An integrated approach to natural disaster management
Public project management and its critical success factors

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Abstract
Purpose – With an aim to develop an integrated approach for effectively managing natural disasters, this paper has three research objectives. First, it provides a framework for effective natural disaster management from a public project management perspective. Second, it proposes an integrated approach for successfully and effectively managing disaster crises. Third, it specifies a set of critical success factors for managing disaster related public projects.

Design/methodology/approach – A detailed case study of the tsunami was carried out to identify specific problems associated with managing natural disaster in Thailand.

Findings – The investigations reveal that the country lacked a master plan for natural disaster management including prediction, warning, mitigation and preparedness, unspecified responsible governmental authority, unclear line of authority, ineffective collaboration among institutions in different levels, lack of encouragement for participation of local and international NGOs, lack of education and knowledge for tsunami in potential disaster effected communities, and lack of information management or database system.

Research limitations/implications – This study identifies the specific problems associated with natural disasters management based on a detailed case study of managing tsunami disaster in Thailand in 2004.

Practical implications – The proposed integrated approach which includes both proactive and reactive strategies can be applied to managing natural disasters successfully in Thailand.

Originality/value – This paper highlights the importance of having proactive and reactive strategies for natural disaster management.

Keywords Natural disasters, Tidal waves, Project management, Thailand

Paper type Conceptual paper

Introduction
According to the UN International Strategy for Disaster Reduction (UN/ISDR, 2002), there are two main origins of hazards, namely natural and technological disasters. Natural disasters include three specific groups:

1. Hydro-meteorological disasters. Including floods and wave surges, storms, droughts and related disasters (extreme temperatures and forest/scrub fires), and landslides and avalanches.
(2) Geophysical disasters. Divided into earthquakes and tsunamis and volcanic eruptions.

(3) Biological disasters. Covering epidemics and insect infestations.

The technological disasters comprise three groups, which are:

(1) Industrial accidents. Such as chemical spills; collapses of industrial infrastructures; explosions; fires, gas leaks; poisoning; radiation.

(2) Transport accidents. By air, rail, road or water means of transport.

(3) Miscellaneous accidents. Collapses of domestic/non-industrial structures; explosions; fires.

Natural disasters, whether of meteorological origin such as cyclones, floods, tornadoes and droughts or of having geological nature such as earthquakes and volcanoes, are well known for their devastating impacts on human life, economy and environment. With tropical climate and unstable landforms, coupled with high population density, poverty, illiteracy and lack of infrastructure development, developing countries are more vulnerable to suffer from the damaging potential of such disasters (Jayaraman et al., 1997, p. 291). In the UN/ISDR (2002), the higher level of impact was found in terms of number of people killed and economic damages due to natural and technological disasters in developing and least developing countries during 1994 and 2003 (Tables I and II). In Thailand, about 28.9 million people have been affected by the disasters during 1994 and 2003 (UN/ISDR, 2002).

It is commonly agreeable that there is no way of neutralizing all negative impacts resulting from disasters. However, efforts can be made in order to reduce their impacts. In this regard, effective disaster management is a key element in good governance.

<table>
<thead>
<tr>
<th>Development group</th>
<th>Natural disasters</th>
<th>Technological disasters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hydro-meteorological</td>
<td>Geological</td>
</tr>
<tr>
<td>OECD</td>
<td>4.465</td>
<td>2.316</td>
</tr>
<tr>
<td>CEE + CIS</td>
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<td>0.499</td>
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<td>1.567</td>
</tr>
<tr>
<td>Least developed countries</td>
<td>3.399</td>
<td>1.386</td>
</tr>
</tbody>
</table>

