, we aspire that the insights gained contribute to a heightened understanding of readiness identification and emphasize the indispensable role of the United States Marine Corps in HA/DR scenarios.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACE	Air Combat Element
ARG	Amphibious Readiness Group
CE	Command Element
C2	Command and Control
DMO	Distributed Maritime Operations
DOD	Department of Defense
EABO	Expeditionary Advanced Base Operations
FD2030	Force Design 2030
GCE	Ground Combat Element
GOJ	Government of Japan
GON	Government of Nepal
HA/DR	Humanitarian Assistance and Disaster Relief
HO	Humanitarian Operations
ISR	Intelligence, Surveillance, and Reconnaissance
JHATST	Joint Humanitarian Assistance Survey team
JTF	Joint Task Force
JTF 505	Joint Task Force 505
LCE	Logistics Combat Element
LAWS	L-class Amphibious Warfare Ship
LHA	Light Helicopter Assault
LHD	Landing Helicopter Deck
LNO	Liaison Officer

LOA	Littoral Operations Area
LOCE	Littoral Operations in a Contested Environment
LPD	Amphibious Transport Dock
LSD	Dock Landing Ship
LSM	Medium Landing Ship
LSV	Logistics Support Vessel
MAGTF	Marine Air Ground Task Force
MARFORPAC	Marine Corps Forces Pacific
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MET	Mission Essential Tasks
MEU	Marine Expeditionary Unit
NGO	Non-Governmental Organizations
POAM	Plan of Action and Milestones
SPMAGTF	Special Purpose Marine Air Ground Task Force
UAS	Unmanned Aerial Systems
UAV	Unmanned Aerial Vehicles
USAID	United States Agency for International Development
USMC	United States Marine Corps
USN	United States Navy
USPACOM	United States Indo-Pacific Command

I. INTRODUCTION

When a natural disaster occurs, prompting widespread suffering, a coordinated response in the form of humanitarian assistance (HA) is initiated. These programs not only bolster U.S. military forces but also contribute to peace and stability in areas of tension. They play a crucial role in providing aid and relief following both natural and manmade disasters (Defense Security Cooperation Agency, n.d.). The United States Marine Corps (USMC) actively participates in humanitarian assistance and disaster relief (HA/DR) efforts. In the event of a natural disaster in a host nation, the option exists for the nation to request assistance from the United States. Once this request for HA is made, it cascades to all Department of Defense (DOD) entities to determine who can provide support. The USMC distinguishes itself in HA/DR operations due to its consistent preparation and training. This readiness is honed through regular training and deployment preparations within the Marine Expeditionary Unit (MEU). MEUs comprise various elements falling under the Command Element (CE), Logistics Combat Element (LCE), Ground Combat Element (GCE), and Air Combat Element (ACE). Each of these elements plays a vital role when responding to an HA/DR request. Before any MEU deploys, mission-essential tasks (METs) are established. These tasks include ensuring the readiness of the unit to support HA/DR efforts. In this research, we delve into past missions to analyze and propose the development of readiness metrics for the USMC. The aim is to enhance efficiency and address identified gaps and shortfalls. Our primary research question is, *Can we develop readiness metrics that will enhance the USMC's capacity to deliver relief effectively?* The secondary research question asks, *What are the specific shortfalls encountered by the Marine Corps during HA/DR operations and how could these be rectified through the implementation of readiness metrics?*

A. BACKGROUND

In the realm of HA/DR operations, several significant natural disasters have tested the USMC's capabilities of response efforts. Here, we analyze three different operations that had high involvement from the USMC and provide the statistics from each disaster.

1. Operation Sahayogi Haat: Nepal Natural Disaster 2015

The Nepal Earthquake was one of the most recent catastrophic HA/DR operations that requested assistance from the USMC. In a short time, Nepal had encountered one of its most destructive and largest earthquakes and aftershocks. The Center of Excellence in Disaster Management and Humanitarian Assistance (CFE-DMHA) disaster information reported all the damage that occurred in 2015. The earthquake struck on April 25, 2015, with a 7.8 magnitude in the Lamjung District. Shortly after on May 12, a 7.3 magnitude aftershock struck again near the Dolakha District. Approximately 8,669 civilians died from the earthquake and aftershocks, 16,808 were injured, and a total of 2.8 million were left displaced. The seismic activity led to more than 5,000 landslides and numerous floods, exacerbating the ongoing conflict. The combination of floods and Nepal's inadequate infrastructure impeded the delivery of support to the region, making the transportation of supplies and services nearly impossible and further hindering relief efforts. Table 1 lists the statistics for the destruction caused during the natural disaster (CFE-DMHA, 2015b).

Table 1. Nepal Earthquake Destruction Statistics Source: CFE-DMHA (2015b)

Affected Population	Cumulative, as of May 26th
Deaths	8,669 (GON, OCHA)
Injured	16,808 (UNICEF)
Missing	384 (GON, OCHA)
Total Displaced	2.8 million (UNRC, WHO)
Total Affected	8.1 million (UNICEF)
Total Population of Nepal	Est. 27.8 million (WB)

2. Operation Damayan: Philippines Super Typhoon Haiyan (Yolanda) 2013

Super Typhoon Haiyan (Yolanda) was another catastrophic natural disaster; it occurred on November 9, 2013. This was considered one of the most powerful tropical cyclones ever seen in the Indo-Pacific. The number of related deaths due to Super Typhoon

Haiyan was 6,300 with 28,689 civilians injured. This natural disaster distinguished itself as one of the most destructive because, according to CFE-DMHA, about 16 million individuals were affected, along with a 45% rate of destruction to houses and infrastructure (CFE-DMHA, 2015c). One of the key factors resulting in a larger problem was poor communication from the Philippine government.

Table 2 shows a side-by-side comparison of Super Typhoon Haiyan and Super Typhoon Hagupit. Each earthquake featured similar magnitudes and overall had different numbers related to death tolls, damage to infrastructure, and injuries. Super Typhoon Haiyan resulted in a higher death toll, injuries, and loss of infrastructure due to the population being caught off guard and having sporadic communication internally within the Philippine government. For its part, Hagupit had more positive results, due to the Philippines changing its standard operating procedures and establishing better communication, which resulted in this natural disaster's death toll being significantly less than its predecessor.

Table 2. Comparative Impact of Super Typhoon Haiyan versus Super Typhoon Hagupit. Source: CFE-DMHA (2015c).

Overview	Super Typhoon Haiyan	Super Typhoon Hagupit
Philippine Area of Responsibility	November 6, 2013 (Entered) November 9, 2013 (Exited)	December 4, 2014 (Entered) December 10, 2014 (exited)
Families Affected	3,424,593	944,249
Individuals Affected	16,078,181	4,149,484
Deaths	6,300	18
Injuries	28,689	916
Total Houses Damaged Completely Damaged Partially Damaged	1,084,762 489,613 595,149	290,670 42,466 248,204

On November 9, 2013, the Philippine government issued a request for humanitarian assistance to the United States government. Marine Corps Forces Pacific (MARFORPAC)

was designated to lead the military relief operation (CFE-DMHA, 2015a). The Marine Expeditionary Brigade (MEB) established a command operations center located in Manila at the Villamor Airbase. USAID began working on delivering supplies to the airbase. This HA/DR situation prompted a civil-military relationship as the international community worked together to assist with the impact of the cyclone. Eventually, United States Indo-Pacific Command (USPACOM) ordered the activation of The Joint Task Force (JTF-505) on November 16, 2013. The JTF-505 totaled over 13,400 personnel, 66 aircraft, and 12 naval vessels. The JTF-505 was responsible for over 1,300 flights, which resulted in delivering goods to over 450 sites (CFE-DMHA, 2015a). The JTF-505 did well in aiding, but in the end, the after-action report suggested that it could do better if it provided ways to improve agility in manning, training, and readiness. Lastly, JTF-505 provided a recommendation that for future instances, it should push relief operations to service component commands such as MARFORPAC instead of activating the JTF. The CFE-DMHA report mentioned its rationale for this: "[W]hile the various command and control arrangements and the shift between these various arrangements did not negatively affect operations, it did not enable a more rapid response" (CFE-DMHA, 2015a, p. 9). The JTF was effective, but if it were held to the service components, communication could have been established faster, providing a more rapid response, and saved more lives.

3. Operation Tomodachi: Tsunami in Japan 2011

On March 11, 2011, Japan was hit by a massive earthquake with a magnitude of 9.0. The location of the earthquake was approximately 80 miles off the shore in Sendai, Japan. In less than an hour tsunami waves were crashing almost six miles inland. This natural disaster was one of the worst that Japan had ever encountered: "Following the tsunami, an estimated 1.4 million households in 14 prefectures had no access to water across Japan and 1.25 million households were out of electricity" (Moroney et al., 2013 p. 87). This resulted in 16,000 deaths and an additional 5,000 injuries, with damages in the range of $300 billion. Roads, bridges, and railways were affected by the combination of the tsunami and the earthquake, which severely impacted Japan's infrastructure and contributed to the massive cost of damages. After the initial disasters, Japan suffered from the destruction of communication infrastructure, along with several explosions, which resulted in a massive threat of

radiological contamination and emissions. With a chemical threat imminent, the government of Japan had to develop an evacuation zone while being assisted by the USMC to ensure citizens were evacuated up to 30 kilometers away from the explosion. A total of 91 countries volunteered to help Japan with humanitarian assistance and raised over $1 billion in donations from the Japanese Red Cross in just three weeks.

