

AN INNOVATIVE CAPABILITY MATURITY MODEL FOR GLOBAL EMERGENCY AND DISASTER MANAGEMENT

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Keywords

emergency management, disaster management, emergency preparedness, emergency analysis, global collaboration, emergency management megacommunity, humanitarian disaster assistance

Abstract

The frequency and intensity of global threats, ranging from natural disasters to human actions, have increased over the past few years; so has their impact — often exceeding the preparedness measures taken by individuals, organizations, and even nations. The questions facing emergency and disaster management professionals today are whether existing measures can adequately protect people and property from these threats, and, *if not*, what can be done about it?

Threats such as global warming, pandemic influenza, tsunamis, or terrorist attacks can produce such complex and far-reaching impacts that no single organization or nation can fully address them alone. As such, there is a pressing need for comprehensive emergency management systems that integrate the complex network of stakeholders — public sector, private sector, and government — and harness their individual and collective capabilities. Establishing such systems requires a set of standards that provides rules for effective collaboration, coordination, and communication and offers a platform to measure, assess, and improve preparedness and response.

However, this set of standards does not exist which impedes successful collaboration and hinders the ability of emergency and disaster managers to develop sufficient capability and capacity to address global threats. Capability maturity models (CMMs) are a proven means for developing and enhancing systems. They provide — a place to start; a way to incorporate lessons learned; a common language; a shared vision; and a framework for prioritizing actions defining improvement. This paper proposes a CMM for global emergency and disaster management systems. The innovative approach described herein provides key insights for achieving comprehensive emergency management systems, including the benefits of improved and sustained collaboration.

While it is difficult to prepare for, or even predict, future threats, there is always a need for emergency and disaster managers to adapt in order to save lives, protect property, and meet basic human needs.

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1. Introduction

Today's threats can produce such complex and far-reaching impacts that no single organization or even nation can adequately address them. Findings from disasters and exercises point to a lack of global standards and guidelines that fully address emergency management systems as a barrier to greater collaboration, coordination, and communication in preparing for and responding to emergencies. Further, global emergency and disaster managers are being asked more so than ever before to strike a balance between increasing threats and decreasing resources.

When a disaster occurs, the influx of responders and supplies can prove overwhelming. Numerous organizations gather information on damage, community needs, and local capacity to respond, but often do so independently and with little coordination. Disaggregated systems for collecting, organizing, analyzing, and conveying disaster information can thwart critical decision making. Humanitarian coordination, especially, is often impeded by lack of standards to assist relief agencies with information sharing so that the most appropriate form of aid reaches the neediest populations first.

In response to the 2004 Indian Ocean tsunami, the United Nations and its donor nations organized arguably the world's largest relief and recovery operation to date. Although there were many successes, the operation has had many challenges, including bottlenecks in aid delivery, civil/military coordination, information sharing. Most of these challenges are tied to the lack of standards and guidelines. Figure 1 illustrates seven key challenges affecting existing emergency management systems.

Figure 1. Key Emergency Management System Challenges



We examined several existing emergency management standards and guidelines as shown in Table 1 to assess, to the extent applicable, how well each one addresses these seven key challenges (Disaster Recovery Journal, 2007).

Table 1: Emergency Management Standards/Guidelines

Standard/Guideline	Description
International Standards Organization (ISO) <i>International Workshop Agreement (IWA) 5:2006</i> — Emergency Preparedness (ISO, 2006)	Includes review and evaluation of other key standards and their applicability for the IWA deliverable focusing on emergency preparedness and operational continuity
National Fire Protection Association (NFPA) 1600:2007 — Standard on Disaster/Emergency Management and Business Continuity Programs (NFPA, 2007)	Establishes a common set of criteria for disaster/emergency management and business continuity programs and includes guidelines to develop, implement, and maintain aspects for prevention, mitigation, preparation, response, and recovery from emergencies. It applies to public, not-for-profit, and private entities
British Standard (BS) 25999:2007 — Code of Practice for Business Continuity Management (British Standards Institute, 2007)	Holistic management system designed to be suitable for any organization public or private, large or small and addresses all parts of business continuity, disaster recovery and emergency planning. Includes steps to develop, implement, maintain and improve a continuity management system
Emergency Management Accreditation Program (EMAP) (EMAP, 2006)	Comprehensive, scalable and rigorous standard that can be applied to an emergency management program of almost any size. Key components of preparedness and response are addressed, including multidisciplinary coordination, continuity of operations and government planning, alternate operating facilities, and interoperability
The SPHERE Project — Humanitarian Charter and Minimum Standards in Disaster Response (Sphere, 2004)	A unique voluntary initiative that establishes minimum standards in disaster response aimed to improve the quality of assistance to people affected by disaster and improve the accountability of states and humanitarian agencies to their constituents, donors and the affected populations
Australian Critical Infrastructure Emergency Risk Management and Assurance Handbook — adopted from Standards Australia and Standards New Zealand [AUS/NZ] 4360:1995 — Risk Management (Emergency Management Australia, 2005)	The focus of this handbook is emergency risk management for those events identified by emergency risk managers during risk assessment of critical infrastructure as having catastrophic consequences
United Nations International Strategy for Disaster Reduction (UN/ISDR) — Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters (UN/ISDR, 2005)	Provides strategic and systematic approach to reducing vulnerabilities and risks to hazards, underscores the need for, and identifies ways of, building the resilience of nations and communities to disasters

