The Search for Collaborative Emergency Management:

Thailand Emergency Response

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The importance of public safety has gained recognition from governments of all countries around the world. Public safety includes how well communities cope with extreme phenomena, such as natural disasters and threats of manmade hazards, as well as how effectively emergency response agencies respond to such crises. The uncertainty and unexpected consequences of these extreme events create severe conditions such as large scale destruction of buildings, dramatic change in geography, destruction of communication and electrical infrastructure, exacerbated by a lack of understanding of risks to which communities are exposed. Natural disasters may create heavy damage across wide areas that require public agencies to work together nationally and locally to manage states of emergency. Such crises require a clear understanding of risks and skillfully coordinated operations to return the situation to normal. Under urgent constraints of time and threat to life, information and communication facilities are critical to enable multiple agencies to coordinate their actions simultaneously and make timely informed decisions. In states of emergency, all participating response agencies need to work together and communicate with each other. This study examines how emergency management policies are implemented in Thailand at national and local levels separately and cooperatively, and what information and communication processes are essential to emergency management.

Key Words: emergency response, emergency management policies, information and communication processes, Thailand

Recent occurrences of natural disasters and severe manmade hazards have increased awareness of the need for effective mitigation and response to such extreme events. States of emergency require multiple agencies to perform multiple tasks simultaneously to return the situation to normal. Unorganized and inexperienced response can delay disaster assistance and recovery processes. This study demonstrates the significant need to systematically integrate intergovernmental coordination, which requires collaboration among emergency agencies through a systematic scalable agency management, and information sharing through communication management. Such integration will enable multiple agencies to perform multiple tasks effectively under time constraint and live threatening.

Extreme events cause devastation and unpredictable impacts, spreading widely across communities, resulting in sudden damage to infrastructure, transportation, communication, property, and losses of life, health, and livelihood. States of emergency require multiple agencies to perform multiple tasks simultaneously to return the situation to normal. Unorganized and inexperienced response can delay disaster assistance and recovery processes. In addition, lack of understanding of risks to which communities are exposed leads to an unprepared state of emergency services to cope with sudden threats and changed conditions. Increasing manpower alone will not be effective in facilitating emergency response operations, if those personnel have insufficient skills and knowledge. A dramatic change in geography and unstable structures make disaster areas more difficult for agencies to access efficiently and coordinate actions with other participating agencies simultaneously without effective communication facilities. The unexpected failure of communication and electrical systems worsens the situation since the agencies could not communicate and update the information. The information and communication facilities are crucial to managing states of emergency especially across a large scale of devastation. Emergency response agencies need sufficient information in order to make more informed decisions, and such information sharing and decision making need to be supported by an efficient communication system.

Intergovernmental management raises the question of what roles and authorities should be assigned to participating agencies individually and cooperatively. States of emergency need to take into account the adaptive capacity of single unit and effective coordination of multi level governmental agencies. The tsunami disaster in six provinces in southern Thailand is a good example of how the national government works with the provincial and local authorities across provincial jurisdictions, while the flood risk and massive accidents in Bangkok reflect how the provincial government manages through its district units and other agencies to respond to states of emergency locally.

With low awareness of tsunami risk and lack of understanding in such states of emergency especially with a large scale of devastation as of 6 provinces along a coastal area, Thai national and provincial governments have many difficulties in working together to provide assistance to damaged communities. Lack of experience in crisis management leads agencies to misinterpret severe risk and creates an unorganized and inadequate response. This study assesses the flood crisis management and massive accident emergency plan of Bangkok as well as response to the tsunami in southern Thailand, expecting to learn of emergency management from Bangkok that emergency personnel has longer and more frequent experience. It seeks to identify the patterns of self organization and adaptation in complex systems in emergency operation. These two approaches explain and clarify the adaptive capacity of organizations to benefit participating agencies and affected communities. Lessons and experiences shared among agencies foster organizational flexibility to adapt to changes and deal with complexity.

