Literature Survey for Understanding Readiness Metrics in Humanitarian Missions in the United States Navy

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The Problem: Are we mission ready?

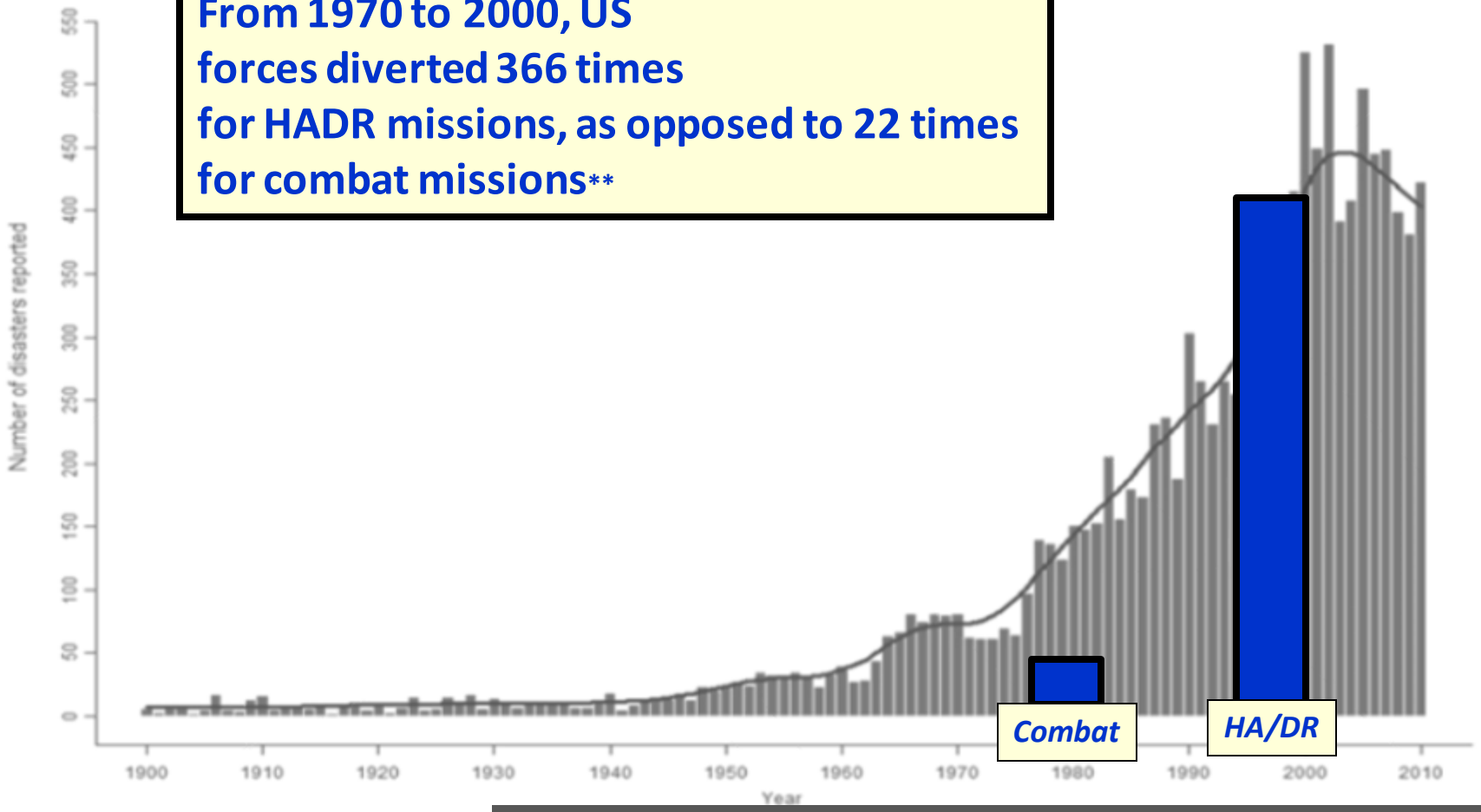
- Readiness metrics are used by the military in gauging performance in the missions
- The military personnel are engaged in combat activities for a relatively small percentage of their total time
- Majority of their time is spent in carrying out exercises so that they can be "ready" to perform the primary mission of defending the nation if and when necessary
- Department of Defense (DoD)* has combat readiness metrics in all services

* In this research Department of Defense refers to United States Department of Defense

Today, officers are always ready for combat missions because they have many tools, such as, combat readiness metrics .....

However, Facts are….

From 1970 to 2000, US forces diverted 366 times for HADR missions, as opposed to 22 times for combat missions**



**Source: USAID Fact Sheet #35, 16 Feb 2010*
*** Source: Center for Naval Analysis*

Natural Disasters Reported 1900 – 2010 *Source: EM-DAT Disaster Database*

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The Problem

However, there is no analog for readiness metrics for HADR missions to assess readiness….

Readiness metrics for HADR missions…

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The Commanding Officer's Problem

There are no well developed and executable HADR readiness metrics available in the Department of Defense….

The commanding officer gets deployed with the ship for combat missions knowing that it is combat mission ready….

Ship gets diverted for HADR mission…

How does the commanding officer know the HADR mission will be carried out efficiently and more importantly, effectively?

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The Commanding Officer's Problem

That is the objective of this research!