**Source:** ISDR (www.unisdr.org)

<table>
<thead>
<tr>
<th>Development Group</th>
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<tbody>
<tr>
<td></td>
<td>Hydro-meteorological</td>
<td>Geological</td>
</tr>
<tr>
<td>OECD</td>
<td>1,82,330.66</td>
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<tr>
<td>CEE + CIS</td>
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<td>544.42</td>
</tr>
<tr>
<td>Developing countries</td>
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<td>20,449.01</td>
</tr>
<tr>
<td>Least developed countries</td>
<td>6,826.91</td>
<td>139.96</td>
</tr>
</tbody>
</table>

**Source:** ISDR (www.unisdr.org)

**Table I.** Average number of people killed per million inhabitants in major world aggregates 1994-2003

**Table II.** Total amount of economic damages reported in major world aggregates 1994-2003 (2003 US $ million)
Disaster management is interchangeably used with the term emergency management. It involves plans, structures, and arrangements established to engage the normal endeavors of governments, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs. Such activities are carried out in an urgent manner when there is an onset of disaster occurrence.

All activities are centered at governmental departments and agencies. In addition, it requires planning, organizing, resource mobilizing, and completing stages (Kelly, 1995), which are similar to public project management. A project is a temporary endeavor undertaken to create a unique product or service while project management is application of knowledge, skills, tools, and techniques to project activities to meet project requirements (PMBOK® Guide, 2004, pp. 4–6). Therefore, disaster management comprises of a unique nature of product and services produced, its temporary nature, and its requirement of knowledge, skills and tools reveal that the disaster management can be explained from a public project management perspective.

This study's unique contribution to the knowledge body of public project management or disaster management is an integrated approach to managing disaster with a basic goal to minimize effectively the impact of the disaster. In addition, basing on lessons learned from managing tsunami disaster impacts, which were recently caused by a hard-hit tsunami in December 2004; the study identifies the problems associated with disaster management in Thailand. Then, comprehensive recommendations are made for those concerned authorities and organizations.

The study's objectives are threefold to:

1. provide a framework for effective natural disaster management from a public project management perspective;
2. propose an integrated approach for successfully and effectively managing disaster crisis; and
3. provide a set of critical success factors (CSFs) for managing disaster related public projects.

This study is organized as follows. The following section reviews a conceptual framework for disaster management. It is followed by case study of recent tsunami disaster in Thailand and identification of specific problems. The next section proposes recommendations for those who are involved in policy making and building institutional capacity.

**Conceptual framework for natural disaster management**

_A what is project management?

A project is a temporary endeavor undertaken to create a unique product or services. Temporary means that every project has a definite beginning and a definite end. A product or service produced may be unique even if the category to which it belongs is large.

According to PMBOK® (2004) project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management is accomplished through:
(1) Initiating. To authorize and define the scope of a new phase or project or that can result in the continuation of halted project work.

(2) Planning. To define the mature the project scope, develop the project scope, develop the project management plan, and identify and schedule the project activities that occur within the project.

(3) Executing and controlling. To complete the work defined in the project management plan to accomplish the project’s objectives defined in the project statement.

(4) Closing or completing. To formally terminate all activities of a project or phase and transfer the completed product to others or close a cancelled project.

The project team manages the work of the projects, and the work typically involves:

- completing demands for scope, time, costs, risks, and quality;
- stakeholders with differing needs and expectations; and
- identified requirements.

*What is disaster management?*

A disaster is a term describing a whole range of distress situations, both individual and communal. These include fires and drowning, earthquake and tornado, epidemics and starvation, heat and cold, rats and *locusts* (Kumar, 2000, p. 72).

There are two types of disasters – exogenous and endogenous. The first refers a process in which biological, economic and psychosocial distress suffered by one section of the community, while material gains and social satisfactions accrue to another. The latter refers to an event in which a community or a society experiences and shares severe danger, injury and destruction, or disruption of the social structure and essential function of the society.

Disaster management includes generic five phases, namely:

1. prediction;
2. warning;
3. emergency relief;
4. rehabilitation; and
5. reconstruction.