1.1 Operations on December 26, 2004

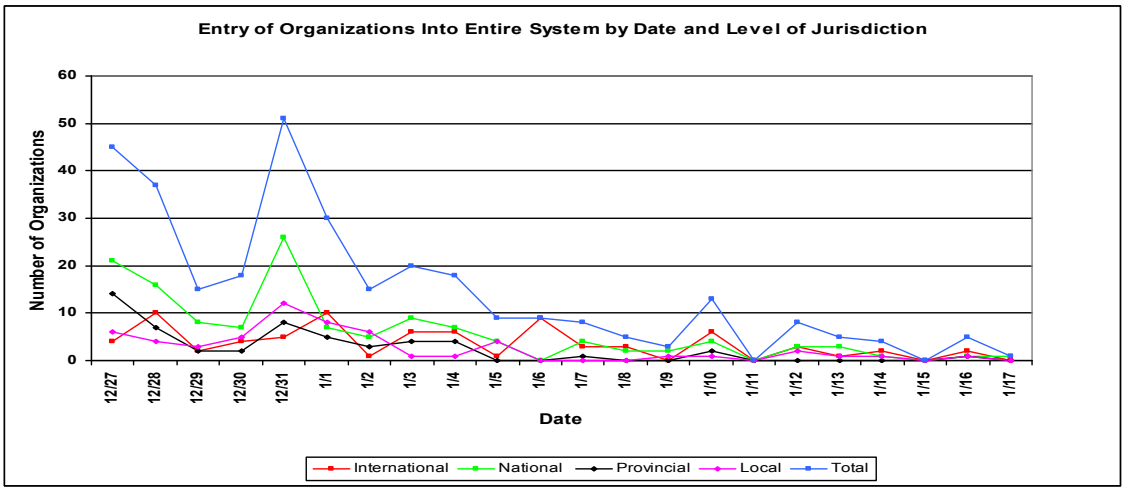
The devastation in southern Thailand from the

December 26, 2004 tsunami was beyond the capability of each affected province to manage. The devastation expanded to six provinces along the southwestern coastline. After the devastation, the geography of some areas in Phuket province and almost all the area in PhangNga province was dramatically changed. It was difficult and complicated to get rescue teams into the area, especially with unskilled and inexperienced personnel. Main roads and bridges were washed away. The entire electrical system was blacked out. Other unexpected impacts were triggered by the first event. When the electricity failed, communication systems went down as well. All agencies worked blindly, physically in the dark, and they could not communicate with each other simultaneously. Radio frequencies as well as cell phone networks were overloaded. During this time, the use of cell phones increased from 3 million connections a day to 33 million connections (Manager Newspaper, March 21, 2005). The lack of communication made it difficult for participating agencies to update the situation and exchange information necessary for coordinating their operations with units from different areas and units. This period of blackout, even though it was shorter than in other areas affected by the tsunami, caused a significant delay in search and rescue.

Phuket and PhangNga are governed in the provincial system under the national government. The governors are appointed by the Minister of Interior. Under a state of emergency, the governor, by the constitution, automatically becomes the head of the emergency operations center of the province. The governor commands the emergency operations and coordinates with all the participating agencies in the area. As ingle provincial system was not capable to respond either to the situation or to coordinate the assistance from neighboring agencies from the other five provinces, since all six provinces shared the same damaged coastline. This limitation signaled to the national government the need to send a national rescue and mitigation team into the area. More equipment, more manpower, and more medical personnel and resources poured, unorganized, into the affected areas like a second wave of water. This lack of organization delayed the rescue and recovery process. The low level of local participation in organizing response and recovery operation sled to misinterpretation of needs for disaster assistance and dissatisfaction with the recovery process. Lack of valid information inhibited the development of trust among emergency agencies, and between citizens and governmental agencies. Distrust, in turn, affected the effectiveness of emergency response coordination.