Proposed Research

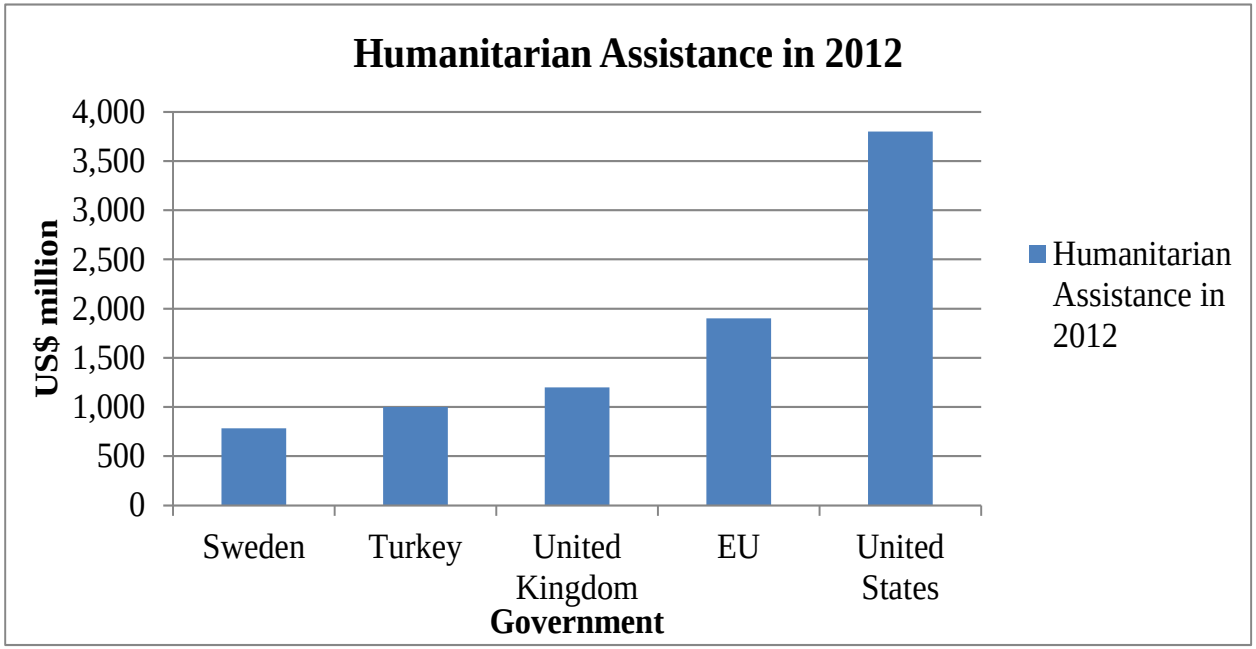
Research and develop a *Readiness Assessment Model*, a playbook of sorts, for that commanding officer so efficient and effective HADR can be performed…and questions like these can be answered…..

- What do I ***need***?
  - Do I ***have*** it?
- What must I ***do***?
  - Can I ***do*** it?
- How do I close the ***gap***?
- ***How*** should I have done it?
- How can I be ***ready*** next time?

Background

- United States Navy (USN) has been the active and major supplier of disaster relief due to their unique and critical capabilities (Apte, Yoho, Greenfield, & Ingram, 2013; Apte, Goncalves, & Yoho, 2016)
- When a disaster strikes, the host nation requests outside assistance if needed. When requested, the USN assets under the guidance of United States Agency for International Development (USAID), get deployed for humanitarian operations.

Background



Humanitarian Assistance in 2012, Top Five Government Donors. Source: Global Humanitarian Assistance (2013)

Background

- It is unknown if this effort will continue and be sustained in an environment of fiscal austerity and budget cuts
- We need to understand the USN's readiness level to utilize these resources