Essential activities include:

- mitigation and preparedness;
- response; and
- recovery are conducted in those phases (Jayaraman et al., 1997).

These phases can be further elaborated by referring to UN/ISDR (2002).

(1) Prediction. In this phase, mitigation and preparedness activities are conducted in the prediction phase. This includes structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards and non-structural measures taken in advance to ensure
effective response to the impact of hazards, including the issuance of timely and
effective early warnings and temporary evacuation of people and property from
threatened locations.

(2) Warning. This phase refers to the provision of timely and effective information,
through identified institutions, that allows individuals exposed to a hazard to
take action to avoid or reduce their risk and prepare effective response.

(3) Emergency relief. The provision of assistance or intervention during or
immediately after a disaster to meet the life preservation and basic subsistence
needs of those people affected. It can be of immediate, short-term, or protracted
duration.

(4) Rehabilitation. This phase includes decisions and actions taken after a disaster
with a view to restoring or improving the pre-disaster living conditions of the
stricken community, while encouraging and facilitating necessary adjustments
to reduce disaster risk.

(5) Reconstruction. This phase includes the essential activities conducted are
mitigation, preparedness activities in prediction phase; response activities in
warning and emergency relief phases; and recovery activities in rehabilitation
and reconstruction phases.

• Mitigation activities include structural and non-structural measures
undertaken to limit the adverse impact of natural hazards, environmental
degradation and technological hazards.

• Preparedness include activities and measures taken in advance to ensure
effective response to the impact of hazards, including the issuance of timely
and effective early warnings and the temporary evacuation of people and
properly from threatened locations.

• Response includes the provision of assistance or intervention during or
immediately after a disaster to meet the life preservation and basic
subsistence needs of those people affected. It can be of an immediate,
short-term, or protracted duration.

• Recovery includes decisions and actions taken after a disaster with a view to
restoring or improving the pre-disaster living conditions of the stricken
community, while encouraging and facilitating necessary adjustments to
reduce disaster risk.

Similarities of phases between public project management and disaster management
Turner (1993) defines project as an endeavor in which human, material and financial
resources are organized in a novel way, to undertake a unique scope of work, of
given specification, within constraints of cost and time, so as to achieve beneficial
change defined by quantitative and qualitative objectives. The three essential
features are:

(1) It is unique. No project before or after will be exactly the same.

(2) It is undertaken using a novel process. No project before or after will use exactly
the same approach.

(3) It is transient. It has a beginning and an end.
These features create three pressures:

1. subject to uncertainty;
2. a need for integration; and
3. undertaken subject to urgency.

Therefore, this study conceptualizes the disaster management as public project management, which intends to produce unique products, with a novel process, which has beginning and end. There are life cycle phases in such public project management or disaster management process. A typical project management life cycle consists of initiation, planning, executing, and completing phases (Maylor, 1999) (Figure 1). In the typical project management life cycle, the phases of initiating and planning may include similar activities conducted in prediction phase in disaster related public project management. Similar to activities conducted in executing phase in the project management, warning, emergency relief, and rehabilitation (short-term) activities as well as reconstruction (long-term) activities are carried out in the disaster related public project management. Therefore, a disaster related public project management includes project life cycle phases of prediction, which includes the initiation and planning which are required for the predication phase. After onset of disaster occurrence, executing involves warning, emergency relief, rehabilitation, and reconstruction. Completion tasks are done when completing and transferring reconstruction outputs to stakeholders or clients.

What are differences between public and private projects?
The projects are normally classified according to sources of funds and objectives. Private projects are usually financed by their clients with an objective of profit-oriented. In contrast, public project or development projects are aimed at elevating poverty and living conditions of people Youker (1999). Table III summarizes differentiating characteristics between public and private projects.

![Figure 1. A comparison of project life cycle and disaster management](image-url)
Disaster management can be viewed as public project management. First, the source of funding is mainly from government and international funding agencies. Second, the main objective is not-for-profit oriented with an aim of reconstruction of infrastructures which are damaged during the disaster, and rehabilitation of affected communities and natural resources.