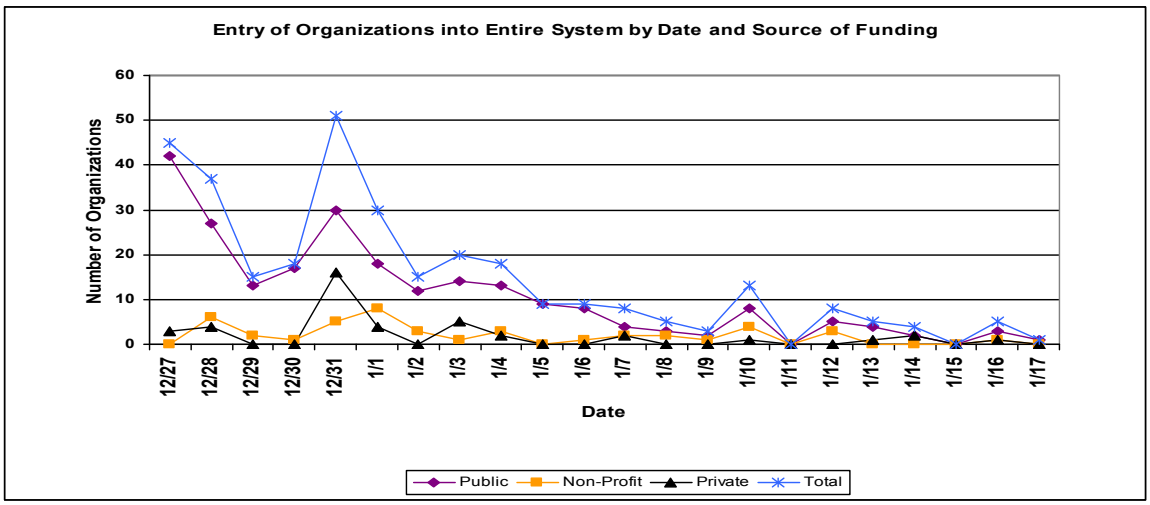
As presented in Figures 1 and 2, the number of organizations entering the response system is categorized by jurisdiction and source of funding. As shown, the number of organization entering the system was very high in the first day and dropped dramatically in the next two days. This drop reflects the difficulties of organizing and managing a large number of organizations in chaos. In addition, the lack of knowledge of the situation and how to deal with states of emergency made it more difficult to manage a single unit, let alone coordinate among multiple units. As reported from interviews and participant observation, many organizations and agencies involved in emergency response on the very first days had no coordination and little effective interaction. New organizations were unlikely to enter the response systematically. Disaster assistance and medical

supplies were therefore delayed or lost in transportation and distribution. Some international organizations, such as private rescue teams from Hong Kong and Korea, managed their operations without initiating any interaction with Thai government agencies or help centers. These organizations entered the target areas where they were informed by local sources of location where it was likely people were present before the tsunami wave, and they proceeded independently with their search and rescue.



Source: Extracted from Thai-Rath Newspaper, Thailand December 27, 2004 - January 17, 2005.

Figure 1 Graph shows the entry of organizations into entire system by date and level of jurisdiction



Source: Extracted from Thai-Rath Newspaper, Thailand, December 27, 2004 - January 17, 2005.

Figure 2 Graph shows the entry of organizations into response system by date and source of funding

The practice of avoiding bureaucratic procedures and confusion during the first days and operating within their own small network was a pattern adopted by international organizations. Several groups of Thai private investors also managed their resources and personnel to response to the damage conditions. They communicated through their private radio networks and had their business network in Bangkokarrange transportation of medical supplies and toolkits. Delivery was arranged by private jets to their temporary contact points. To make the use of private jets efficient, the companies flew over-flight of the area to locate survivors and deliver inter-island necessities before returning to the bases.

In order to better understand how the scalable emergency response operated through national, provincial and local levels, this study focuses its first discussion into the domestic network of tsunami emergency response. The international organizations were excluded from this analysis to provide a measure of the national network.

Given the size of this domestic operational network of organizations, several sets of organizations were combined into a single category. For example, local military units were combined into one organization, the Thai military. With these combinations, the total number of Thai organizations participating in the domestic emergency response network was reduced. As shown in figure 3, the map of domestic organizational interaction lays out the network of the emergency operations conducted. The international domain interaction network will be presented separately to discuss how the international organizations functioned in the emergency operations and how they coordinate and interact among themselves as well as with organizations.