Goal of the Ongoing Research is to

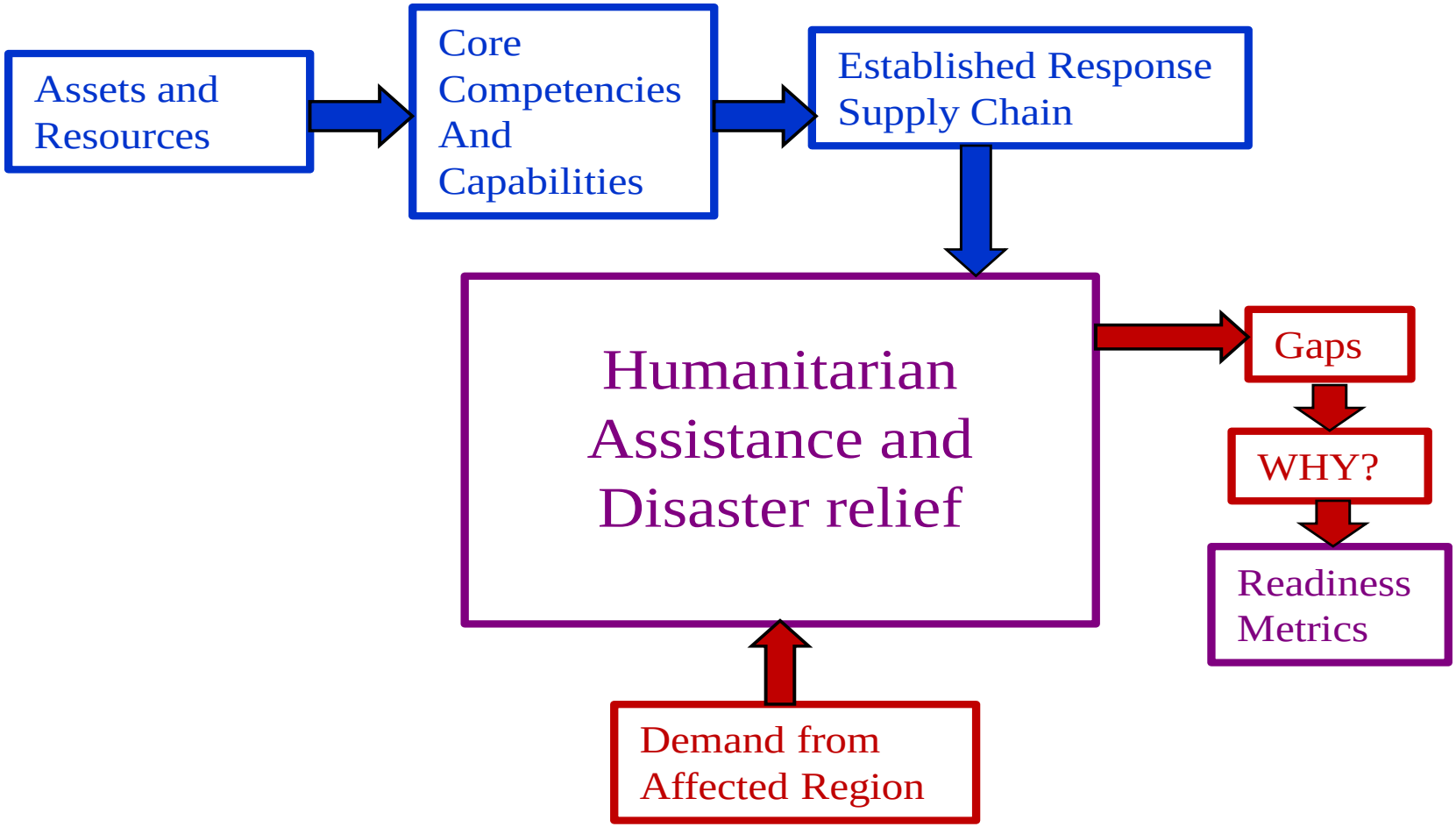
1. Develop Readiness Assessment Model
2. Utility function for deployment of ships
3. Feasibility for transportation of supplies and services by USMC

in order to identify what Readiness means to DoD for Humanitarian Missions and provide Metrics.

Ongoing Research

1. Develop Readiness Assessment Model

Framework for Readiness Metrics



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Background

For example, the core competency of ***Information and Knowledge Management*** can be transformed into what is ***needed*** to be ready , ***knowledge*** of being ready, and ***measure*** for readiness:

Need	Knowledge	Measure

• Hard Assets:
  • Aerial platform
  • Satellites
  • IT equipment
  • Soft Assets:
  • Database
  • Skilled staff
	• Testing and evaluation
	• Exercises and drills
	• Wargames
	• Inspection
		• Mission essential tasks (MET)
		• Accounting for hard assets
		• Cost vs capability

• Preset thresholds for
  • The mission
  • Situational assessment
	• Contingencies
	• Scenario analysis
		• Past exposure
		• Lessons learned

• Plans for gathering intelligence	• Current status • Tradeoff between risk tolerance and threat level	

Lessons Learned from Past Disasters…..