Based upon our review, we propose an emergency management capability maturity model (EM-CMM) to help address the seven key challenges and provide a unifying approach for better and sustained collaboration, coordination, and communication. In particular, the model provides for the assessment and measurement of, as well as the improvement to emergency management systems.

2. Providing a Model to Measure Emergency Management System Maturity

To meet global threats, emergency management systems require an appropriate combination of people, processes and enabling technologies to deliver capabilities at the *right* time, at the

right place, and in the *right* amount. Ensuring that needed capabilities are available when disasters strike requires: (1) effective collaboration, coordination, and communication and (2) realistic testing and measuring of these capabilities over time, with problems identified and subsequently addressed in partnership with all stakeholders.

The proposed EM-CMM provides a reference for measuring comprehensive emergency management systems and to use the results of this measurement to identify strengths and weaknesses. Further, the model also helps compare and contrast similarities and differences between disparate systems helping to lay the foundation for improved global collaboration and continuous improvement.

Defining Criteria and Maturity Levels for EM-CMM

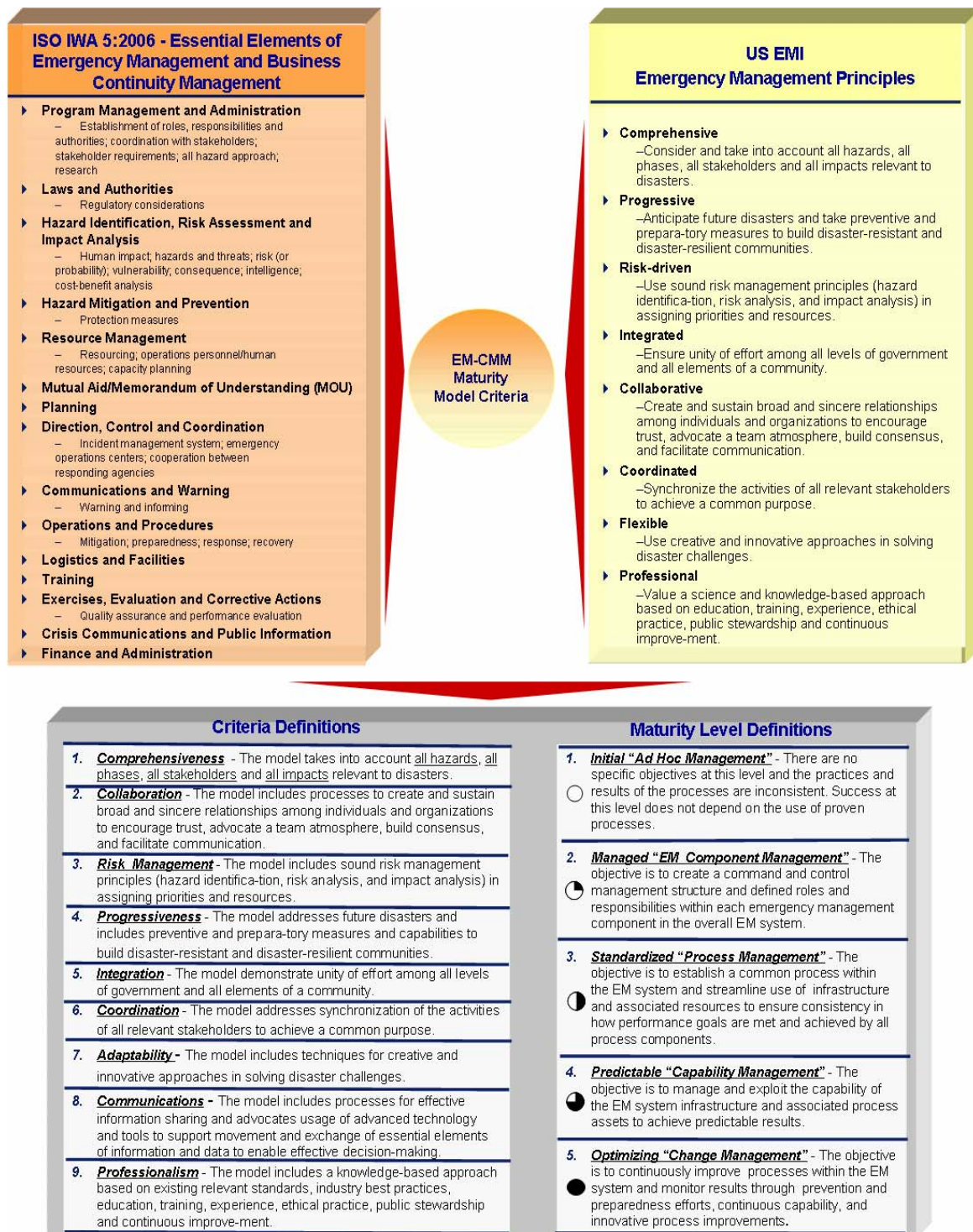
In 2006, the International Standards Organization (ISO) published International Workshop Agreement (IWA) 5, *Emergency Preparedness*, representing the consensus of workshop participants on emergency preparedness and includes recommendations and guidance to ISO for possibly developing international standards on this subject (ISO, 2006). An IWA represents consensus among participants on a specific topic of interest to the standards community that can be further evolved into an international standard by an ISO technical committee, if appropriate. Among several recommendations, IWA 5 includes a list of essential elements of emergency and business continuity management: crisis communications, resource management, incident management systems, hazard identification, mitigation, and prevention.