**Differences between crisis and disaster management**
A crisis is a situation faced by an individual, group or organization which they are unable to cope with by the use of normal routine procedures and in which stress is created by sudden change (Booth, 1993). Kumar (2000) argues that the second phase of disaster events includes the emergency and crisis that the community shares the impact and sufferings. Thus, the crisis term may refer to the event when crisis arises whereas disaster management covers wider scope of prediction, warning, emergency relief, rehabilitation, and reconstruction.

**Approaches to disaster management**
In our conceptual framework, there are two approaches for disaster management, namely:

1. pro-active approach; and
2. reactive approach.

Activities that are planned and conducted before the disaster impact with an aim to effectively minimize the adverse impacts of the disasters are called proactive approach. In contrast, activities of responses and recovery are conducted as reactive approach.

**A case study of Thailand’s tsunami disaster management**
On 26 December 2004, across Asia, people in coastal areas in the Indian Ocean and the Andaman Sea were killed by tidal waves caused by the earthquake. They also swept away a huge chunk of the region’s fishing industry and tourism spots that helped put it on the world’s travel map. Measured at 8.9 on the Richter scale with its epicentre near
Sumatra Island, the quake was the most powerful to occur in four decades. The wave heights were at 5 to 6 meter in Phuket West Coast and 11 meter in Phang Nga at Kao Lak. The velocity of attacks was measured at 40 kilometer/hour.

As tidal waves wreak havoc after Sumatra earthquake aftershock in Thailand, Phuket, Phang Nga, Krabi, Satual, and Ranong including two islands namely Phi Phi and Lanta were devastated. The giant waves triggered by an earthquake in Indonesia swept away lives, property and an economy that took decades to build. The Thai government declared a state of emergency in Phuket and declared the area off limits to visitors. Prime Minister Thaksin Shinawatra left by helicopter on the night of 26 December to inspect the damage and held an emergency meeting with top officials in Phuket. Ambassadors from 21 countries were also scheduled to leave for the area last night to help with the evacuation of their nationals (The Nation, 2004). There were 5,303 dead, 3,498 missing, and 8,457 injured and economic damage accounted for 0.03 percent of total GDP. A total of 7,053 houses were damaged.

The main purpose of this session is to critically analyze the experience of managing disaster; to specify problems; and to study lessons learned form tsunami disaster management in Thailand. First, there were no activities conducted for prediction, warning and emergency relief phases that are associated with proactive approach. Mostly the activities carried out through the disaster management in Thailand were only associated with parts of emergency relief, rehabilitation and reconstruction.

This case study reveals that there were specific problems encountered in each of the phases of project life cycle. The main cause of the problems was obviously found that the country lacked a master plan for disaster management. It was coupled with not specified responsible unit for handling disaster management in the national level. The following common problems are found in the disaster management in Thailand.

- lack of a master plan for disaster management in Thailand;
- lack of activities for proactive approach including prediction and warning for disaster occurrences;
- no specific responsible unit;
- slow decision making in national level for emergency relief activities;
- unclear line of command from top to provincial level authorities;
- logistic problems for distributing goods for emergency relief;
- lack of effective collaboration among institutions in different levels;
- lack of encouragement for participation of local and international NGOs;
- lack of education and knowledge for tsunami in potential disaster effected communities; and
- lack of information management or database system.

From the experience of tsunami disaster management, it is found that the lack of proactive approach had caused more damage and dead. The main lesson learned was to encourage more activities for proactive approach. There was a lead-time of 2 hours that should be sufficient to evacuate people in the risk prone communities to mitigate the tsunami. As a result of lack of risk identification system and warning, it had caused more people dead. After the disaster or post-disaster management process, unclear line of authorities, and unspecific responsible authority coupled with slow decision process
An integrated approach to disaster management

What is an integrated approach?