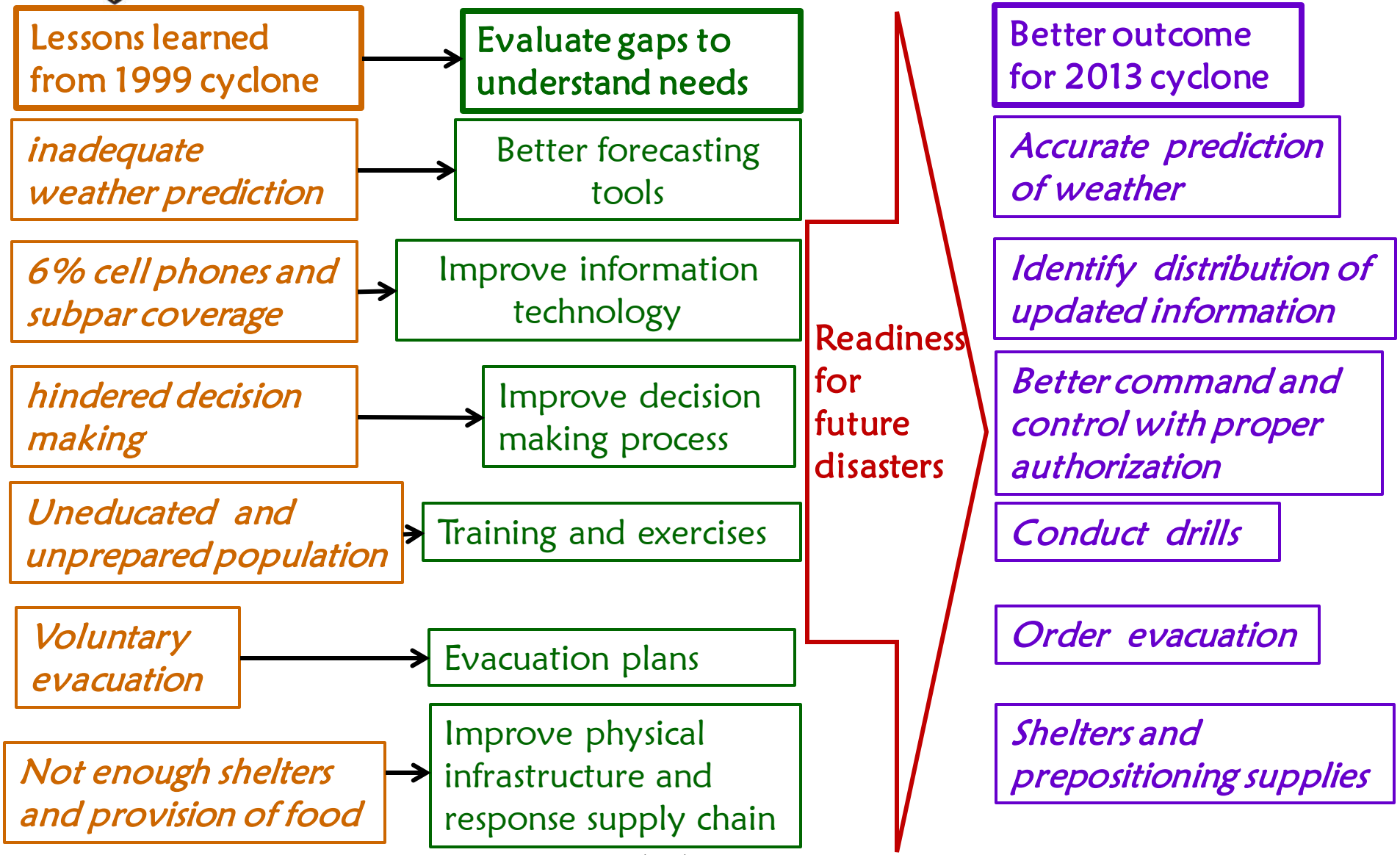
Indian Super-cyclone 1999

The Super-cyclone struck eastern Indian state of Odisha in 1999 with winds of at least 125 mph; ***10,000 people were killed.***

Indian Cyclone Phailin 2013

The massive cyclone, winds of at least 125 mph, that hit the same state destroyed tens of thousands of homes, but ***killed fewer than 30 people.***

Lessons Learned from Past Disasters…..



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Lessons Learned from Past Disasters…..

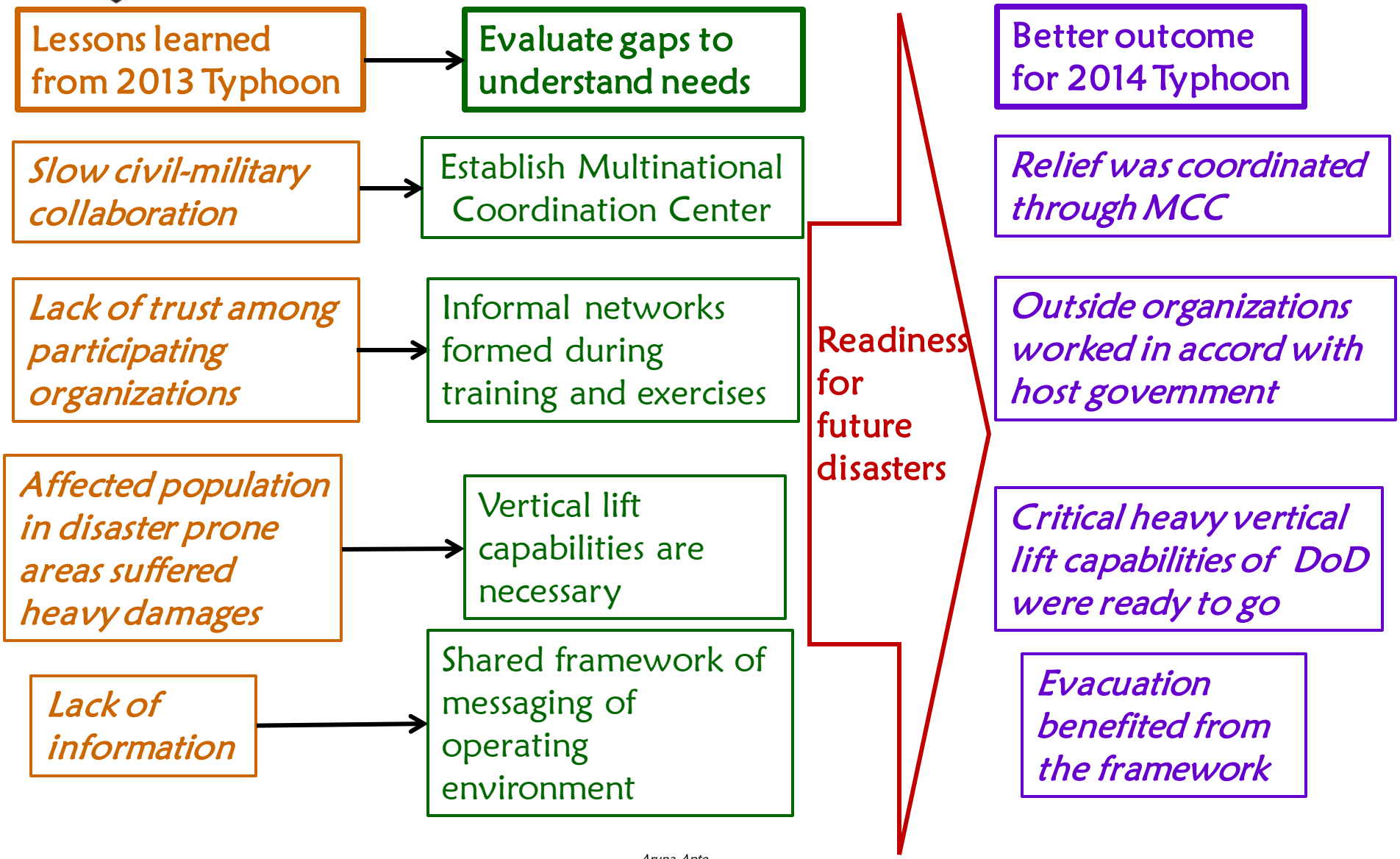
Super Typhoon Haiyan 2013

Overview	Super Typhoon Haiyan
Philippine Area of Responsibility	November 6, 2013 (entered) November 9, 2013 (exited)
Families Affected	3,424,593
Individuals Affected	16,078,181
Deaths	6,300
Injuries	28,689