On March 11, 2011, the Government of Japan (GOJ) initially requested HA/DR support with the Secretary of Defense approving $35 million of funding in support for disaster relief operations. The 31st MEU and III Marine Expeditionary Force (MEF) were directly in support of Operation Tomodachi. In the entirety of this HA/DR situation, there were about 500 fixed-wing and rotary wing aircraft, along with 60 ships in support of the affected areas. This natural disaster resulted in all DOD services being involved. The USMC's role in this disaster was related to delivering supplies and clearing access to the affected areas. Operation Tomodachi did identify some issues with its command and control. While all DOD entities were deployed to support Japan, it was said to be very confusing as far as who had tactical command over the forces in Japan: "The U.S. military services all had different metrics or benchmarks for their exit strategies" (Moroney et al., 2013, p. 95). In these circumstances, it was said each DOD entity would consider its missions or tasks completed, but the GOJ still had ongoing requests for assistance that were not being met. One of the recommendations mentioned in Moroney's research was that the DOD should work on "enhancing interagency coordination" (Moroney et al., 2013, p. 12). While all DOD entities have different mission sets in support of any HA/DR, developing interagency metrics could also boost proficiency when supporting a country with natural disasters. Another approach that can be taken is having the USMC work with more joint training; this would help improve command and control while also providing the Marines with experience.

Another recommendation from Moroney et al. (2013) was to develop better coordination with recipient countries: "While the majority of U.S. support to HA/DR operations takes place in developing countries, operation Tomodachi has shown that there are expectations and that these exceptions are not featured prominently in military planning processes" (n.p.). While the USMC is used to helping countries that are not well developed, this is something important to consider because in the future, we will need to communicate

and teach our partnered countries how we work and better our coordination to ensure there are no issues with command and control (C2). Utilizing a Liaison Officer (LNO) is crucial for communication. While the USMC has one LNO, it might also be worth investing in more than just one representative like the other branches of service, which have three to four. One of the noted problems that stems from this natural disaster is the inability to communicate. It was noted that many levels of command had issues with C2. The GOJ had issues communicating with the United States and all DOD entities had issues with C2 and understanding what each other's roles were and who was predominantly in command.

B. MOTIVATION

The USMC does well because it constantly train its operatives to respond to these disasters. But as mentioned previously, many instances where we struggled were due to not being prepared for HA/DR situations of a certain magnitude. Many of these natural disasters can be recurring; as this is a task that will be assigned to our future MEUs, there is a feeling that our commanders should be well-versed on what needs to be executed to ensure we don't fall into the same problems. The USMC always works to ensure it meets the standard of being combat-effective, but neglects to highlight the importance of HA/DR. When these situations happen, it is often the USMC's assignment. The USMC is the one DOD entity that prides itself on being amphibious and able to support whether it's in combat or for humanitarian aid. If we were to better recognize gaps and shortfalls, we can provide aid faster and reduce the death tolls in these foreign countries requesting support. If we establish a Marine Corps-wide readiness metric, this would be beneficial to future leaders and provide them with something to reference so they can avoid making the same mistakes that were made in the past.

C. METHODOLOGY

This section delineates the scope of our research, highlighting the three operations chosen for the analysis of the USMC's readiness and identifying any gaps or potential shortfalls. Additionally, we provide a succinct overview of the organizational structure of the subsequent sections in the thesis, offering a preview of what readers can expect in the following chapters.

1. Scope

This report examines three recent cases: the Tsunami in Japan (Operation Tomodachi), the super typhoon in the Philippines (Operation Damayan), and the earthquake in Nepal (Operation Sahoyogi). The scope of the research is limited to foreign, natural disasters, which are supported by the USMC with humanitarian aid and relief efforts. Data collection was limited to a 12-year period occurring from 2011–2023. Additionally, this research is focused more on the responsiveness of the USMC, identifying what gaps and shortfalls the USMC encountered, and finally establishing USMC readiness metrics that could help support the Marine Corps in future humanitarian aid.

2. Organization and Analysis

This report analyzes several different types of literature: peer-reviewed, historical records, which involved the USMC and its support to provide relief; scholarly journals; and publications related to USMC-specific HA/DR articles. The three disasters referenced were analyzed with the intent of observing how the USMC encountered shortfalls and what could be done in the future to ensure these shortfalls do not reoccur. Chapter II will provide a detailed literature review of the articles, historical records, and publications. Chapter III will analyze the USMCs competencies and capabilities as an organization, as well as identify any gaps or shortfalls we can expect with its upcoming force design changes. Chapter IV wraps up the report with conclusions, a deep dive into readiness metrics, lessons learned from each operation, and a look at the three C's of civil-military relations as they apply to HA/DR.

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II. LITERATURE REVIEW

Applicable literature was analyzed to provide a better understanding of Humanitarian Operations (HO) and the development of the Marine Corps readiness metrics and all factors that are associated with establishing the metrics. We studied government documents, peer-reviewed theses, and research papers. To assist in establishing the readiness metrics, we broke down the literature review into five categories: Humanitarian Assistance and Disaster Relief, identifying readiness for the USMC, USMC core competencies and capabilities of the MEU, issues and challenges in humanitarian operations, and lessons learned and evaluated gaps. These topics will develop a path for establishing readiness metrics for the USMC.

A. HUMANITARIAN ASSISTANCE AND DISASTER RELIEF

Natural disasters have brought a widespread array of issues that all DOD entities must support. It is difficult to measure or prepare because these situations happen without warning and can cause serious destruction. According to Apte (2009), "Disasters have historically been classified as either natural or manmade, but recent models seek to classify disasters based on the size of the location affected and the tempo of the disaster" (as cited in Gastrock & Iturriaga, 2013, p. 25). Utilizing this classification system can help provide enough information on the level of difficulty of each disaster with which DOD entities interact. In Figure 1, multiple factors (e.g., location, time, localization, dispersion, slow onset, and sudden onset) are used to determine the level of difficulty in support of a natural disaster. This classification system is an important tool to use for the USMC because this could help us identify the severity of each natural disaster and allow us to think critically about what kind of support we can provide.

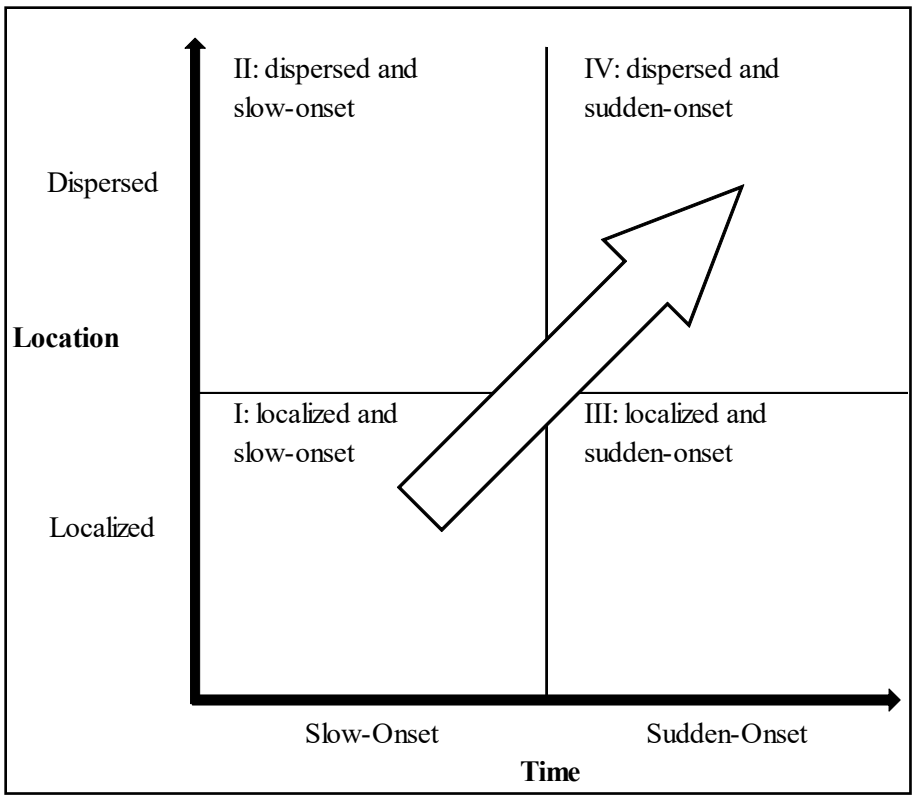

Figure 1. Classification of Disasters. Source: Apte (2009, p. 14).

As stated by the Joint Chiefs of Staff (2019), "HA as part of a military operation is the use of available military resources to assist or complement the efforts of responsible civil actors in the operational area or specialized civil humanitarian organizations in fulfilling their primary responsibility to alleviate human suffering" (p. I-5). The USMC plays one of the biggest roles in supporting humanitarian assistance due to its unique capabilities and ability to respond quickly when a disaster strikes. Wrote Apte (2019), "When a disaster strikes, the host nation requests outside assistance if needed. When requested, the United States Navy (USN) and the USMC, under the guidance of the USAID, get deployed for humanitarian operations" (p. 2). The need to support humanitarian assistance has always been a high priority with the USMC, but one of the most important factors is communication. As host nations are hit with these natural disasters, it is important they maintain positive communication with the USMC. This allows us to quickly come up with a plan for support, whether it is with vertical lift capabilities, sustenance, or logistics.