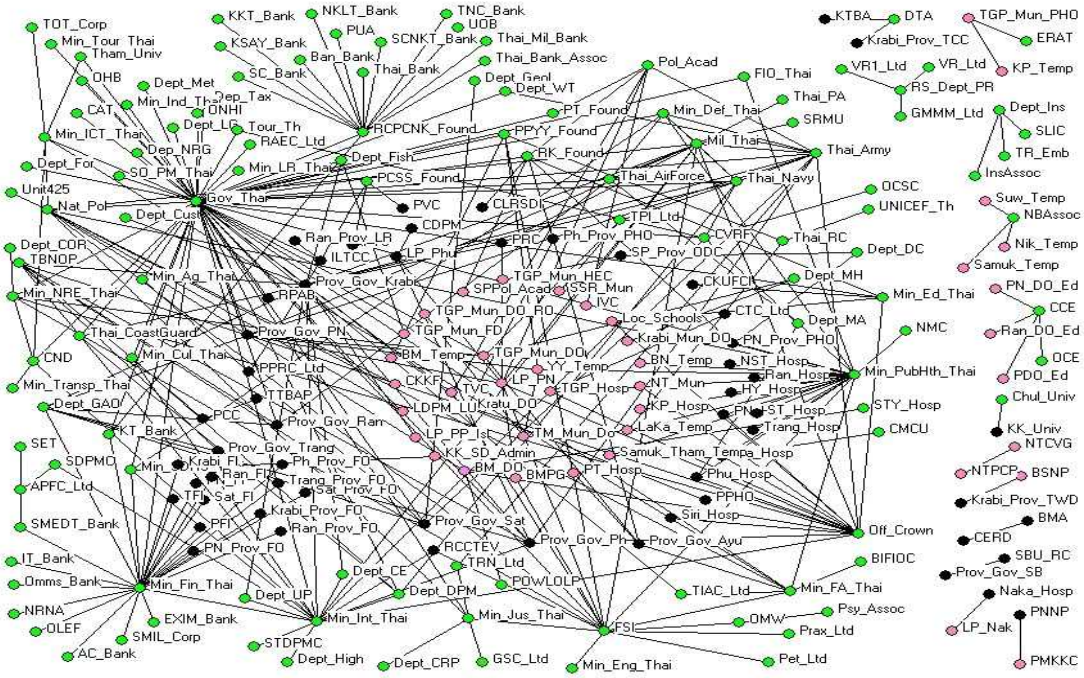


Figure 3 Map of Domestic Organizational Interactions in the Thai Tsunami Response December 27, 2004 – January 17, 2005

Source: Extracted from ThaiRath Newspaper dated December 27, 2004 - January 17, 2005

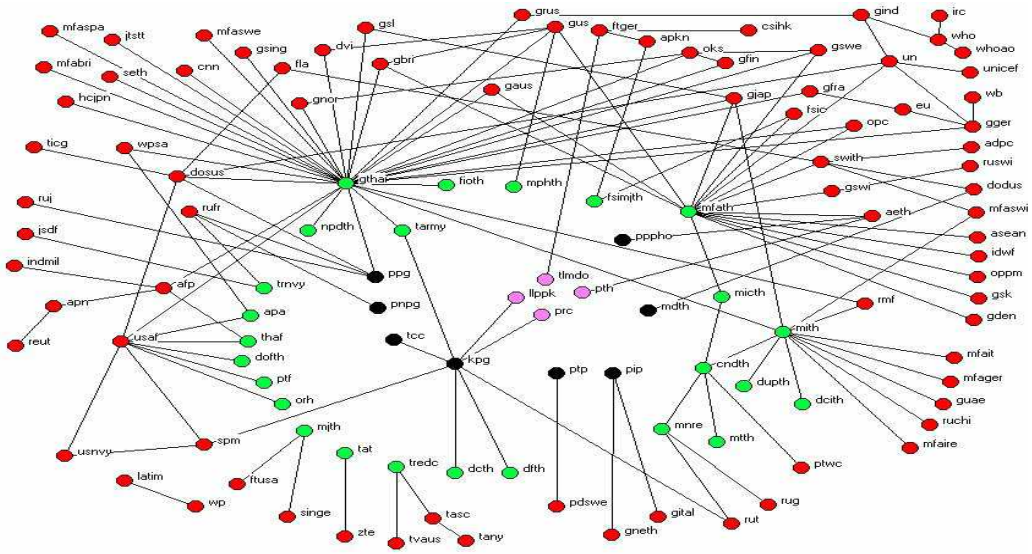
NOTE: (In color, green represents national organizations, black represents provincial organizations and pink represents local organizations) (Scattered dots far right cannot be identified in black and white, please see acronym in Appendix)