Super Typhoon Hagupit 2014

Overview	Super Typhoon Hagupit
Philippine Area of Responsibility	December 4, 2014 (entered) December 10, 2014 (exited)
Families Affected	944,249
Individuals Affected	4,149,484
Deaths	18
Injuries	916

Lessons Learned from Past Disasters…..



How will it be done? Literature Review

- We studied over 80 documents that included peer-reviewed scholarly articles, government documents, white papers, research papers, and DoD briefings for our literature review.
- We believe this review will help understand the definitions and descriptions of post-disaster performance indicators and pre-disaster readiness metrics.
- We believe such understanding paired with comparison with combat readiness metrics as defined by DoD will enable us to propose a framework for readiness metrics for humanitarian operations.

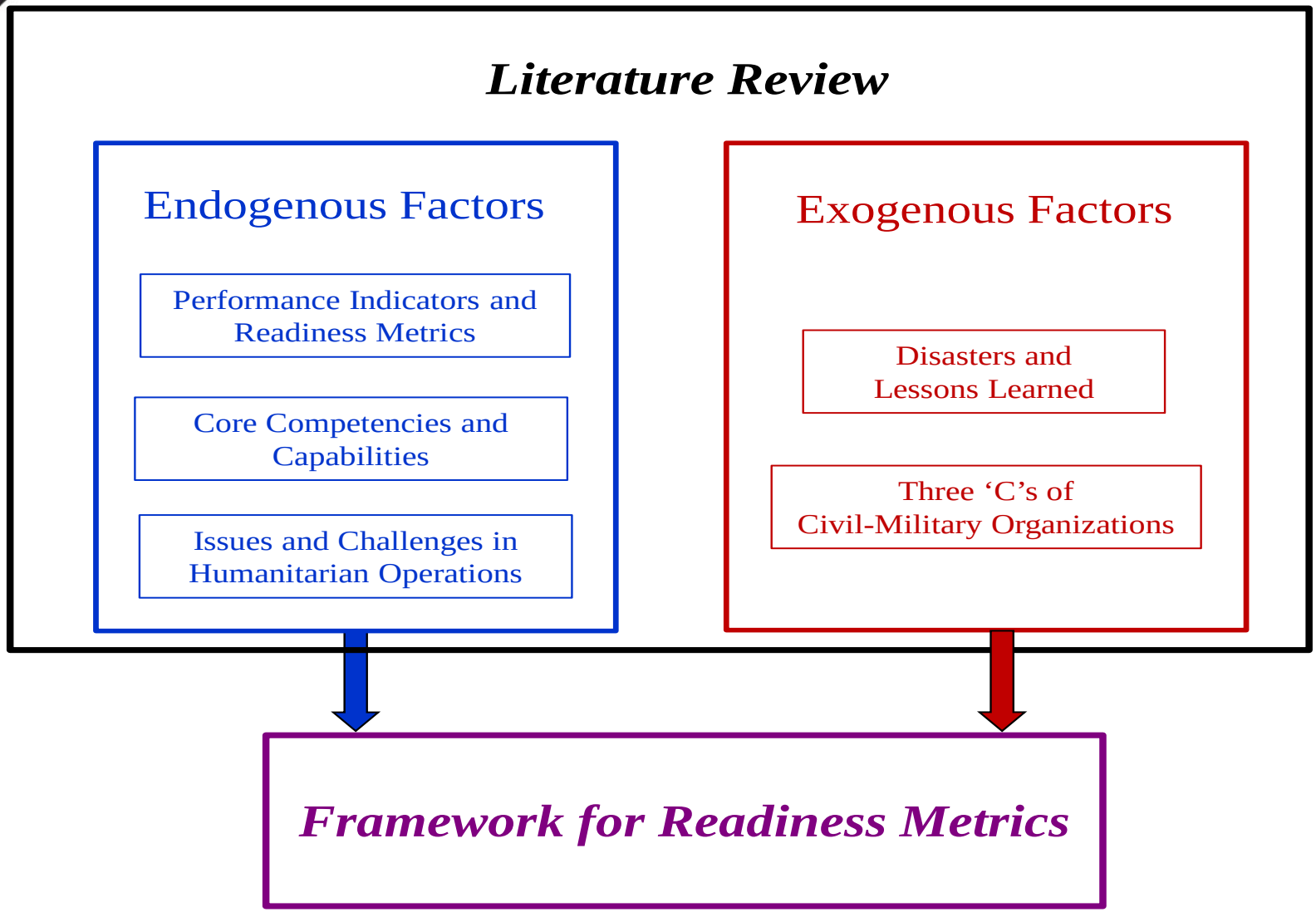
How will it be done? Literature Review

- For supporting this process, we divided the literature into categories:
  - Performance Indicators and Readiness Metrics
  - Core Competencies and Capabilities
  - Issues and Challenges in Humanitarian Operations
  - Disasters and Lessons Learned
  - "Three Cs" of Civil-Military Organizations
- These topics assist develop the path for recognizing readiness in humanitarian organizations*

* In this research humanitarian organizations include NGOs, Military, NMOs, those that provide humanitarian assistance and disaster relief to the affected population.