In 2007, as a result of Hurricane Katrina, the Federal Emergency Management Agency (FEMA) Emergency Management Institute established a working group that proposed eight principles to guide the development of an emergency management doctrine (FEMA, 2007). The working group recognized a precise and accurate description of the scope and nature of the profession of emergency management was critically needed.

Incorporating the concepts from both efforts, we developed an initial set of measurable criteria for an EM-CMM. These criteria and their associated maturity levels are briefly described (Figure 2) in terms of their focus and primary objectives.

Each maturity level comprises a set of goals that, when satisfied, stabilizes critical practices that build upon the preceding maturity level and form the foundation for future improvement. Achieving each maturity level of EM-CMM results in an increase in the capability for a given emergency management system. Organizing EM-CMM into the five maturity levels prioritizes improvement efforts for further maturity. The levels are measured against specific goals contained within the process. At this stage, EM-CMM only provides high-level goals. To fully develop the model, each criterion must include a detailed list of supporting questions (for evaluation) that define and describe the maturity level.

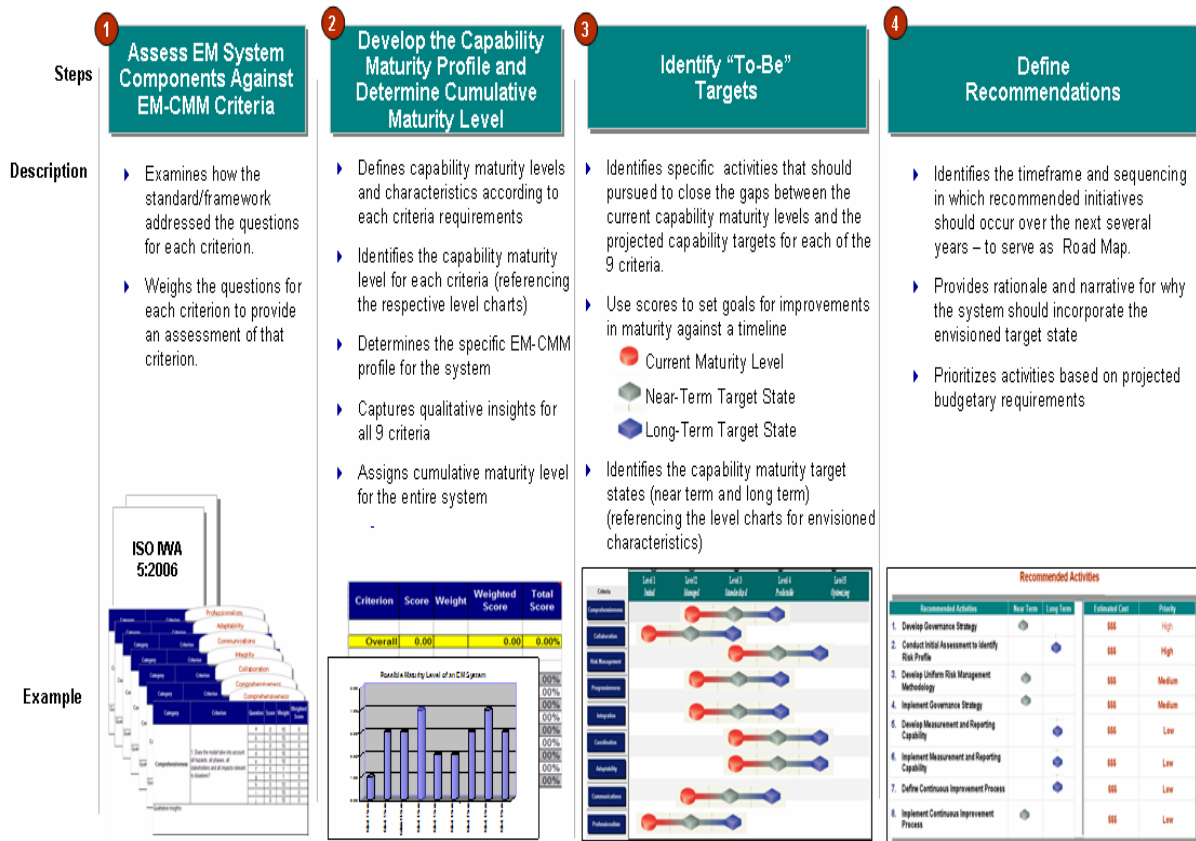
Figure 2: EM-CMM Maturity Levels and Criteria



Emergency Management System Maturity Assessment

Figure 3 illustrates four steps in the application of the EM-CMM, starting with the criteria, profiling the overall maturity level, identifying target end states, and, finally, developing near- and long-term recommendations for improvement to any emergency management system.

Figure 3: Maturity Assessment Methodology



The five maturity levels reflect the unique benefit of the EM-CMM — improving and optimizing existing capability of any emergency management system and establishing a process for efficient development of prioritized, cost-effective solutions for complex disaster management issues. The priorities in EM-CMM, as expressed by these maturity levels, are not directed at individual components of the overall system. Rather, the model focuses on all components — which, when properly aligned, managed, and measured — can significantly enhance the operations of the entire system as a whole.