Apte (2009) wrote further that "In a disaster response, there is an immediate need for critical supplies but usually, there is limited information available about the requirements. Hence, disaster response tends to become, to some extent, 'reactionary logistics.'" (p. 16). In instances like these, problems and gaps become apparent, whether due to insufficient communication from the host nation or the USMC lacking the necessary equipment for support. Apte et al. (2016) "outlined the key stages of humanitarian operations as preparedness, relief response, recovery, and development" (as cited in George & Harbinson, 2018, p. 19) Preparedness refers to the actions of the government and humanitarian organizations being timely with actions. The Marine Corps needs to ensure it continues to work on its response times as this aids in streamlined restoration to a great number of recipients in the host nation that requests support.

B. IDENTIFYING READINESS FOR THE USMC

Apte (2019), paraphrasing Ferris (2008), wrote that "[g]iven the recent frequency of disasters around the world, it is probable that the occurrence of these events will continue, thus creating a demand for relief capabilities." (p. 3). We believe identifying readiness metrics for the USMC would help benefit response time, as well as reduce the number of fatalities from host nations requesting support. Further, Apte (2019) stated, "A primary takeaway from their work is the challenge faced by the USMC to match the capabilities of the USMC to the demand created by future disasters" (p. 9).

Throughout this literature review, we will identify readiness metrics for the USMC by utilizing other sources of literature to support our argument. Our first objective is to identify readiness and what readiness means to the USMC. Within the USMC *Commander's Readiness Handbook*, The United States Marine Corps discusses how they view readiness:

> Readiness is the synthesis of two distinct but interrelated levels.
>
> a. Unit Readiness—The ability to provide capabilities required by the combatant commanders to execute their assigned missions. This is derived from the ability of each unit to deliver the outputs for which it was designed.

> b. Joint Readiness—The combatant commander's ability to integrate and synchronize ready combat and support forces to execute his or her assigned missions. (United States Marine Corps 2014, p. iv)

Understanding there are many definitions of readiness, the USMC constantly strives to ensure we are ready to accomplish any task to meet our mission requirements.

The *Commander's Readiness Handbook* also puts a high emphasis on institutional readiness which identifies five important pillars in obtaining this readiness level as an institution. Figure 2 provides a visual representation of what readiness means to the Marine Corps and what pillars are needed to obtain institutional readiness (United States Marine Corps, 2014).

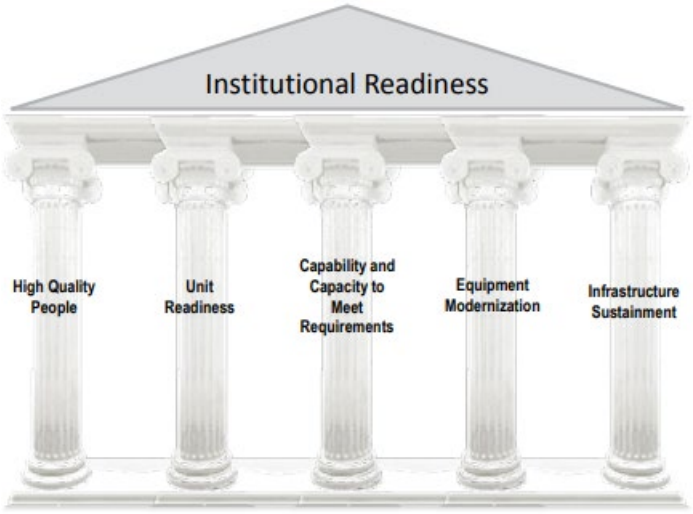

Figure 2. Five Pillars of Institutional Readiness. Source: United States Marine Corps (2014 p. 1).

The USMC continues to expand its readiness beyond a combat scenario. As mentioned within the *Capability and Capacity to Meet Requirements* pillar, one of the goals the USMC strives to obtain is not only stabilizing a forward presence but also responding to all crises and contingencies, which begs the question, "How is the USMC measuring readiness for HA/DR?" Apte (2019) discussed the USN and USMC readiness when it comes to HA/DR: "[N]o comprehensive plan exists for humanitarian missions,

thus emphasizing that a readiness framework is necessary" (p. 19). Figure 3 shows the framework for readiness metrics. Each step from this framework will be analyzed from prior literature to assist in developing readiness metrics that can be used for the USMC and could provide a readiness framework to help assist with HA/DR.

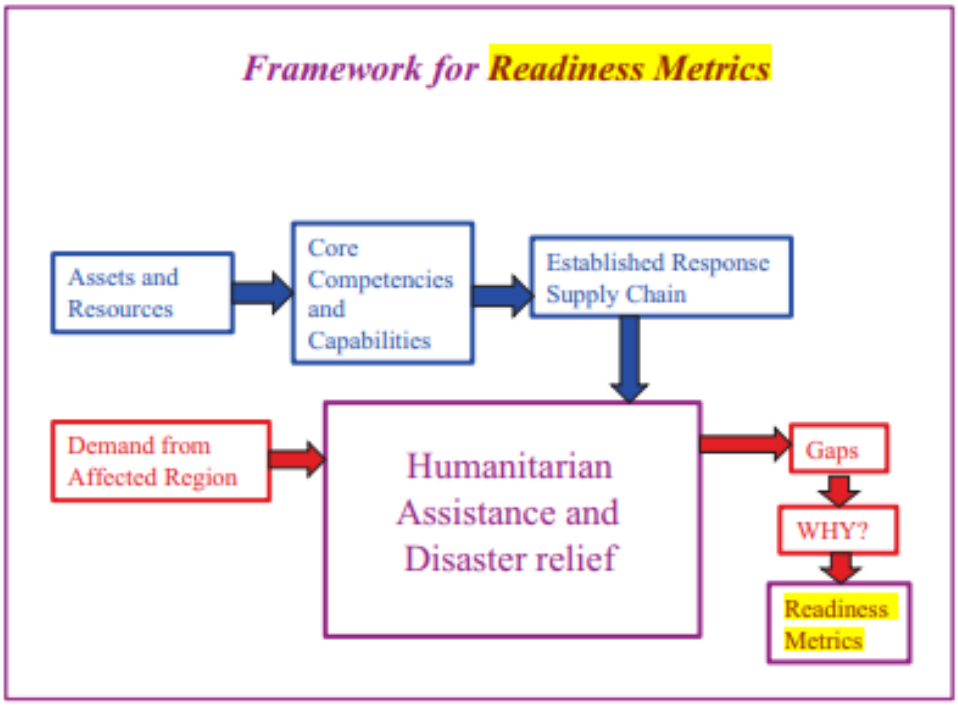

Figure 3. Framework for Readiness Metrics. Source: Apte (2019, p. 19).

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III. METHODOLOGY

In this section, we delineate the core competencies and capabilities of the USMC functioning as an MEU and a Marine Air-Ground Task force (MAGTF). The analysis encompasses an examination of projected assets we can expect with the 2030 force design, followed by an exploration of lessons learned of commonly observed gaps in the context of HA/DR.

A. USMC CORE COMPETENCIES AND CAPABILITIES OF THE MEU

The USMC has established a revised and updated vision for the Core Competencies and modernization of its capabilities, which the Corps has since been known for. Since the introduction and implementation of "Force Design 2030" (FD2030), which was led by the then Commandant General David H. Berger, the Marine Corps has focused extensively on restructuring not just the number of personnel, but the supported equipment to be utilized. Many of these changes are focused on the near-peer adversary, China, in the Indo-Pacific region, where concerns about its ship-killing missiles and island campaign capabilities to reach well beyond outside international borders drive a major concern for the United States. Additionally, as more technology is introduced, cost savings and reduction/divestment of assets as well as Marine Corps' units have aided in the further re-structuring of the United States Marine Corps, and their abilities within the coming decade(s). This literature review will seek to identify projected changes of the Marine Air-Ground Task Force as a result of FD2030, the projected capabilities that will be added, and how the USMC utilizes its new construct not just for projections of deterrence, but also as a capability to react to HA/DR.

To assess the Marine Corp's core competency specifically in rapid deployment in support of HA/DR, we identify the assets the Marine Corps utilizes. The USMC utilizes the makeup of what is called an MEU. An MEU is designed to be self-sustaining for a period of approximately 15 days. This means it can operate independently for around two weeks without requiring significant resupply or support from external sources. MEUs are equipped with the necessary personnel, equipment, supplies, and resources to conduct a range of military operations, including amphibious assaults, humanitarian assistance,

disaster relief, and more, during this initial sustainment period. After this time, additional resupply and support may be required to continue sustained operations.

The Core Competencies and Capabilities remain similar in nature as executed in the past and are not a complete identification change. General Berger's (2020) focus on getting back to the Marine Corps roots of integrating with the Navy will take an extensive stance: "A return to our historic role in the maritime littoral will also demand greater integration with the Navy and a reaffirmation of that strategic partnership" (p. 2). However, as previously mentioned, the focus of becoming lighter, more agile, and equipped to react within a combat theater will ensure this effort is made in tandem. Additionally, as stated by General Berger in the initial FD2030, "And in partnership with the Navy, our units will possess littoral maneuver capabilities to include high-speed, long-range, low-signature craft capable of maneuvering Marines for a variety of missions" (p. 4). As this partnership with the Navy becomes stronger, there comes the need to increase the number of smaller, more agile ships capable of having a lower military profile; these vessels must resemble commercial ships capable of a carrying a much smaller force of Marines on board, but still holding a credible amount of military influence and firepower. "We must transform," General Berger stated, "to meet new desired ends and do so in full partnership with the Navy" (2020 p. 4). The USMC has increased its need to modernize and improve the Amphibious Ready Group (ARG)/MEU, its interest in naval warfare and ship-to-ship constructs. Wrote General Berger,

> [t]he joint force needs sea-based expeditionary forces that can provide immediate crisis response, flexible and platform-agnostic naval C2 capable of executing a joint/naval campaign with allies and partners, contributing to the joint force's ability to sense and make sense of the operational environment and, when necessary, enabling and contributing to joint kill webs. (Berger, 2023 p. 9)

As this significantly relates to wartime structure, it will heavily influence a presence and rapid response structure for future HA/DR missions required. This report comes as a response and support of Congress, which has "demonstrated its support for the Marine Corps' continued role in crisis response and counter-maritime-gray-zone warfare by establishing a minimum amphibious warfare ship requirement of 10 Light Helicopter

Assault (LHA)/Landing Helicopter Deck (LHD) and 21 LPDs/LSDs" (O'Rourke, 2023a). These ships are currently utilized by the USMC's forces as their primary means of littoral mobility. It is important to note that this construct is not forecasted to diminish in capability nor deplete core competency for the USMC.