How will it be done? Literature Review

- We focused on four disasters for the lessons learned:
  - the 2010 earthquake in Haiti,
  - the 2011 earthquake and tsunami in Japan,
  - the 2013 Typhoon Haiyan (Yolanda) in the Philippines,
  - the 2014 earthquake in Nepal.


Literature Review
Endogenous Factors
Performance Indicators and Readiness Metrics
Core Competencies and Capabilities
Issues and Challenges in Humanitarian Operations
Exogenous Factors
Disasters and Lessons Learned
Three 'C's of Civil-Military Organizations
Framework for Readiness Metrics

Endogenous Factors:
Performance Indicators and Readiness Metrics

- The absence of clear performance indicators and/or readiness metrics in humanitarian organizations (HOs) has been recognized by the humanitarian community. There are several factors that contribute to the difficulty of defining and measuring either the performance indicators or readiness metrics in HOs (Davidson 2006)
- DoD's rebuilding efforts for readiness may not work if there is no comprehensive plan in place. A framework is necessary for combat readiness (GAO, 2016)

Endogenous Factors:
Performance Indicators and Readiness Metrics

- Haavista and Goentzel (2015) offer a review of literature based on supply chain performance measure.
- Van der Laan, de Brito, and Vergunst (2009) offer a review of literature identifying the necessary conditions for performance measures for humanitarian supply chains.

Endogenous Factors:
Performance Indicators and Readiness Metrics

- Bonaventre (2006) lists at least three reasons why the DoD should measure the impact of humanitarian assistance programs.
  - measuring the impact of HOs offers opportunities for future and mid-course corrections in the projects through feedback loops enabling planners to underscore activities that are cost-effective
  - collection and sharing of data prevents the duplication of activities performed by all HOs. Not duplicating activities helps us understand the core competencies and capabilities of HOs
  - analysis based on collected data offers transparency and quantifiable results that do not leave any ambiguity

Endogenous Factors:
Core Competencies and Capabilities

- Apte, Goncalves and Yoho(2016) identify the competencies and capabilities that are core to U.S. military and non-military organizations (NMOs) for HADR
  - identification of the specific competencies and capabilities that are core to the humanitarian organizations can enable better planning to achieve greater effectiveness and efficiency in their humanitarian responses
  - extend the concept of identifying, cultivating, and exploiting the core capabilities of the private sector to the organizations that seek to respond to disasters
  - identify the top five essential services and capabilities for disaster relief as Information and Knowledge Management, Needs Assessment, Supply, Distribution and Deployment, and Health Services Support

Endogenous Factors:
Core Competencies and Capabilities

- Roughead, Morrison, Cullison, and Gannon (2013) offer an in-depth analysis of the USN's humanitarian assistance, especially in the face of budget cuts and austerity
  - studies the proactive engagement or strategic pre-positioning of humanitarian assistance
  - strengthen relations in critical geographic areas through greater cultural understanding
  - improve the capabilities and readiness of USN humanitarian assistance
  - reinforce other capabilities such as health systems of host nations

Endogenous Factors:
Core Competencies and Capabilities

- Apte, Yoho, Greenfield and Ingram(2013) evaluate HADR by the USN using a structured, qualitative evaluation schema complemented by expert ratings
  - evaluate the capabilities and utility of ships in the USN
  - find that there are specific types of vessels with significant disaster response utility
  - recommend a flotilla type that would be best suited for humanitarian operations

Endogenous Factors:
Issues and Challenges in Humanitarian Operations

- Roughead *et al.* (2013) list the operational challenges for the USN
  - short-term or discontinuous engagement in HADR
  - lacking enduring coordination and development
  - insufficient integration with host nations and NGO operatives
  - dependence on sole assets of vessels that may not serve the necessary demand
  - inadequate and irregular funding
  - most notably, difficulty in measuring the alignment of humanitarian efforts with strategic goals

Endogenous Factors:
Issues and Challenges in Humanitarian Operations

- Beamon and Kotleba (2006) describe the stochasticity of the demand of the disaster, and if the disaster is large-scale, the strain that it creates on the physical distribution
- United Nations (2007),Duran *et al. (*2011), Apte and Yoho (2011), World Meteorological Organization (2009) state that inadequate or incorrect estimation of demands leads to further casualties and suffering in the affected area
- McCoy (2008), Apte (2009), Apte *et al.* (2013) stress that estimating where and when such demand is needed is even harder

Exogenous Factors: Lessons Learned

Long Term Planning, 2010 Haiti Earthquake

Source: JCOA (2010)

- The president's declaration about making the disaster relief a priority would help the administration and the country focus on the effort
- Civilian and military resources may be pushed to mitigate the disaster by establishing the national response structure rapidly
- Roles, responsibilities, authorities, and essential capabilities need to be clarified at the outset
- Division of labor within the DoD should be clearly defined
- Integration of HOs may raise many policy issues that need to be resolved
- Incomplete data on the ground at the onset of the disaster is a challenge for logistics requirements and priorities

Exogenous Factors: Lessons Learned

Critical Areas and Key Findings, 2011 Japan Earthquake

Source: Carafano (2011)