Implications

Emergency managers recognize that their success depends on an ability to work with a multitude of stakeholders, representing government, business, and civil-sector organizations, with shared interests. Further, in light of the increase in intensity and frequency of global threats, multi-sector involvement is especially great today because such threats hold the potential to produce far-reaching catastrophic, cascading impacts across multiple communities. The most effective way to manage this is by creating partnerships and alliances across organizations, without compromising each organization’s imperatives and legal responsibilities. This type of in-depth, long-term alliance has been dubbed a *megacommunity*: a sphere in which organizations — public, private, and civil — join together to address a compelling issue of mutual importance (Gerenscer, M., 2008). Leaders are attracted to megacommunities because they recognize that many modern challenges — especially those facing emergency and disaster management — are so complex and extensive in terms of the geographic impact that no single organization or even nation can adequately address them alone.

In preparing for disasters, megacommunities have a particularly valuable role to play (Himberger, D., 2007). Historically, the impact of most disasters was localized. Today, especially because of our increasingly interconnected society, the impact extends more broadly. For example, a power outage in one city can disrupt and hamper businesses throughout an entire country or even a continent.

Emergency managers benefit from the scale offered by coordinating regional, national, and international efforts through megacommunities. Diverse stakeholders can more readily share information; track resources and supplies in real time; establish command centers; collaborate on preparedness, training and exercises, recovery and relief operations; and avoid working at cross-purposes. These points can help define a mature emergency management system, and the EM-CMM aids in the assessment of such systems to improve global emergency and disaster management.