- Amphibious Assault Ship (LHD or LHA): The flagship of the ARG, this ship serves as the C2 center for the MEU. It carries a mix of aircraft, landing craft, and Marine personnel.
- The Amphibious Transport Dock (LPD): This ship carries additional Marine personnel, vehicles, and equipment, as well as landing craft to transport them ashore.
- Dock Landing Ship (LSD): This ship carries landing craft and additional equipment needed for amphibious operations.

Together, these ships provide the MEU with the capability to conduct amphibious operations, including the transportation of personnel, equipment, and supplies to and from shore. The maintenance of these assets assures that lift and vertical lift capabilities in support of HADR missions will remain a constant, and an even practiced, component.

B. MARINE AIR GROUND TASK FORCE

The Marine Corps core competency is in large part the MAGTF, in which combined arms are balanced by all elements of operating forces. The core components of a MAGTF include four different types of units: CE, GCE, LCE, and ACE. The MAGTF's ability to have integrated the naval aspect is what combines all elements into a platform that is globally sourced. A recent publication in February of 2022 ("Marine Air-Ground Task Forces") references numerous supplemental articles that articulate the MAGTF's structure and operational competencies:

1. Marine Corps Doctrine Publication 10
2. Marine Corps Reference Publication 110.1
3. Marine Corps Order 3120.13

4. Amphibious Ready Group and Marine Expeditionary Unit Overview

5. Marine Expeditionary Brigade Information Overview

6. Tentative Manual for Expeditionary Advanced Base Operations

These publications provide added, in-depth insight to further outline the structural components and elements of the Marine Air-Ground Task Force. Through comparison, it can be seen that most of the structure remains the same; however, there are changes reflective of the FD2030 future structure.

The four types of MAGTFs are the Marine Expeditionary Force, the Marine Expeditionary Brigade, the Marine Expeditionary Unit, and the Special Purpose MAGTF (SPMAGTF). The nature of the 2030 MEU remains dynamic and subject to change as a result of FD2030. For example, the USMC has divested all its tanks to the Army in order to remove its capabilities that the Army already extensively practices. Additionally, the increasing need for Unmanned Aerial Vehicles (UAVs) is projected to double its stance. All the while, the USMC is looking to lower current personnel strength levels and streamline the size and scope of supporting smaller ships via the Light Armored Warship and the Medium Landing Ship. The direction in which the concept of inclusion of advanced and more agile ships supplements the dynamic change. One such concept is the Expeditionary Advanced Base Operations (EABO), as described in the Congressional Research Service 2023. The Navy and Marine Corps in tandem will seek to invest in smaller ships versus the traditionally bigger carrier, LHA/LHD, concepts that will support a "less concentrated, more distributed manner" (O'Rourke, 2023a, p. 6) The Navy's and Marine Corps' vision, which includes Distributed Maritime Operations (DMO), EABO, and Littoral Operations in a Contested Environment (LOCE), will require more and smaller ships, if the distributed operational concepts are to come to fruition. Nonetheless, to maintain its effective MAGTF structure, the Naval component will need to continue modernizing as technology and platforms increase in capabilities, as well as the restructuring of focus for deterring adversaries. Figures 4 and 5 depict a basic structure of the MAGTF, its elements/types and the assets that are notionally associated.

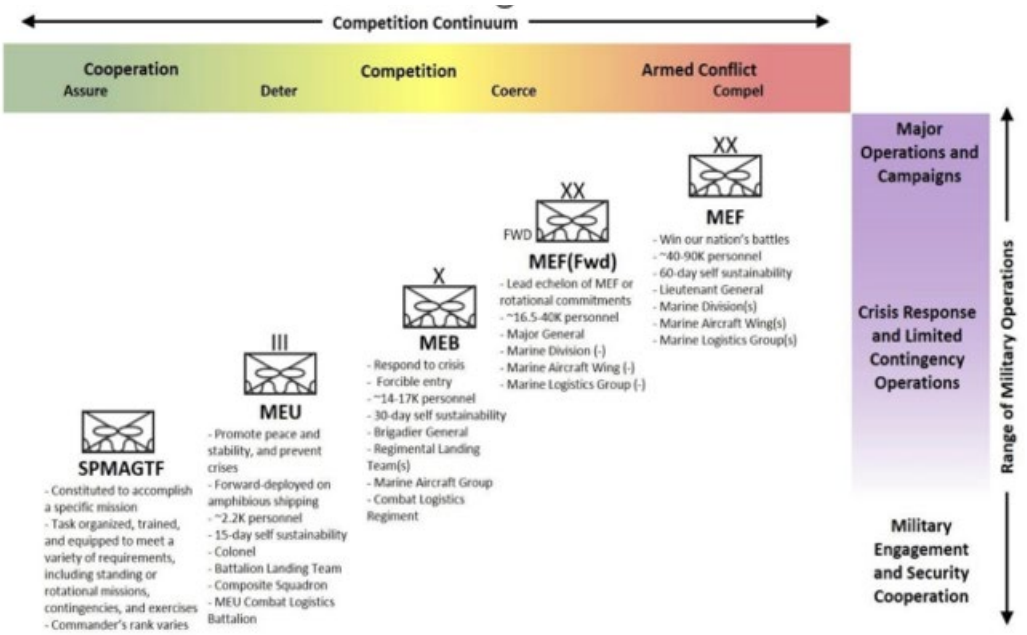

Figure 4. Continuum of MAGTFs. Source: Marine Corps University (2022 p. 2).

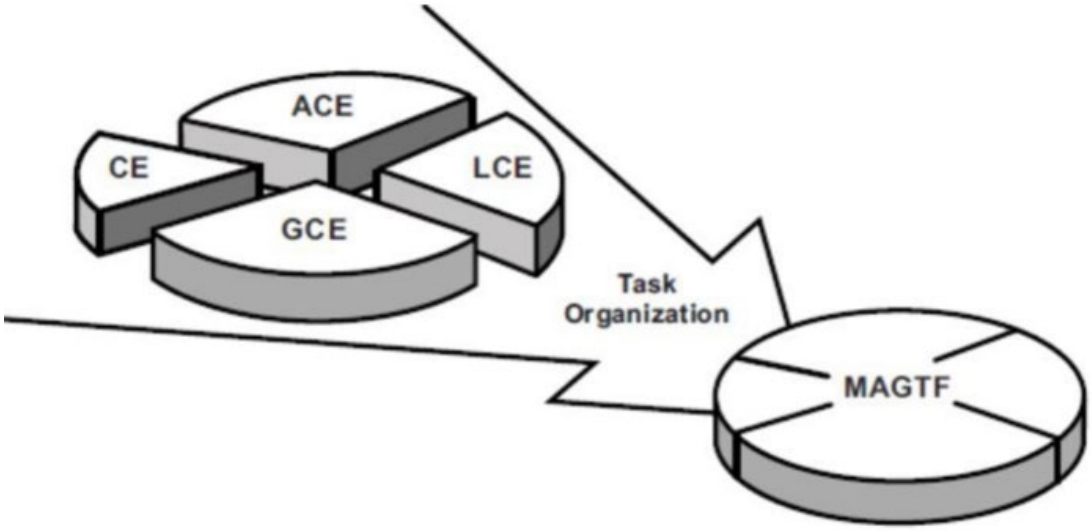

Figure 5. MAGTF Organization. Source: Marine Corps University (2022, p. 4).

C. FORECASTED ASSETS

HA/DR readiness metrics oftentimes view capabilities such as Naval ships and specifically landing craft as an extremely important resource in response to humanitarian aid across the globe. According to a 2013 study by Apte et al.,

> Landing craft serve as the waterborne transportation link between amphibious platforms and the shore. In HA/DR operations, landing craft play the critical role of getting supplies, cargo, and personnel to and from the shoreline and supporting ships. USN landing craft were not designed for HA/DR operations, yet they are valuable assets that are capable of supporting the mission because of their lift capacity, draft, speed, and range. (p. 47)

Fortunately, and as projected, the USMC and USN have both agreed their partnership will include smaller crafts that are similar to landing craft and will bridge the gap for shore-to-shore movements. The concept at hand is still in production along with the EABO construct, but a landing craft to support EABO will surely be a necessity. As previously mentioned, the EABO concept will need to be supported by an aggregated ship force from both Navy and Marines, operating in a much more agile manner. As a result of this increased partnership, the Navy has conducted studies identifying a requirement for "28-31 L-class amphibious warfare ships (LAW) and 35 LSMs (LSM) for maritime mobility" (Berger, 2023, p. 4). The LAW and the LSM are one in the same program and are now a focus of "18 to 35 new amphibious ships to support the Marine Corps" (O'Rourke, 2023a, p. 1). The EABO concept and its implementation are still an ongoing debate as it focuses primarily on the Indo-Pacific region. The concepts of support regarding HA/DR aid and the potential support from an LSM as it relates to affected islands can gain an incredible and immediate foothold for humanitarian aid. As these ships are mainly focused on sea-denial operations, the ability to embark, transport, land and reembark with a much smaller signature and small element of Marines aboard are conceptually designed to execute various missions. A recent report (O'Rourke, 2023a), details the missions in support of the EABO:

> The LAW supports the day-to-day maneuver of stand-in forces operating in the LOA [littoral operations area]. It complements L-class amphibious ships and other surface connectors. Utilizing the LAW to transport forces of the

> surface reduces the impacts of tactical vehicles on the road network, increases deception, and allows for the sustainment of forces during embarkation. The range, endurance, and austere access of LAWs enable the littoral force to deliver personnel, equipment, and sustainment across a widely distributed area. Shallow draft and beaching capability are keys to providing the volume and agility to maneuver the required capabilities to key maritime terrain. (p. 7)

The capability design of the LSM as intended for maneuver warfare in forward operating areas will be anticipated to further increase sustainment and rapid response in support of HA/DR. Outside of the lift capabilities that typically require airfields, confined to lift/load capabilities, the type/number of assets like generators, vehicles, and personnel are limited in comparison to a ship that in concept can touch an area of land immediately despite shoreline tides. Figure 6 depicts a concept of the LSM as described in the following design features:

- a length of 200 feet to 400 feet
- a maximum draft of 12 feet
- a displacement of up to 4,000 tons
- a ship's crew of no more than 40 Navy sailors
- an ability to embark at least 75 Marines
- 4,000 to 8,000 square feet of cargo area for the Marines' weapons, equipment, and supplies
- a stern or bow landing ramp for moving the Marines and their weapons, equipment, and supplies the ship to shore (and vice versa) across a beach
- a modest suite of C4I equipment
- a 25mm or 30mm gun system and .50 caliber machine guns for self-defense
- a transit speed of at least 14 knots, and preferably 15 knots
- a minimum unrefueled transit range of 3,500 nautical miles
- a Tier 2+" plus level of survivability (i.e., ruggedness for withstanding battle damage)—a level, broadly comparable to that of a smaller U.S. Navy surface combatant (i.e., a corvette or frigate), that would permit the ship to absorb a hit from an enemy weapon and keep the crew safe until they and their equipment and supplies can be transferred to another LSM
- an ability to operate within fleet groups or deploy independently
- a 20-year expected service life. (O'Rourke, 2023a, pp. 8–9)

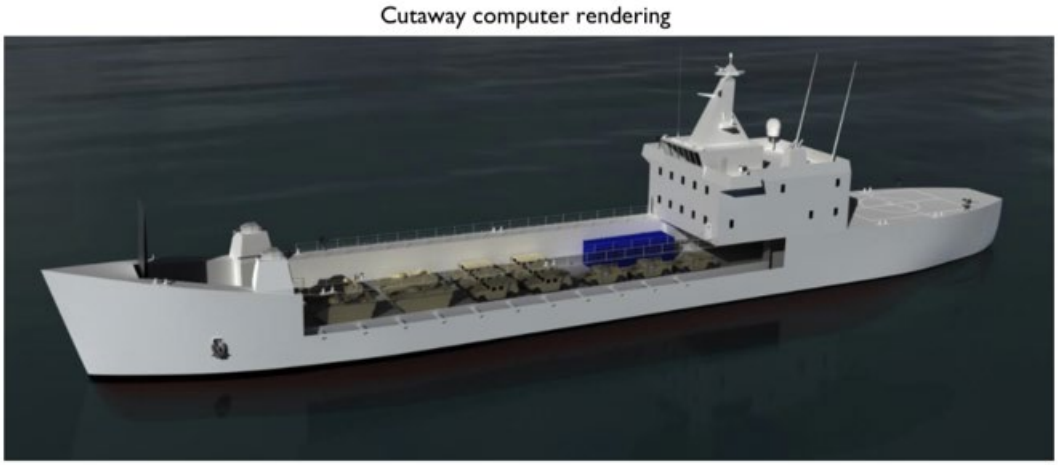

Figure 6. Navy Notional LSM Design Concept. Source: O'Rourke (2023b, p. 15).

The independence of maneuvering from ship-to-ship and ship-to-shore will aid the immediate connecting of personnel and essential equipment in support of HA/DR, as traditional LHD/LHA and other like-sized ships would traditionally be confined to solely airlift capabilities. While the LSM concept continues to advance in research and development for refined outfitting and role capabilities, the Army does have a similar watercraft called the Logistics Support Vessel (LSV). The idea of utilizing the Army's assets to maintain low costs of a new vessel could potentially be an answer. While acquisition remains to be the factor in executing the Navy's and Marine's vision for EABO and support ship in the Indo-Pacific region, much can be argued that beyond the battlefield, the LSM concept can be a force multiplier in any theater where HA/DR will be required. Although the focus is primarily on the Indo-Pacific region, and it is forecasted that the east coast MEUs will not be a mirror image of the significant FD2030 changes and focus for the west coast MEUs, having the LSM on both coasts will aid in ship-to-shore effectiveness in support of HA/DR. From our perspective, the LSM will be a highly versatile, agile, accessible, and transformable ship capable of many configurations not only for wartime but for HA/DR support. Vessels that fit this description and have the capability as forecasted in support of EABO although not primarily the focus of HA/DR can provide the same support and response in disaster scenarios that traditionally larger ships were unable to achieve. We believe that in the future, once all LSMs have finally been procured and

made operational within a contested area of operations, that the LSM's capability and demand will increase. Proof of concept for LSMs to be primarily in the Indo-Pacific region, if successful, can be of great use for the many islands that are close to and border United States international waters:

> We believe that for future HA/DR operations, a HA/DR task force composed of amphibious vessels and MSC vessels will be more effective and efficient. A task force should be able to conduct all required HA/DR missions with only the most effective platforms, leaving other vessels free to perform other USN missions or training. (Apte et al. 2013, p. 55)

We concur and believe the LSM could be the future concept that will emplace this vision for support. As readiness is a metric affected by the monetary value that will be allocated for the increase in resources, modernization, and adaptation to the learned lessons and or environmental factors of global conflict/climate change, it would be a metric of assured step in the right direction if followed through.

One of the greatest assets to the Marine's arsenal to get within reach of a disaster site is the availability of aircraft, specifically rotary wing aircraft. The MEUs contain a combination of rotary-wing aircraft, which can include various types of helicopters. The exact number of helicopters can vary depending on the specific composition of the MEU and its mission requirements. On average, a MEU might have around 25 to 30 helicopters, but this number can change based on the situation, equipment availability, and the specific needs of the mission. Helicopters and tilt rotary aircraft provide crucial advantages in disaster-stricken areas due to their ability to access hard-to-reach or isolated locations, transport personnel and supplies, perform search and rescue missions, and evacuate individuals in need of urgent medical attention. Their flexibility, maneuverability, and capacity to swiftly respond to changing situations make helicopters invaluable assets in HA/DR efforts.

Some of the rotary-wing aircraft that can be found on a MEU include:

- MV-22 Osprey: These tilt-rotor aircraft serve as the primary means of troop transport, logistics support, and assault capabilities for the MEU.
- AH-1Z Viper: These attack helicopters provide close air support and anti-armor capabilities.

- UH-1Y Venom: These utility helicopters are used for troop transport, medical evacuation, and other support roles.
- CH-53E Super Stallion: These heavy-lift helicopters can transport large equipment and supplies, as well as perform humanitarian assistance and disaster relief missions. The CH-53E has been a workhorse with regard to HA/DR support. However, in the past decease, research and development has sought to evolve and update the CH-53E into the CH-53 King Stallion that boasts an engine that produces 57% more horsepower with 63% fewer parts relative to its predecessor, which translates to an expanded capability to deliver internal and external cargo loads, providing the commander a mobility and sustainment capability the MAGTF has never had before. The most notable attribute of the King Stallion is its ability to maintain increased performance margins in a degraded aeronautical environment, for example at higher altitudes, hotter climates, and carrying up to 27,000 lbs. out to 110 nautical miles; whereas the CH-53E would be limited to a 9,628-pound external load in the same environment.
- From the standpoint of increased maneuverability with its increased capacity to lift almost three times the amount of the CH-53E, it can be inferred that the King Stallion will make significant impacts in a HA/DR event. (Hernandez, 2022)

D. LESSONS LEARNED AND EVALUATED GAPS

This report has focused on where we're going, but perhaps more importantly on where we've been. As we have previously identified, the natural disasters across the globe and the U.S. military's response, although of great help and importance, is not without gaps. Each of the natural disasters are tailored specifically to that geographical location's typical natural disasters, which differ in many ways, but in other ways are very much alike. However, there are a few evaluations from reports pertaining to those disasters that share a need for adapting to the previously identified challenges.

1. Lack of Communication

Critical infrastructure along with the population are the first to be impacted during a natural disaster. Our studies have shown that the damage to buildings inland as well as along the coastal shores are negatively impacted via key electrical components that enable communication. HA/DR requires a rapid response because most natural disasters come with no notice. Without anticipation of an earthquake or a tsunami's magnitude, a major failure in communication between Non-governmental Organizations (NGOs) and reacting

DOD forces complicates the required support. For instance, Moroney et al. (2013, as referenced by George & Harbinson, 2018), during the 2011 Japan Tsunami and earthquake "communications infrastructure was severely impacted, including 2,000 transmission stations for mobile phones destroyed, which 'inhibited early estimates of the extent of the damage'" (p. 88). Because of a lack of communication, the agencies working in tandem in response to HA/DR play a vital role but are limited until capabilities are re-established.