From the interaction matrix, circles represent organizations and lines represent interactions between organizations located in four different areas of the map. The first area on the right hand side of the map shows a scatter plot of organizations that interacted outside a main network. In the network, there are three layers of organizations, an outer layer of national organization circling around the edge, a middle layer of provincial organizations, and the center area shows those from local jurisdictions.

The response system appears to be loosely connected, although with many organizations participating, but not necessarily interacting efficiently with one another. Group centrality reflects the operation by function. In addition, a more comprehensive look at the network maps on the right side of Figure 3shows several organizations scattered and interacting outside of the network boundary. Those organizations represent public, private and non-profit sources of funding as well as national, provincial and local levels. This pattern reflects the poor connection and coordination among all levels of agencies. Those organizations entered the system by themselves and chose to interact with fewer organizations to accomplish specific tasks. In their interactions, these organizations frequently interacted with lower or higher levels of jurisdiction. Such interactions are functional. Most of

those organizations finished their operations and withdrew from the damaged area on schedule. Those operations were more likely to be repeated because of lack of feedback and communication difficulties.

Figure 4 shows the interactions of international organizations in the Thai tsunami response system. The analysis includes only the interactions that have at least one international organization involved. The map shows the obvious pattern of interactions among international organizations and Thai organizations. Those interactions were made mostly between international organizations and Thai national agencies. Only two local organizations were directly interacting with international organizations while there were six provincial organizations in the same direct interaction. A visualization of the network map shows the high degree of dependency of international organizations on Thai national agencies to facilitate their involvement in the tsunami response system.



Source: Extracted from ThaiRath Newspaper dated December 27, 2004 - January 17, 2005

NOTE: Acronyms of organizations are spelt out in Appendix

Figure 4 Map of International Organizational Interactions in the Thai Tsunami Response 12/27/2004-1/17/2005

From the content analysis and semi-structured interviews, this study obtained information that many of these governments sent their expert teams, especially in search and rescue, to assist the emergency operations in Thailand. They recognized the lack of skilled emergency personnel and effective equipment in Thailand for complicated tasks resulting from unexpected consequences.

Later, the number of international organizations dropped dramatically because search and rescue operations were limited to authorized personnel only in order to organize a systematic process with feedback. When the significance of bringing those experts and equipment together in a more systematic operation

emerged, the numbers of international organization again increased.

1.2 The Analysis of TSUNAMI Response Management

From the discussions of emergency regulations, structure, organizations, and operations, it is clear that the Government of Thailand plays critical roles in mobilizing response operations as well as connecting the interaction from international organizations through the response network. Furthermore, Ministry of Interior is second in line to command the operations. This complies with the emergency regulation in the constitution that, under state of emergency of a large scale, the Minister of Interior is a commander in chief and the Ministry of Interior becomes a national command center.

The frontline emergency response personnel were the agencies from Department of Disaster Prevention and Mitigation of Regional Center, Provincial Unit and Headquarter in Bangkok, Private Rescue Foundations and Civil Defense Volunteer Units. The response operations were slow and difficult due to lack of information and understanding in such disaster, less experience in dealing with tsunami response and consequence management and the absence of electricity, power and effective communication. Besides, there were many organizations and agencies in the area that tried to work the process of search and rescue without an understanding of how the other units worked. The problems of redundancy and repetition delayed the help to the victims and wasted manpower and resource needed for the operations.