- 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

Exogenous Factors: Lessons Learned

Critical Areas and Key Findings, 2011 Japan Earthquake

Source: Carafano (2011)

- 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

Exogenous Factors:

"Three Cs" of Civil-Military Organizations

- The three Cs for civil military organizations are communication, coordination, and collaboration
- Civil-military organizations are needed to establish, maintain, influence, and exploit relations between military, government, and non-government organizations, including the host country of the disaster
- With complimentary capabilities and competencies, other government and non-government organizations participate with military organizations in HADR
- It is essential that coordination and communication among all humanitarian organizations be explored and enhanced
- Apte *et al. (*2016) and Moroney *et al. (*2013) hypothesize that response in the future will be efficient and effective in spite of limited budgets

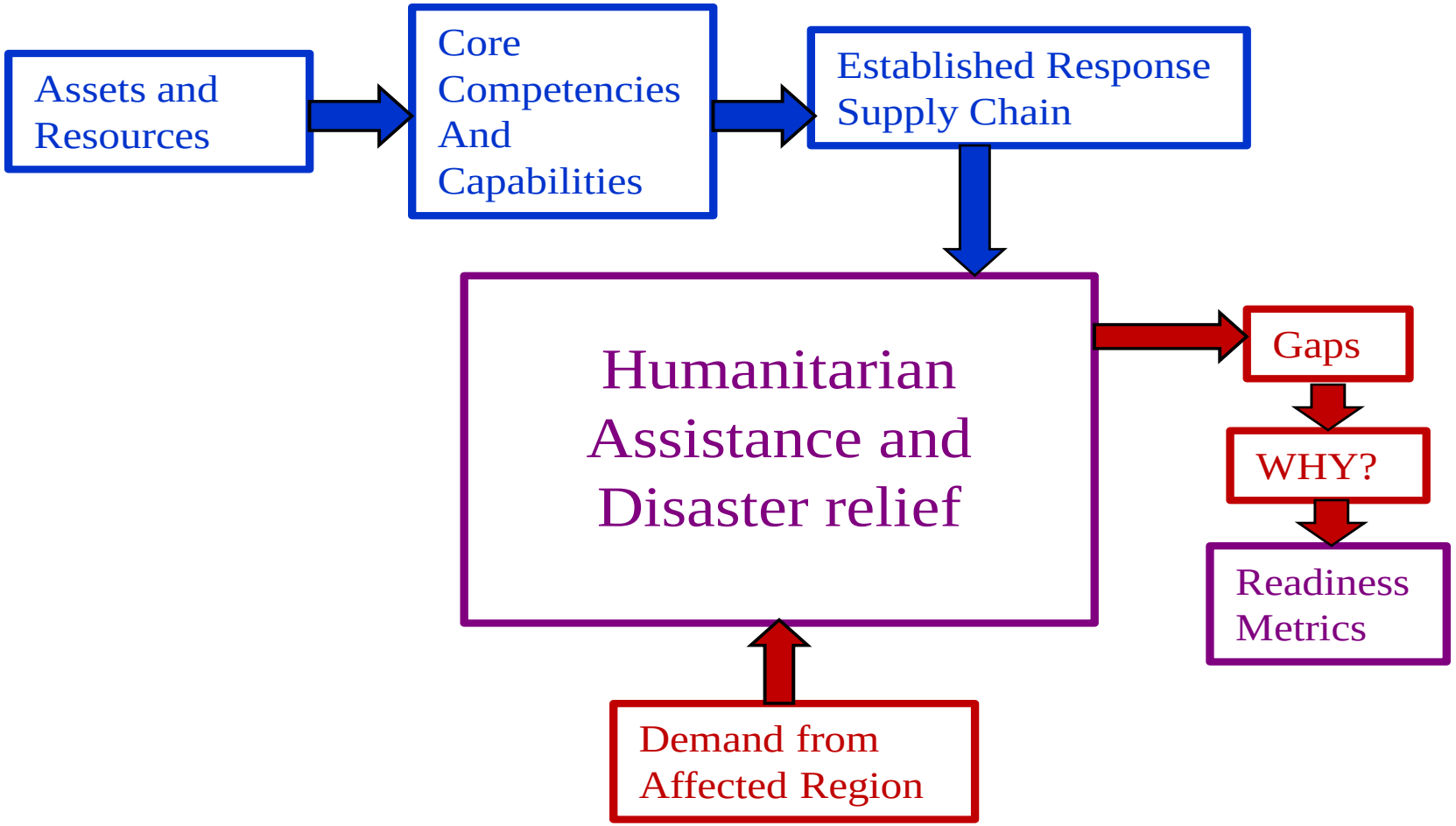
Exogenous Factors:

"Three Cs" of Civil-Military Organizations

CFE-DM (2015) conclude that advances in civil-military coordination occur when

- Consensus in the operating environment paves the way for unity of effort
- Systemic changes through an inclusive multi-sectoral approach streamlines disparate efforts on emergency response preparedness
- A convergence in concepts, frameworks, protocols, and procedures maintains a clear distinction of responsibilities and national sovereignty
- Institutionalized internal and external partnerships augment a country's latent ability to surge