2. Supply Chain Management Issues

The maintenance of supplies to support an HA/DR scenario can have many factors in which both the Navy and the USMC are capable of multiple weeks of sustainment. Particularly, the MEU boasts a 15-day sustainment. Appropriate sustainment lay within the factors of the size of the ship or vessel, timing of supplies aboard the ship and when it needs or has been re-supplied, and the requested needs fulfillment to support the area of operations. Considering all these factors, we can deduce, based on Apte et al.'s (2013) findings, that Tables 2–4 provide insights into the capacity and effectiveness ratings of USN and MSC ship capabilities, specifically assessing their effectiveness from a supply perspective. We will use these metrics as reference to the observations through our methodology in the coming chapter. Nonetheless, the conclusions as referenced in Apte et al. (2013) articulate that effectiveness of on-scene response is efficient, but with limitations/gaps. The caveat of asset availability at a given time for an individual day heavily dictate capability and readiness. Timing plays a crucial variable to on-hand sustainment as stated by Apte et al. (2013): "The cumulative capability offers an explanation of the total certain capabilities available (supply) for a given relief requirement (demand)" (p. 51).

3. Budgeting Expenses for Vertical Lift Capabilities

According to Apte et al. (2022). "As HADR has become a core competency during a time of limited budgets […] it is important to consider cost effective methods of performing these humanitarian missions" (pp. 77–78). This gap is something that can quickly create a problem for the USMC; as an organization we have all the capabilities to support HA/DR but when we talk about long-term sustainability, we encounter issues

because of budgeting. “It should be noted that since the demand during the initial 72 hours is too high to meet and humanitarian missions are not the primary goals of the USN,” Apte et al. (2022) continue, “managing efficacy and efficiency are the goals in the HA/DR missions. Therefore, we focus on reducing the cost while delivering the most supplies” (p. 84). The *Marine Corps Commander’s Handbook* mentions that “After the drawdown from Afghanistan, the Marine Corps expects to be increasingly engaged around the world training with partners, deterring instability, and responding to all manner of crises and contingencies” (United States Marine Corps, 2014, p. 2). This was mentioned in the capabilities and capacity to meet requirements pillar for USMC readiness. As a fighting force, this is important because we need to ensure we are not only training our forces for combat but also training for these crises that could happen at any time. As the USMC continues to improve its methods of preparation, we as a force also need to consider how we plan to get funding to support our capabilities when an emergency like this happens and are waiting for funding to support: “We assumed all other costs (e.g., acquisition and periodic maintenance and uniformed labor) to be sunk costs, not affected by the decision to deploy in humanitarian assistance. Fuel is the main incremental expenditure against USN budgets, from an HA/DR deployment” (Apte, 2022, p. 82). As an organization, the USMC also needs to consider these constraints as we support lots of operations with our vertical lift capabilities but fuel is one of the biggest expenditures in order for us to utilize our vertical lift capabilities and needs to be something we prepare for in order to be able to sustain our support for HA/DR.

IV. CONCLUSION

In this conclusion, we will delve into the concept of readiness metrics and analyze the framework, discuss the lessons learned from each operation, and lastly dive into the importance of the three C's of civil-military relations and how this applies to HA/DR.

A. READINESS METRICS FRAMEWORK

In this research, we surveyed numerous relevant literatures to help us understand how the HOs and USMC define readiness to assist us with developing readiness metrics. We studied literature that pertains to the support from the USN and the USMC during natural disasters. Utilizing Apte's (2019) readiness metrics framework will allow the USMC as an organizational force to be more prepared to support HA/DR and allow us to learn from any previous mistakes we could have experienced: "One observation is that the DOD's rebuilding efforts for readiness may not work if no comprehensive plan exists. A framework is necessary for combat readiness" (p. 6; Government Accountability Office, 2016). This is mentioned as well in Apte's research for USN Readiness Metrics, which emphasizes the USN and USMCs focus more on meeting combat readiness and mentions the importance of having a specific framework for readiness metrics that should be developed for HA/DR.

As it pertains to methodology, our report utilizes Apte's (2019) "Framework for Readiness Metrics" as displayed in Figure 7. This framework has two separate factors, endogenous and exogenous, when understanding and configuring readiness. As defined by Apte (2019), endogenous factors are "performance indicators and readiness metrics" (p. 19). The humanitarian community acknowledges the lack of well-defined performance indicators and readiness metrics in humanitarian operations. From this perspective, the intrinsic factors motivating research include performance indicators, issues and challenges within humanitarian operations, and readiness metrics. As this applies to forward-thinking on the USMC's part and what has occurred in the past, it is important to highlight these three factors and compare/contrast what is to come.

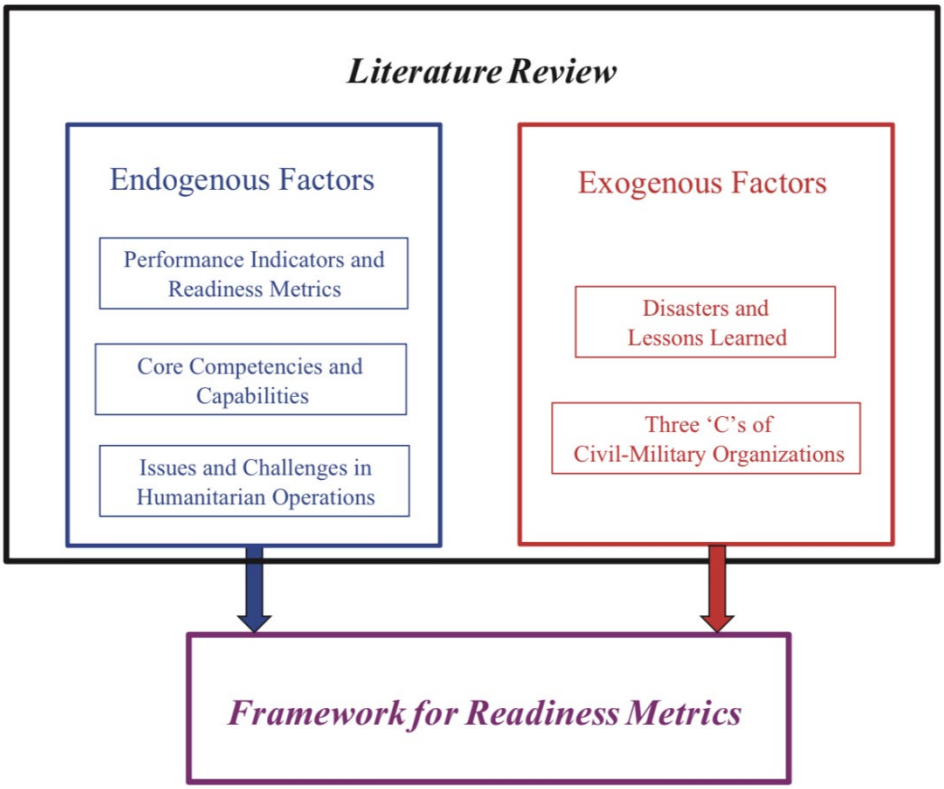

Figure 7. Framework for Readiness Metrics. Source: Apte (2019, p. 4).

As Force Design 2030 continues to shape and mold the USMC's core competencies focused primarily on increased naval capabilities, the limiting factors of supply/logistics sustainment and operational usage continue to be a reappearing question. There appears to be a potential answer to aid in the supply and logistics movements from ship-to-shore via the LSM. However, with only 18–35 being projected to be procured, those assets still remain in question as to whether or not they will be appropriately outfitted to support HA/DR. The theoretical intent to have ships capable of getting onto the shore for wartime operations, as well as having an adequate number of personnel and deterrence capabilities, should be highly considered in support of HA/DR. O'Rourke (2023b) has stated that the LSM will have numerous capabilities when maneuvering to a shore location:

- Rapidly maneuver forces from shore-to-shore in a contested environment
- Sustain a combat-credible force ashore
- Conduct enduring operations
- Enable persistent joint-force operations and power projection

- Provide increased and capable forward presence (O'Rourke, 2023b, pp. 7–8)

By analyzing these "effects," we can determine that the LSM's maneuverability, sustainment of forces, a joint-force operations, and increase in presence can be translated over to HA/DR support, rather than for operational support of combat theater mission requirements. O'Rourke in his report to the Congressional Research Service (2023b) also references a statement from LT. Gen. Karsten Heckl, who at the time was the deputy commandant for combat development and integration:

> The Marines don't envision using this vessel during combat operations either, the general said. If there are indications a conflict may break out, the combatant commander would order the light amphibious warships, or LAW, to quickly relocate Marines or resupply units, and then it goes into hiding. (O'Rourke, 2023b, p. 11)

With this in mind, we envision this asset being utilized in exercises for re-supply and flexing its capability to be a vital increase of HA/DR support. However, as the debate over funding of the LSM (as of April 4, 2023) and the projected design are still in talks before it goes into full rate production, we have discovered that a shore-to-shore vessel that is able to provide support beyond vertical lift capabilities is a critical need. This poses as a challenge and issue as there is much to discover and test for it to be a clear demonstration of HA/DR support. Additionally, it is still not clear that the LSM will be utilized outside of the Indo-PACOM region, as FD2030 heavily focuses on this region.