In addition, this study also identifies the significance of knowledge and information sharing, and communication channel to keep DDPM agencies connected among themselves as well as with the other agencies in the response operation in different areas. DDPM personnel in each unit view their frequent interactions with multiple agencies in emergency response operations. Surprisingly, national agencies are ranked the least frequent in interactions with DDPM at regional centers as well as those under the provincial level. DDPM personnel in the tsunami-affected provinces also reported their interaction with the national agencies less frequently than with provincial agencies and private rescue teams. Provincial and local agencies are evidently favored over other organizations interacting in disaster response. Interestingly, the volunteers'interaction with DDPM ranges from the most frequent to less frequent. I examined the importance of volunteers in their role as community representatives.

Most coordination and interaction between DDPM units with others is through their routine work. The second most frequent is the interaction through command and authority. This pattern tells the story of a long traditional management of bureaucracy that still has roots in the agency, although decentralization has been introduced into the system. It will take a long process to move them to interact through assistance, negotiation and persuasion for co-activities and practices. Such actions are still considered a high-profile decision making process which is reserved only for top management. It is also understandable, under emergency constraints, that less powerful and unauthorized personnel are not able to facilitate actions, reallocate resources, or request assistance across their jurisdiction.

The lack of exchange in emergency response skills is

also confirmed by the information regarding training programs reported by organizations in the surveys. DDPM personnel receive training within their organization and are trained individually more frequently than any of the co-training programs provided by their agency or other organizations. The lack of training creates another problem in the lack of understanding of work processes in other response organizations and adaptive skills to compensate or substitute actions for problems that may be caused by those who failed. The purpose of co-training and skills transfer through interaction among the emergency response agencies is to facilitate knowledge and information sharing within the network sufficiently for emergency personnel to react faster and more accurately.

The flow of information consistently identified more than one direction, all ways, and top-down with bottom-up. This indicates the possible existence of feedback from within the organization that can help to evaluate performance and insert new knowledge or solutions for previous problems. Information flow facilitates the dissemination of knowledge and information needed to understand tasks or problems that have not yet been experienced. The variety of directions of information flow assists in effective dissemination. One may argue that the redundancy of information from various source and directions creates confusion. Based on data from this survey as well from interviews regarding what types of decisions were made where and by whom in the organization, it is clear that decisions will still be made primarily by top or middle management personnel.

It is more likely to be middle management personnel at the provincial level who confirm the assumption that the tsunami response system relied very much on decisions made by mid-level managers of provincial agencies. However, lack of timely, accurate information weakened the validity and confidence of their decisions, especially under urgent time constraints that in turn delayed delivery of needed assistance. Although the organization tends to have a decentralized pattern of information flow and its personnel are willing to receive such information, it is critical to provide information that corresponds to the needs of emergency operations and problem solving. Rules and regulations still play a crucial role as guidelines and direction for emergency personnel to follow. From the interviews, most personnel view the use of law, rules, and regulations as directing their actions. In states of emergency for which personnel have less knowledge and experience, it is more difficult for them to make informed and accurate judgments and decisions. The flow of sufficient information and relevant knowledge requires effective database management as well as efficient communication systems to support secure delivery of the information to operations personnel.

Cell phone networks, although very convenient, become congested and unavailable in large scale emergencies. Emergency personnel are unlikely to operate facilities and equipment through satellites and those applications such as Global Positioning System (GPS) and Geographical Information System (GIS). It leaves two alternatives for low radio frequency through local small networks and high frequency radio through HAM or amateur network. In the tsunami response network, I obtained evidence that the local residents preferred to use their mega-phone-network to communicate in their communities, villages and

beach areas while the emergency front line personnel who mostly were local prefer the use of their amateur radio networks. Military and DDPM private radio networks are also activated under emergency conditions. Private organizations also communicated their operations and mobilization through their own radio networks. Interestingly, the information obtained about other equipment used in emergency reported the use of communities'radio network that usually broadcasts communities'news. This radio network can be used as a redundant communication in an emergency especially if the power is down since it uses power supply from the generators.