3. Applying EM-CMM to Emergency Management Systems

As noted above, there is no recognized standard or guideline for emergency management systems. Further, although current standards and guidelines address different challenges, they do not address them in a complete or integrated manner. The lack of global standards or guidelines impedes successful collaboration among and within various stakeholders and subsequently prevents the realization of comprehensive emergency management systems.

Capability maturity models exist in different applications, most often developed by private corporations to help organizations evaluate specific business processes. These models, however, focus mostly on what process changes must occur but offer very little, if any, guidance on how to achieve these changes to improve maturity.

EM-CMM can be customized to meet the unique needs of any organization and measure specific components of emergency management systems (e.g., supporting financial/procurement processes, IT processes, etc.) The model sets the stage to foster innovations in applying enabling technology. However, the benefits of its application may be diluted by immature emergency management systems and their supporting processes. For example, an organization may have the means to acquire geographic information system (GIS) technology to enhance disaster response and recovery, but does not have an interoperable communications platform that allows for seamless integration with existing architecture. Capability improvements guided by EM-CMM can enable organizations to better exploit people, processes, and technologies to improve comprehensive emergency management systems.

There are four primary ways in which the EM-CMM can be used:

1. **Guiding process improvement programs** – To guide emergency management system improvement programs, resulting in an evaluation of the organization's current capability strengths and weaknesses.
2. **Assessing risk for developing and deploying innovative technologies to support existing EM processes** – To identify risks to the successful implementation of systems (e.g., GIS, emergency communications) and to provide guidance on the actions to be taken to improve them prior to system deployment or integration into an existing framework.
3. **Evaluating the existing capability** – To evaluate internal capabilities for meeting service level, quality, cost, and functionality commitments for disaster and emergency management.

4. **Benchmarking** – To evaluate the relative maturity of one emergency management system to another.

To illustrate the value of EM-CMM, we provide below a notional assessment of an existing emergency management system, indicating areas for improvement that, if enacted, may strengthen the individual components of the system and lead, through a planned sequence of measurable steps, to an increased maturity level.

Although focused herein on a specific system, application of EM-CMM to other existing (or future) emergency management systems can lead to a common understanding of what an individual, organization, or nation needs in order to improve preparedness and better address global threats, thus translating the concept of megacommunity into practice. This information can not only inform emergency management system improvements, but also lead to the development a recognized global standard.

Notional Assessment of the National Incident Management System (NIMS)










Established by a Homeland Security Presidential Directive, the National Incident Management System (NIMS) provides the United States a consistent nationwide template to enable all government, private-sector, and nongovernmental organizations to work together to prepare for, protect against, respond to, and recover from the entire spectrum of all-hazard emergencies (U.S. Department of Homeland Security, 2004). NIMS is an all-encompassing system for disaster-related organizational and inter-organizational functioning and coordination; however, it only addresses a portion of the emergency management lifecycle. NIMS provides a baseline for how to organize the societal response in the aftermath of disasters, and its effectiveness depends on specific characteristics of the disaster and the organizations that use it.

Figure 4 illustrates a notional maturity level for NIMS to demonstrate how one would use EM-CMM to assess and improve any emergency management system. At the top of the figure, we show an overall maturity level for NIMS that is based upon (for the purposes of this paper) a cumulative average of the scores for each criterion in the model. A score is provided for each of nine criteria along with the justification of that score. Essentially this notional assessment reflects steps 1 and 2 in the EM-CMM methodology (as shown in Figure 4).

To complete a detailed assessment of the system under consideration, one needs to perform steps 3 and 4. This notional assessment of NIMS (or of any other emergency management system) is just a snapshot in time. The full value of EM-CMM is derived through continual applications of the model similar to the life-cycle approach endemic to emergency management.