To the extent of core competencies, readiness as measured by the USMC's ability to consistently deploy MEUs into various regions and their rapid response, along with the acclaimed 15 days of supply sustainment, make the MEU the bedrock of performance metrics. As the core competencies continue to refine via the FD2030 and many assets are being replaced, there is much to learn in the coming years. The increased integration and relationship with the Navy—as outlined in the Littoral Mobility via the FD2030 Annual Update published in June of 2023—has plans in motion of directed actions to take place leading into Fiscal year 2024. Many of the directed actions include ARG/MEU guidance of a Plan of Action and Milestones (POAM), future concepts of future developments for the timeframe 2040, and also the notion to "prioritize forward-deployed, scalable MAGTFs

as part of flexible sea-based constructs that include integration with allies and partners" (Berger, 2023, p. 9). The forward-thinking and action-setting by both the USMC and Navy will soon come to fruition, the extent of core competencies making the necessary modifications of integration and performance. There is a huge push within these core competencies to increase the modernization of our force, technologically, systematically, communicatively, and via required support. The concepts of forward projection and deterrence as the MAGTF/MEU and Navy's core competencies won't change ideologically, it is in the continuous shift of modernization at a rapid pace to stay ahead of near peer adversaries. As stated by the FD2030 Annual update published June 2023,

> To fully realize the objectives of FD2030, we will also need to work with the other services to integrate our modernization into the overall design of the joint force. Deeper integration and synchronization with our sister services will significantly increase the capability, lethality, and effectiveness of the joint force. Combined with additional wargames and enhancing exercises with allies and partners, we are on a path to maximize the utility of the total force. (Berger, 2023, p. 5)

Data inputs although not readily available for public issue and have not also come into production will soon make its way as we near closer to the year 2030. Either way, the measures considered to continue building a rapid ready force ensure forward progression as lessons have been learned and adapted to the new technological and demanding era of today.

In Apte et al. (2013), numerous challenges were addressed in various disasters around the world. A significant disaster that demonstrated several challenges was the earthquake that impacted Haiti on January 12, 2010. Apte et al. (2013) stated, "The collapse of port docks and cranes in Haiti presented navigation challenges to ships because of uncertainty in the location of the coastline" (p. 45). The DOD has been increasing the UAV presence of its arsenal over the past decade per General Berger's FD2030 guidance, which aims to increase the current active component of UAV squadrons from three to six. Furthermore, FD2030 emphasizes employing Unmanned Aerial Systems (UAS) within the MAGTF's GCE, which may aid in uncertain areas of an affected disaster area for reconnaissance and surveillance and even perhaps for search and rescue missions. As stated in the FD2030 Annual Update (2023), "In addition to tactical resupply UAS, we are currently fielding thousands of small UAS in the GCE to provide small unit leaders with an organic intelligence, surveillance, and

reconnaissance (ISR) capability" (Berger, 2023, p. 11). Mitigating uncertainty of locations for tactical insertion of personnel and its assets within the modernized military force aids to the impact of ensuring the right resources are utilized in an efficient means. UAV ISR capabilities can serve to have an edge on a damaged communication infrastructure of an affected area as its loitering capability over long durations and communicating shore-to-shore ship access points, or potential landing zones for vertical lift capabilities for initial insertion of forces. George and Harbison (2018) identified extensively the last-mile challenges, along with managing how supplies reaches their intended destination over a damaged network system: "Placing relief supplies into the hands of the affected population requires a robust capability and detailed management of supply routes that the military is uniquely suited to support" (p. 43). As mentioned, the uniqueness and increased ability of ISR can prevent bottlenecks and identify where new or main supply routes are accessible. This kind of command and control with visibility prior to support embarked to a designation will increase the fast and effective maneuvering of troops and equipment. What was once a compounded issue can in theory be implemented in an integrated networked activity amongst joint/sister forces for effective coordinated efforts.

Readiness and performance metrics are addressed via the known challenges and issues from previous disasters, and with the use of current and future core competencies evolving into a modern force, we can conclude that expected performance is projected to increase. Readiness will maintain its current challenges of budget execution of concept research and development projects such as the LSM, re-visiting current operational execution, and how those concepts are married together with the Navy, joint services, and the after-action reports from previously discussed disasters. Additionally, readiness and performance will be tested repeatedly to perfect theory into injected doctrine for the next couple of decades. The luminous questions of theory made into reality take up the majority of the ambiguity that has many questioning the efficacy of FD2030. Nonetheless, the challenges have been vigorously addressed and action put into play.

B. EXOGENOUS FACTORS

The next critical factor when determining a framework for readiness metrics is the exogenous factors. This discusses previous disasters and the lessons learned and discusses the Three Cs of civil-military Organizations. In this research, we will discuss the lessons learned from the three most recent natural disasters that involved support from the USMC. Operation Sahayogi Haat, Operation Damayan, and Operation Tomodachi were each catastrophic events. Identifying lessons learned allows us to understand all natural disasters whether they are natural or manmade, are not always the same and require us as an organization to be able to use whatever capabilities we must support a host nation within a short time period.

1. Lessons Learned from Operation Sahyogi Haat

The earthquake in Nepal has been one of the more recent large-scale HA/DR operations the USMC had supported the GON with multiple air assets. This 7.8 earthquake was followed by 20 aftershocks resulting in landslides and flooding, which made transporting supplies and materials a massive problem. The DOD deployed soft and hard assets for HA/DR. The 3rd Marine Expeditionary Brigade (MEB) and other forces formed the JTF 505 to respond to this disaster under the guidance of USAID (Apte, 2019). The USMC had been in charge of spearheading this operation and was heavily supported with rotary wing and tilt rotor assets. This natural disaster served to be a great lesson learned, while there were no ways to move logistical assets on the group the Marine Corps was able to use rotary wing assets to assist with evacuations and delivering supplies and materials. This natural disaster also served as a unique obstacle; as Apte mentioned, this caused the country to be landlocked, so the USMC had to respond accordingly. The inadequate collection of field information and dissemination of the same turned out to be a major handicap (Apte, 2019). During this natural disaster communication was one of the biggest issues that the GON and United States had to deal with because they needed ways to communicate with villages, fix roads, and overall adjust their search and rescue capabilities. Apte also quotes Wendelbo's evaluated challenges and lessons learned from Nepal as seen in Table 3.

Table 3. Executive Summary of the Nepal Earthquake. Source: Apte (2019 p. 9)

Planning	In spite of sound planning for disasters, the efforts fell short. The framework with rules and regulations were not fully funded and therefore not enforced.
Building Codes	The scientifically strong building codes that exist in Nepal were not enforced.
Household damages	Though the damage to the infrastructure and public facilities was mitigated through inside as well as outside help, the rural households remain damaged.
Logistical challenges	Being a poor and underdeveloped country, the infrastructure in Nepal was inadequate. The country has a single airport, which turned out to be the bottleneck. The relief efforts could not be utilized in spite of sufficiently available supply, and some teams had to return without delivering the aid.
Communication	Nepal's communication networks physically and virtually collapsed, so the local responders could not convey the existing conditions and needs to the authorities.
Coordination	The inadequate physical infrastructure, before and after the disaster, intensified the lack of coordination between Hos delivering support.
Misdirected Focus	Trendy methodologies were used by some Hos that are costly for locals to sustain, such as K9 teams for search and rescue instead of more efficient methods.
Funding	Though about U.S. $4 billion was pledged within a month, when Nepalese government launched the recovery efforts, not all the funds came through. Perhaps it was due to lack of fulfilling the promises on the donors' part or not having faith in the utilization of the funds by the host nation.

2. Lessons Learned from Operation Damayan

The next natural disaster we learned lessons from was the super typhoon in the Philippines. The country endured so much damage from Super Typhoon Haiyan with a total of 16 million people being affected and 6,300 fatalities. The USMC had the 31st MEU support with HA/DR which formed into the Joint Task Force (JTF) 505: "The heavy vertical lift capabilities of the DOD and other military organizations helped in the face of infrastructure destruction" (Apte, 2019, p. 12). This is another instance where we had to utilize our vertical lift capabilities to support a host nation due to the destruction and loss of infrastructure. While most of the support was in remote areas, these aircraft supported evacuation and the USMC had marines distributing supplies and rations to the local populace. One of the biggest lessons learned from this crisis was their ability to collaborate and communicate more effectively, along with being able to evacuate civilians in rural/ disaster-prone areas. Additionally, upon fixing the standard operating procedures for the government of the Philippines, they were able to internally communicate better, which positively reflected on the next super typhoon Hagupit, reducing the death toll from 6,300 to a total of 18 people.

3. Lessons Learned from Operation Tomodachi

The earthquake and tsunami in Japan proved to be very catastrophic; not only was this country affected by a natural disaster, but it was also affected by a manmade disaster: "Several nuclear power plants were heavily damaged resulting in rolling blackouts. The earthquake also affected the transportation system, and for a short time, all the ports were closed" (Apte, 2019, p. 11). The USMC had been tested with expanding its capabilities to support as this not only involved having to support logistically, air support but also involved having to coordinate bilaterally with the GOJ to help remove the decontamination: "These lessons learned—such as improving bilateral coordination, removing control and command confusion, and preparing for large-scale decontamination—are also critical for handling future disasters." (Apte, 2019 p. 11). This natural disaster serves as a good example of how readiness metrics can help assist if this occurs again. Apte created a table from Carafano's four key areas in crisis response. She applies this to the Japan earthquake and discusses the critical areas and key findings from the Japan disaster which served as a good basis for what lessons were learned seen in Table 4.