Framework for Readiness Metrics



This framework for Readiness Metrics is evolving…

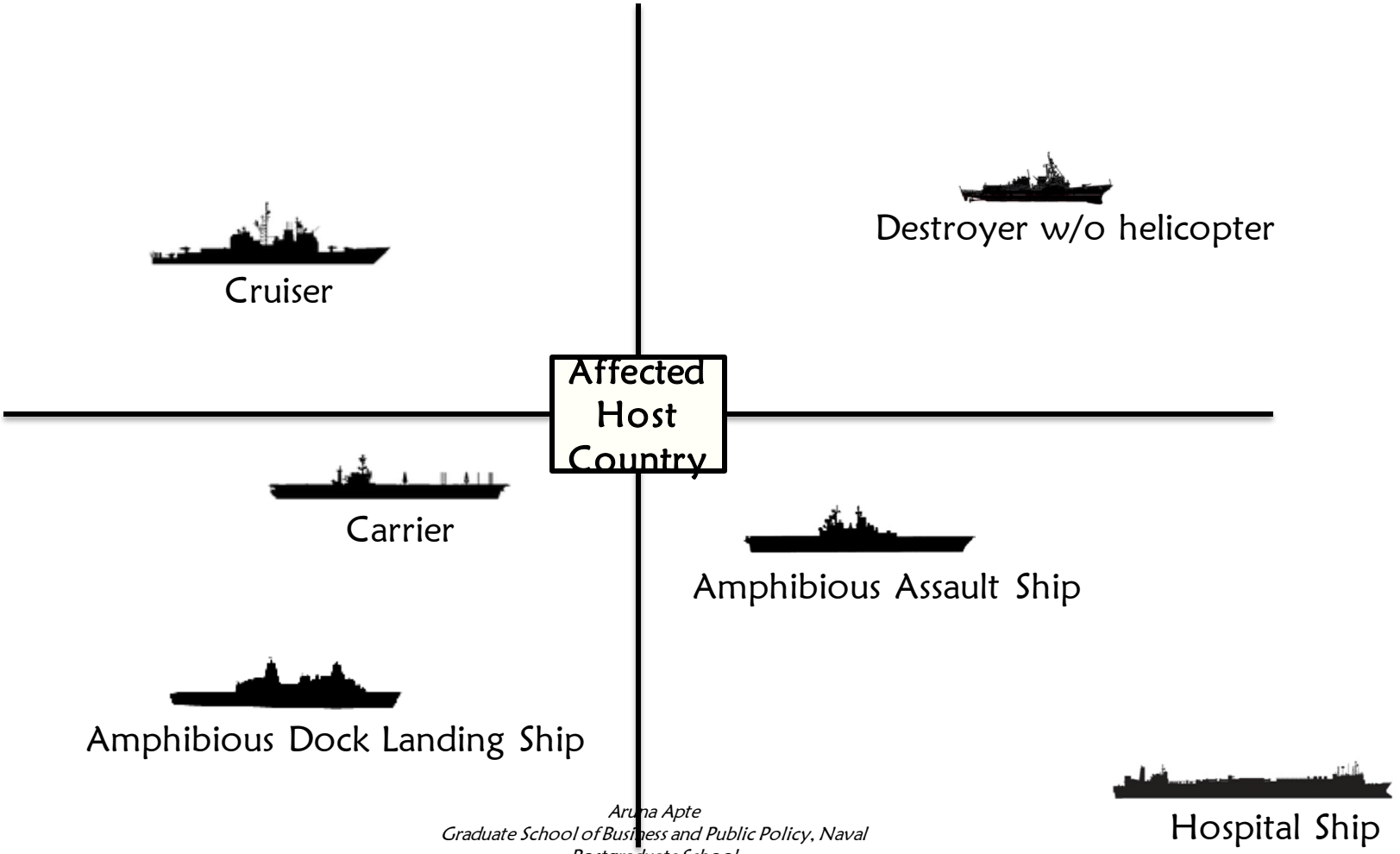
this is what we have so far….

Ongoing Research

2. Utility function for deployment of ships that takes into account capability, cost, proximity and availability of a ship

2. Ongoing Research

Decisions to include proximity of the ship to replenishing ports or affected host country and incorporate availability of the ships



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2. Ongoing Research

- Determine an HADR utility function that links ship HADR capability with reported operating and support (O&S) cost, and proximity, and possibly availability.
- Of all available and active U.S. naval ships at disaster onset, what is the optimal mix of ships that maximizes the utility of HADR operations given platform capability, proximity, and cost?

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2. Ongoing Research

- a utility function with set of generated parameters are used to calculate stylized utility values for each ship class
- the parameters include
  - capability
  - proximity
  - cost
  - availability through inventory
- the goal of incorporating capability, proximity, cost, and inventory into the database is to maximize the combined utility of ships tasked to respond during a USN HADR operation.

2. Ongoing Research

- big data therefore we use big data techniques called Factor Analysis (FA)
- FA
  - creates indices/attributes that enter the Utility Function
  - aggregate big data/multiple correlated variables while preserving the maximal amount of information in data
  - weighted average where weights are optimized (explicit objective function) such that variance of original data is maximized/retained
  - component weights themselves provide useful information (e.g. importance of air support vs refrigerated goods cargo to ships' capability in HADR)

Ongoing Research

3. Feasibility for transportation of supplies and services by USMC

3. Ongoing Research

How III Marine Expeditionary Force (MEF) can most effectively employ their resources to an affected country based on their

- type of transportation assets
- the location and quantity of the transportation assets
- the infrastructure originally available in the country
- limitations in infrastructure due to a disaster

3. Ongoing Research

Develop a capacity planning model for a infrastructure available vs transportation capability

- used by III MEF planners in the future
- so they can adjust the inputs to the model based on
  - actual Disaster effects
  - real-world III MEF asset availability
  - the location and quantity of the transportation assets