Figure 4: Applying EM-CMM to NIMS

Mapping NIMS Components Against EM-CMM Criteria	Overall Maturity Level***
NIMS	3

NIMS Maturity Scorecard	0	1	2	A	H	Qualitative Insights
	Level 1	Level 2	Level 3	Level 4	Level 5	
Comprehensiveness						Establishes ICS as a standard incident management organization with five functional areas – command, operations, planning, logistics, and finance/administration – for management of all major incidents
Collaboration						Prescribes collaboration protocols and procedures that apply to Federal government, states, territories, cities, counties, and townships, tribal officials, and first responders
Risk Management						Mitigation of risks is limited to public education and outreach, structural modifications to lessen the loss of life or destruction of property
Progressiveness						The system does not address issues related to future disasters
Integration						Integrates best practices, coupled with consistency and national standardization, across all incident management processes to achieve unity of the response
Coordination						The process for synchronization of activities between and among different entities is developed but not fully implemented
Adaptability						Current organizational structure allows for limited creative and innovative approach in solving disaster challenges
Communications						Prescribes standardized interoperable communications systems for both incident and information management
Professionalism						Incorporates incident management best practices developed and proven by thousands of responders and relevant authorities

***Deduced from the weighted cumulative average of individual criteria scores

4. Model Refinement and Implementation

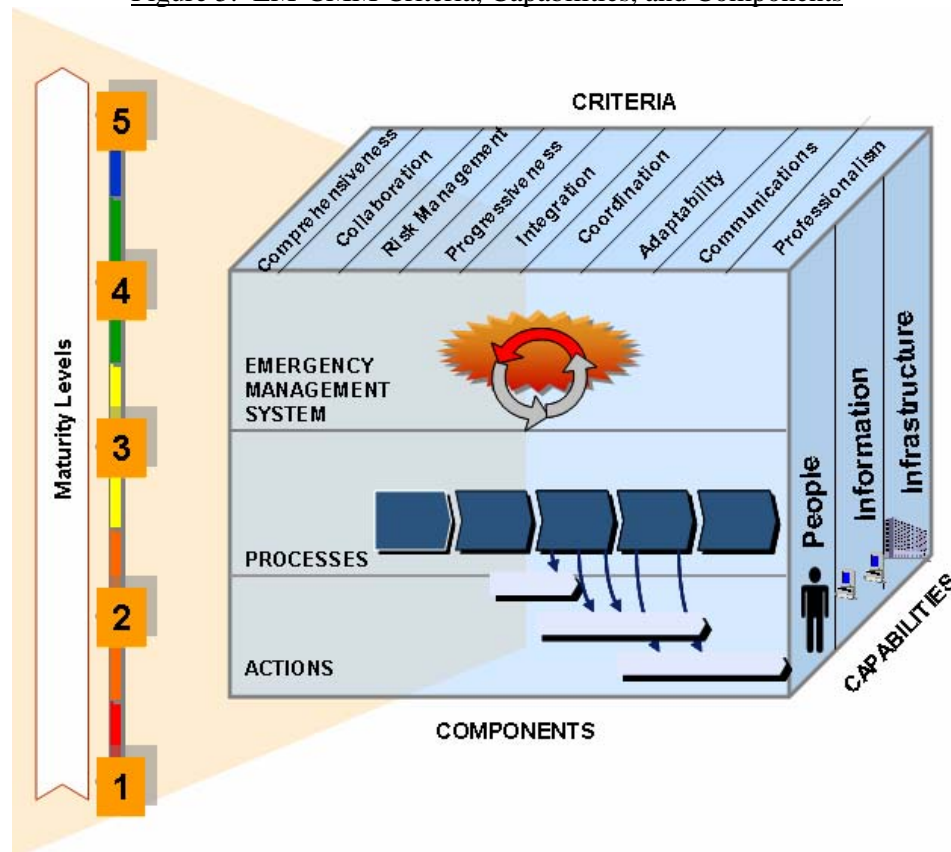
As noted above, current emergency management standards and guidelines lack the required features and functionalities that would support establishment of comprehensive emergency management systems. A capability maturity model for emergency management can support the entire lifecycle — mitigation, preparedness, response, and recovery — filling the current gap and providing important insights and indicators for improving emergency management systems. Such a model needs to take into consideration all global threats and do so through enhanced collaboration, coordination, and communication.

In large-scale disasters, a sweeping variety of conditions, tasks, and resources are involved; identifying and utilizing such conditions, tasks, and resources at a detailed level should be the goal of a continuity maturity model for global emergency and disaster management. Incorporating this level of conditions, tasks, and resources today would provide the basis tomorrow for an effective, useful and practical emergency management system; one which would expand the attention to the full range of mitigation, preparedness, response and recovery.

As mentioned previously, EM-CMM is only presented at a high level. Full development of the model must include a detailed list of supporting questions for each criterion. These supporting questions will provide more comprehensive descriptions of each maturity level. Moreover, they will also give greater insight into *the how*, not just *the what*, is needed to improve emergency management systems.