Table 4. The Great Eastern Japan Earthquake: Assessing Disaster Response and Lessons for the U.S. Source: Apte (2019, p. 11)

Preparedness and response	Effective planning, preparedness and mitigation measures with possible decentralization for execution of this plan is necessary need to nurture a national culture of preparedness by concentrating on self-reliance in communities as well as individuals is essential
Communicating the risk	Community awareness and understanding risk through communication fetches better cost-effective results than protection measures such as building seawalls communicating risk of low-dose radiation and building confidence for that risk.
International assistance	The United States and, based on history, Japan have difficulty receiving aid. The United States needs to bolster its capacity to accept and apply international aid efficiently.
Critical infrastructure	Need to focus on the most 'vital' infrastructure (United States—Canada grid) to maintain resilient infrastructure that can recover quickly in case of disaster Industry and federal regulators need to work together to understand lessons from Fukushima and how they can be adapted for nuclear disasters in the United States

As we now have evaluated the gaps and identified lessons learned, we as a force can work and update our training standards to ensure we can quickly support and teach

host nations who encounter the same level of catastrophe how to minimize the number of lives lost. In the end, most of the common lessons learned from many HA/DR operations involve poor communication/ coordination. If the USMC were to establish readiness metrics, it would be able to see that this is a trend and could work on updating training with other allied partners to ensure if a country encounters frequent natural disasters we as a force are ready and their government is ready and can provide all the information needed to the United States for support. "The 2011 earthquake in Japan also taught lessons about having a geographical perspective. 'Developing a tsunami response system using inundation maps helps disaster managers model the potential effects of a tsunami so that the most suitable shelter locations and optional evacuation routes can be planned'" (Apte, 2019, p. 12; Hong, 2012). As mentioned by Apte geographic perspective will be a factor and will change so this is an important consideration to keep in mind when training our organization to support HA/DR and if we do well, we can help host nations develop better shelters and better evacuation routes and methods to minimize the number of fatalities if this were to happen again.

C. THREE C'S OF CIVIL-MILITARY RELATIONS

Having delved into the lessons learned from the previous natural disasters, we will now turn our attention to the essential framework of the three C's of civil-military organizations: communication, coordination, and collaboration (Apte, 2019). The three C's are important to humanitarian operations as a whole because this allows all government entities to be more efficient and in turn improve the performance from past mistakes made into ensuring and maximizing readiness for future humanitarian operations: "Civil–military organizations are needed to establish, maintain, influence, and exploit relations among military, government, and non-government organizations, including the host country of the disaster" (Apte, 2019, p. 16). This exogenous concept is crucial because all the natural disasters mentioned within this research have one common issue and it falls within the three C's. Many host nations struggle with communication, whether it is the GON struggling to be able to reach out to rural villages in Nepal, communication from the Philippines to its people and U.S. military, or even GOJ having issues communicating the risk. They all share the same issues in common. We can also see what the effects are of

improved communication, coordination, and collaboration with the second super typhoon in the Philippines. Their updated standard operating procedures allowed the Philippine government to communicate better, learn from past natural disasters, and overall lead to a drastic decrease in fatalities.

"With complimentary capabilities and competencies, other government and non-government organizations participate with military organizations in HA/DR. Therefore, it is essential that coordination and communication among all these organizations be explored and enhanced" (Apte, 2019, p. 16). Apte continues to reinforce the importance of other government and non-government organizations working on improving their communication and coordination. With regards to the USMC, we as an organization can also do well to work on the three C's when we work with allied host nations to ensure we have better communication, collaboration, and Coordination. If the USMC continues to integrate allied partners within exercises or even potentially explore conducting exercises that involve scenarios, we have seen in past natural disasters this could better assist our communication as an organization and communication with our partners: "Absence of institutionalized civil-military coordination is a significant void that is exacerbated when a country is facing a super-disaster or crisis." (Apte, 2019, p. 17). In summary, both endogenous and exogenous factors play critical roles in the readiness metrics. Implementing the readiness metrics in the USMC can help us better prepare for the future and allow us to continuously work with our allies to ensure our communication is better to reduce more fatalities if another disaster were to occur.

LIST OF REFERENCES

Apte, A. (2009). Humanitarian logistics: A new field of research and action. *Foundation and Trends in Technology, Information and Operations Management, 3*(1). https://www.nowpublishers.com/article/Details/TOM-014

Apte, A., Yoho, K., Greenfield C., & Ingram, C. (2013). *Selecting maritime disaster response capabilities.* https://pdfs.semanticscholar.org/5e3b/48199098ca729cd11314bdd0a46ecb8c20a9.pdf

Apte, A., Goncalves, P., & Yoho, K. (2016). Capabilities and competencies in humanitarian operations. *Journal of Humanitarian Logistics and Supply Chain Management, 6*(2), 240–258. https://www.emerald.com/insight/content/doi/10.1108/JHLSCM-04-2015-0020/full/html

Apte, A. (2019). Understanding readiness metrics for the humanitarian operations through literature review. *Journal of Humanitarian Logistics and Supply Chain Management, 10*(3), *321–345*. https://www.emerald.com/insight/content/doi/10.1108/JHLSCM-08-2018-0059/full/html

Apte, A., Chirgwin, S., Doerr, K., & Katakura, D. (2022). Analysis of vertical lift capabilities of U.S. Navy (USN) in Humanitarian Assistance and Disaster Relief (HADR), *Journal of Defense Analytics and Logistics, 6(1), 73–93.* https://www.emerald.com/insight/content/doi/10.1108/JDAL-10-2021-0012/full/html

Berger, D. H. (2020). *Force Design 2030.* Marines.Mil https://www.hqmc.marines.mil/Portals/142/Docs/CMC38%20Force%20Design%202030%20Report%20Phase%20I%20and%20II.pdf?ver=2020-03-26-121328-460

Berger, D. H. (2023). *Force Design 2030 Annual Update.* Marines.Mil https://www.marines.mil/Portals/1/Docs/Force_Design_2030_Annual_Update_June_2023.pdf

Carafano, J. (2011). *The Great Eastern Japan Earthquake: Assessing Disaster Response and Lessons for the U.*S. The Heritage Foundation. https://www.heritage.org/asia/report/the-great-eastern-japan-earthquake-assessing-disaster-response-and-lessons-the-us

Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DMHA) (2015a). *An inside look into USPACOM response to super typhoon Haiyan*. https://www.cfe-dmha.org/LinkClick.aspx?fileticket=n-WdVPd7dQ0%3d&portalid=0

Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DMHA) (2015b). *Disaster Information Report Nepal Earthquake*. https://www.cfe-dmha.org/LinkClick.aspx?fileticket=1s5jMZgbiPw%3d&portalid=0

Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DMHA) (2015c). *How the Philippines turned lessons learned from super typhoon Haiyan into best practices for disaster preparedness and response*. https://www.cfe-dmha.org/LinkClick.aspx?fileticket=VpvTSjDJ_Zw%3d&portalid=0

Defense Security Cooperation Agency. (N.D). *Humanitarian Assistance and Disaster Relief.* https://www.dsca.mil/50th-anniversary/humanitarian-assistance-and-disaster-relief

O'Rourke R. (2023a). *Navy Medium Landing Ship (LSM) (Previously Light Amphibious Warship [LAW]) Program: Background and Issues for Congress*. (CRS report No. R46374 Version. 53). Congressional Research Service. https://crsreports.congress.gov/product/pdf/R/R46374/53

O'Rourke R. (2023b). *Navy Medium Landing Ship (LSM) (Previously Light Amphibious Warship [LAW]) Program: Background and Issues for Congress*. (CRS report No. R46374 Version. 55). Congressional Research Service. https://crsreports.congress.gov/product/pdf/R/R46374/55

Ferris, E. (2008) *Natural disasters, human rights, and the role of national human rights institutions*. Brookings. https://www.brookings.edu/articles/natural-disasters-human-rights-and-the-role-of-national-human-rights-institutions/

Hernandez J. (2022). *Marine Corps Declares IOC for CH-53K King Stallion.* Marines.mil. https://www.marines.mil/News/News-Display/Article/3010851/marine-corps-declares-ioc-for-ch-53k-king-stallion/

Hong, J. (2012). Creation of tsunami disaster response system in the Republic of Korea using inundation maps," *Liaison: A Journal of Civil-Military Disaster Management and Humanitarian Relief Collaborations*, Vol. 5, PP. 75–78.

Joint Chiefs of Staff. (2019). Foreign humanitarian assistance (JP 3-29). https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp3_29.pdf

Gastrock, J. R, & Iturriaga J. J. (2013). "*Analysis of United States Marines Corps operations in support of Humanitarian Assistance and Disaster Relief*"[Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/62026

Government Accountability Office (GAO) (2016), "Military readiness: DOD's readiness rebuilding efforts may be at risk without a comprehensive plan," (GAO-16-841), https://www.gao.gov/assets/gao-16-841.pdf

George, S. M, & Harbinson J. S. (2018). "*Evaluation of Gaps to Understand Needs for HA/DR: A case for USMC Readiness Metrics*"[Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/58298

Moroney, J. D. P., Pezard, S., Miller, L. E., Engstrom, J., & Doll, A. (2013). *Lessons from Department of Defense disaster relief efforts in the Asia-Pacific region*. https://www.rand.org/pubs/research_reports/RR146.html

United States Marine Corps. (2014). *Commander's Readiness Handbook*. https://www.hqmc.marines.mil/Portals/138/LowRes%20Commanders%20Readiness%20Handbook.pdf

Wendelbo, M., La China, F., Dekeyser, H., Taccetti, L., Mori, S., Aggarwal, V., Alam, O., Savoldi, A. and Zielonka, R. (2016), "The crisis response to the Nepal Earthquake: lessons learned," http://www.eias.org/wp-content/uploads/2016/02/The-Crisis-Response-to-the-Nepal-Earthquake-_-Lessons-Learned-colour-1.pdf

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

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