This study confirms that information sharing and efficient communication channels can expand the cognitive capacity of individuals and their organizations in learning to adapt to complex situations and to make effective decisions under pressure. Emergency response personnel need information that is reliable and actionable in order to maintain command of their operations. The events that occur during a state of emergency are often complex and unforeseen, and emergency personnel must be able to react to change and effectively adapt their response activities. Unfortunately, there are situations where emergency response personnel are unable to communicate the information that is needed to trigger adaptation. While training programs can help to reduce the occurrence of such situations, it is crucial that all emergency response personnel and organizations learn how to effectively manage the communication of information within and among organizations.

Each of these technologies, however, comes with certain limitations that can reduce communication. For example, as discussed earlier, the DDPM emergency personnel surveys revealed that, while cell phones are convenient and handy in large-scale states of emergency, cellular networks often become congested and unavailable. The Civil Defense Volunteer Units report that low frequency radios such as walky-talkies are effective, but can create problems when their personnel operate outside the transmission range of the devices. Alternatively, each District Office possesses special VHF radios, which communicate throughout the provincial government radio network without having to rely upon repeaters. In the event of an emergency, this radio can shorten communication paths between decision-makers and front-line responders. However, this radio can only be used when authorized by the District Deputy. Given these limitations, it is important that emergency response personnel do not rely on any single form of technology or equipment to ensure communication.

Based on the findings from the survey and interviews, I propose to develop a strategic plan for linking these private and special networks of communication together in states of emergency. The most important obstacle that emergency personnel in both public and private organizations, provincial governments, and military confront was how to bring the focal points of contact together. It is not possible to have multiple agencies and multiple teams working in the field without communication among them, even if a command center has representatives of every agency sitting in a war-room, trying to keep one another connected. Each unit operated and communicated within its network to send updates to their personnel. In states of emergency, one single unit cannot work alone. Implementing and coordinating multiple tasks with multiple units and agencies on a large scale area

requires an effective communication system. The activation of special frequencies for radio networks in emergency may be one alternative. Telephone networks of "emergency bridging" through satellite maybe another. These alternatives will be discussed again in the recommendations.

The solution may not depend upon the adoption of expensive and sophisticated technology. While these tools provide amazing capabilities, emergency personnel are unlikely to operate facilities and equipment through satellite phones and applications such as Global Positioning System (GPS) and Geographical Information System (GIS). This leaves three low cost alternatives: low frequency radio used by small local networks; high frequency radio used by HAM or amateur networks; and VHF radio networks used by public and private organizations.

1.3 Moving thailand emergency response to an auto-adaptive response or self-organizing system

Systems operating at the edge of chaos have the potential for creative response to meet suddenly altered conditions of operations in effective ways. Yet, the margin for choice is narrow. Systems that do not move toward creative new actions will slide back toward chaos as their old patterns of performance fracture under the stress. Such systems have a high degree of socio-technical components. This study provides its assessment how to move the two emergency response systems of Thailand to the state of auto-adaptive response system.

1.3.1 Technical Infrastructures

Before discussing how to more effectively position the emergency response infrastructure, I evaluate the new infrastructure already being implemented. The newly established National Disaster Warning Center, Thailand, has been operating through installed 76 warning towers along the southern coastline. Those towers, activated from the national center in Bangkok, are linked to automatically warn people of upcoming threats to life and property. The towers are expected be linked to the alarm systems of every hotel and building so that a warning message will be disseminated. Signs, placed along the beaches, indicate evacuation routes and the nearest emergency facilities and shelters. The Department of Disaster Prevention and Mitigation (DDPM) has been working with the Department of Mineral Resources, provincial governments of the six coastal provinces and municipality administration to develop evacuation maps, plans and building codes.

The Civil Emergency Relief Department (CERD)under Bangkok Metropolitan Administration (BMA) has purchased fire trucks, extinguishers, equipment and designed action plans that serve as a standardized operational manual. Budgetary allocations for the construction of additional fire stations have also been approved. In many places, the construction of these stations has already begun.

This movement toward training and mitigation is a sign that emergency response agencies are attempting to coordinate their infrastructure and their operations. Drills for tsunami evacuations should encourage the DDPM to activate and update their evacuation maps with provincial governments and municipalities. The DDPM information center should reorganize the information and knowledge needed for operations and make sure it is made available to emergency personnel.