To preview the possibilities, we present a glimpse into a fully developed EM-CMM that encapsulates all the required activities of global emergency and disaster management (Figure 5) and promotes an establishment of a global megacommunity driven by a common vision.

Figure 5: EM-CMM Criteria, Capabilities, and Components



In the megacommunity concept, the authors found the most effective way to manage emergencies is to create partnerships across public, private and civil sectors and to embrace and empower all organizations as full partners with unique strengths to offer. This approach capitalizes on the very best ideas, ingenuity, and innovation to meet the urgent needs of a global citizenry that arguably faces more frequent and complex disasters than ever before, with less of a clear sense of to whom to turn. Clearly, these points are highly relevant given the recent natural disasters in Burma (Myanmar) and China and their outcomes.

In the United States, implementing EM-CMM would involve tri-sector involvement from government – notably FEMA and its partners – non-government organizations (NGOs), such as the American Red Cross, and industry.

Through the years, these organizations helped shape or promulgate *voluntary* standards and guidelines, including best practices and lessons learned for improved emergency management. However, portions of these standards and guidelines got incorporated into national preparedness programs. For example, DHS stipulated that any applicable grantee seeking FY 2006 homeland security funding needed to perform a self assessment of its evacuation plans, utilizing one of several existing standards, and participate in a peer review

of these plans by former State and local emergency management and homeland security officials prior to receiving these funds.

Chartered in 1900 by the U.S. Congress, the American Red Cross holds an unique and important relationship with the federal government in disaster management both domestically and internationally. In recognition, clear responsibilities for the American Red Cross in mass care and sheltering are incorporated in the National Response Plan, which is administered and coordinated by FEMA.

Finally, the U.S. Office of Foreign Disaster Assistance (OFDA) is responsible for facilitating and coordinating federal government emergency assistance overseas. OFDA apportions a majority of its disaster assistance funding to NGOs, followed by U.N. agencies, other U.S. government agencies, and other international organizations to address priorities in prevention and mitigation, preparedness, recovery, and infrastructure restoration.

All three organizations – FEMA, American Red Cross, and OFDA – work closely with industry partners to develop, deliver and sustain programs across the emergency management lifecycle.

Implementing EM-CMM is best served by a megacommunities approach, focused around a few initial steps:

- Guidance documents should be updated to reflect lessons learned in executing national and international emergency plans during recent catastrophic events.
- Lead government agencies should work together to help foster international standards. Using a phased approach and working through existing programs, certain elements of the EM-CMM could be weaved into current standards and guidelines to elicit more effective and better coordinated response activities among all participating stakeholders.
- National-level exercises should be designed to measure all components of EM-CMM to provide a mechanism for officials from different agencies and different levels of government to jointly review requirements and resources available for disaster management.

5. CONCLUSION

In summary, the proposed EM-CMM is based on the analysis and alignment of existing emergency and disaster management standards and guidelines and conforms to generally accepted governance principles. It is positioned at a high level, covering the full range of emergency management activities, and concentrates on *what* should be achieved rather than *how* to achieve effective governance, management and control. The model is designed to be complementary to, and used together with, existing practices.

Key benefits of the EM-CMM are as follows:

- Leverages other recognized mandates, guidelines, and approaches for emergency and disaster management, reflecting the current state of best practice
- Is not a “one-size-fits-all” methodology; to suit both stable and emergent environments and conditions
- Supports a comprehensive emergency management system through consideration of governance, finance, technology, operations, and human capital
- Is scalable and covers all aspects of emergency and disaster management
- Allows for identification and prioritization of near- and long-term goals to achieve desired maturity target states based on operational and budgetary requirements

- Establishes optimized process for continuous improvement which allows for development of customized and cost-effective solutions to complex disaster management challenges
- Will drive more interest in model-based approaches to capability analysis along with the acceptance of technologies such as GIS and emergency communications, based on future standards. Capability improvements guided by the EM-CMM reduce the risk of implementing new applications and technology. As the probability of success increases, organizations will be willing to invest more in IT.

Finally, the distinctive feature of this model is that it takes into account the arrangement of activities in a logical sequence of steps. It is applicable and based on a series of easy-to-determine factors which are combined in a simple way. The result of this combination and linkage of steps is a comprehensive global emergency and disaster management system.

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