The DDPM academy should developcurriculum for co-training programs that encourage all personnel to learn about their equipment, procedures, facilities, risk assessments and action plans for responding to multi-hazards. The BMA should take this opportunity to integrate district officers and volunteers and teach them about the facilities and procedures of CERD and DDPM that are available within and around the area of Bangkok. Regional DPM at the center, located in Bangkok vicinity's area, which is structured as supporting unit for provincial DPM, can help Bangkok emergency personnel to reallocate more resources and personnel in a large scale emergency response. Knowing how to use alternate facilities, learning how the other emergency unit operates, and developing relationship through coordination help emergency personnel and organizations reach for assistance as needed.

1.3.2 Cultural Openness

It is unfortunate that it costs a huge number of deaths for people to recognize how important emergency response is. Willingness to learn is already rooted in the minds of all emergency personnel because they recognize that it is the unknown that caused people to suffer injury. This is evidenced by the significantly different mean scores between the three socio-technical components. As the study previously discussed, the cultural openness of emergency personnel is not driven by the enforcement of law or regulations. It is obviously pushed by the public that confront with an unknown disaster and experience an ineffectiveness of emergency response operations to ensure public safety. It is also emphasized by the emergency personnel's recognition of their lack of knowledge and skill to operate effective emergency responses which can also cost their lives during the operations.

High awareness of risk all parties creates the best opportunity for national and provincial governments to continue improving their emergency personnel and systems. In the practice of public management, culture and willingness to accept change are two of the most difficult factors to alter. Most of the time, policy makers confront difficulties translating policy into practice because of a resistance to change within the personnel who implement such policy and change. International experts and assistance have been offered to the country to enhance the capabilities to understand and manage disaster and emergency response. The establishment of the National Disaster Warning Center represents a big step towards accepting change, new technology, coordination and solving conflicts and mistakes made in the past. The next time they confront a multi-hazard, the DPM, CERD and DO will be better equipped and prepared to learn new knowledge and skills.

1.3.3 Organizational Flexibility

Willingness to change and commitment to improvement can be worthless if the organizations do not provide flexibility in implementing the emergency response. BMA has a good start in designing two systems of single incident command and unified incident command. This will allow emergency response operations and personnel to move towards developing creative solutions if unexpected complications or consequences occur. The other pattern of transferring command to subordinates reflects the decentralized decision making process.

This allows emergency personnel to make their own decisions about the situation at hand. These decision making capabilities are critical because emergency personnel need accurate, timely, and updated information to make informed decisions. DDPM has to focus on the changes within BMA and consider whether these changes can be applied to their system. Co-training programs will help connect their operation and share the information and knowledge needed in the operation into practice. An effective information sharing network needs effective database administration, organizational willingness to share knowledge and information, and efficient communication management to facilitate acquired information to emergency personnel at the time they need.

1.4 Conclusion

The analysis and findings presented throughout this study demonstrates the significant need to integrate intergovernmental coordination, which requires collaboration among emergency agencies through a systematic scalable agency management, and information sharing through communication management. To strengthen their individual and cooperative capabilities to manage crises and emergency response capabilities, emergency agencies need a moderate to high level of technical infrastructure, organizational flexibility and cultural openness Effective interagency emergency response, however, must also take into account the need for multi-jurisdictional cooperation among all actors, whether they are governmental or non-governmental. A self-adaptive system will be managed from the top by national agencies through the operational level of local level actors and communities.

To be effective, the individuals and organizations that operate within an emergency response system must have the ability to learn, cooperate and adapt. The ability to learn supports the management and coordination of operations under the time constraints and life threatening circumstances presented by disasters and complex emergencies. The ability to cooperate though the sharing of information and knowledge assists with building and reinforcing of mutual understanding between the actors within the emergency response system. The ability to adapt strengthens the emergency response network as a whole so that governmental agencies and local communities can better confront the complex problems that arise during extreme events. In such an environment, emergency response personnel will develop tools and techniques that will assist them to make informed policy decisions that affect the safety of the general public.

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