This study proposes an integrated approach that could be adopted to disaster management in Thailand (Figure 2). The integrated approach includes both proactive and reactive strategies. The proactive approach requires identification of risk. Grounding on the risk identified, the activities of:

- mitigation;
- preparedness; and
- partial response in the phases of prediction and warning.

Since, these activities are mainly based on identified risk and thus prediction and estimation of the risk is necessary and critical.

The reactive approach includes assessing impacts and its level. Depending on the level of impacts from disasters, response and recovery activities can be carried out for warning, emergency relief, rehabilitation, and reconstruction phases in the disaster management. Thus, the impact assessment is crucial for successful implementation of the disaster related public project management.

What are activities included in the approach?

Risk identification and assessment is the most critical task in managing disasters (Uitto, 1998). Its continuous assessment, accuracy, quality of information are important inputs for effectively minimize negative impact of disasters. The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency and probability; and also the analysis of the physical, social, economic and environmental dimensions of vulnerability and exposure, while taking particular account of the coping capabilities pertinent to the risk scenarios. Vulnerability measures the conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards (UN/ISDR, 2002). Risk identification and assessment is normally conducted by the key actors of in national, provincial, district, sub-district, and village levels. The principal key stakeholder of the disaster management is the governmental unit, namely Department of Mitigation and Preparedness Center (DMPC). The assessment of impact levels is critical because it can be used for rehabilitation and reconstruction. The main purposes are to identify damage level of disasters effected areas and locations in terms of social, economic, and environmental assessments, to prioritize effected communities for rehabilitation and reconstruction, and to design and plan for implementation of reconstruction process. Levels of impacts can be classified into high, medium, and low. Responsible governmental unit can be in a hierarchal order in:

- national;
- provincial; and
- district, sub-district, and village for high, medium, and low levels of disaster effected areas, respectively.
<table>
<thead>
<tr>
<th>Disaster management phases</th>
<th>Activities conducted</th>
<th>Problems identified</th>
<th>Lesson learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction</td>
<td>None</td>
<td>No risk identification and assessment</td>
<td>There should be a master plan for managing natural disasters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No master plan for disaster management</td>
<td>Application of technology in order to identify and assess risk, e.g. DART Mooring System</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No single agency fully responsible to overall management</td>
<td>There should be policy priorities for disaster management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No stand policy and procedure to manage disasters</td>
<td>There was a lead-time of nearly 2 hours before the tidal waves hit the effected areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No warning was done</td>
<td>Otherwise causalities should be minimized</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Many people do not know what the tsunami is</td>
<td>There should be media such as televisions, and radio stations disseminating information on time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>They lacked educational knowledge on how to escape tsunami</td>
<td>Coordination is essential</td>
</tr>
<tr>
<td>Warning</td>
<td>None</td>
<td></td>
<td>Line of authority should be clear in such emergency situations</td>
</tr>
<tr>
<td>Emergency relief</td>
<td>High ranking officials visiting the areas</td>
<td>Redundant commands given to authorities concerned</td>
<td>More collective efforts should be made</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conflicts among provincial governors</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Confusion and indecisiveness</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Long waiting for commands from supervisors</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Lack of proper coordination among provincial, district, and sub-district administrative officers, NGOs and volunteers</td>
<td></td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Disaster management phases</th>
<th>Activities conducted</th>
<th>Problems identified</th>
<th>Lesson learned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Donations and supplies were mobilized to the effected areas</td>
<td>Problems associated with logistics, database management, telecommunications, and transportation</td>
<td>Logistics plan should be drawn before Database management system should be installed for effective distribution of supplies</td>
</tr>
<tr>
<td></td>
<td>Ministries concerned approved emergency funds withdrawal</td>
<td>Ministry of Finance approved emergency withdrawal on 28 December 14:00</td>
<td>There should be faster action for emergency funds withdrawal</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>MOI appointed an expert for forensic treatment and investigation of dead bodies in Phang Nga on 29 December 2004 at 11:00 am</td>
<td>Conflict between an expert and police department</td>
<td>There should be clear responsible unit for such kind of investigation associated with disasters</td>
</tr>
<tr>
<td></td>
<td>MOI appointed Royal Thai Police as the lead agency in forensic treatment and investigation of dead bodies for all provinces on 5 January 2005 8:00 am</td>
<td>Redundant in investigation of dead bodies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prime Minister assigned Minister of Interior in Phuket, Minister of Natural Resources in Phang Nga, Deputy Minister of Interior in Krabi, and Deputy Prime Minister in Ranong on 26 December</td>
<td>Many different ministries are taking control of the same kind of operations It results in conflict among governmental departments</td>
<td>There should be one centralized authority who could be in command for handling rehabilitation activities For example, Department of Disaster Prevention and Mitigation under MOI should be fully responsible and fully authorized</td>
</tr>
<tr>
<td></td>
<td>PM also assigned Minister and Deputy Minister of Interior and Director General of Department of Disaster Prevention to set up relief operation center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disaster management phases</td>
<td>Activities conducted</td>
<td>Problems identified</td>
<td>Lesson learned</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Natural resources and community based rehabilitation activities</td>
<td>Lack of proper coordination on rehabilitation efforts</td>
<td>There should have been a master plan for local rehabilitation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lack of holistic and integrated local rehabilitation plan</td>
<td></td>
<td>More collective actions should be taken in making efforts for rehabilitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Participatory approach for long-term sustainable development</td>
</tr>
<tr>
<td>Reconstruction</td>
<td>Reconstruction projects are initiated and being implemented</td>
<td>Clear goals and relevant information are not included</td>
<td>Critical success factors for project management for reconstruction were</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Each phases of project life cycle, design, procurement,</td>
<td>unaware</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implementation, operation, and maintenance lack clear goals</td>
<td>Lack of competencies of project managers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and specific information</td>
<td>Lack of coordination among different levels of institutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lack of client participation</td>
</tr>
</tbody>
</table>

**Sources:** Tingsanchali (2005) and Pongquan (2005)
What are gains from the integrated approach?
Managing disasters with the integrated approach can receive valuable gains. First, the proactive approach allows mitigation, preparedness, and warning for disasters before they take place. Natural hazards are normally classified by their onset time. Some are slow-onset and provide lead-time for mitigative action. Slow-onset hazards include droughts, floods, and volcanic eruptions. Other events, such as flash floods, tsunamis, and cyclones, provide little or no lead-time for mitigation and preparedness measures or appropriate warnings. Sufficient lead-time increases the potential for saving lives, livestock, property, and livelihoods of a population at risk. These potentials can be realized as gains when proactive approach is adopted (Table V).

What are critical success factors for successful disaster management?
This disaster management can be conceived as a public project management in which the government is the key stakeholder. There are many challenges ahead of the adoption of the integrated approach in the project management. To complete project successfully, some CSFs must be taken into consideration throughout the project life cycle phases. The project success factors are the circumstances, facts, or influences that are inputs into management systems and can directly or indirectly affect the outcomes of a project (Lim and Mohamed, 1999; Cooke-Davies, 2002). There are ten CSFs that must be carefully taken into considerations in managing disasters. They are as follows:

1. **Effective institutional arrangement.** The effective institutional arrangement is necessary for adopting the integrated approach. And lack of responsible governmental unit will lead to unclear line of authority and delay in decision-making process especially for emergency relief and rehabilitation. The principal responsible government department must be specified and the specific responsible unit must be fully authorized for disaster management in a national level.

2. **Coordination and collaboration.** The effective coordination and collaboration is also critical in successfully managing disasters. There are five different levels of coordination and collaboration among key stakeholders, namely international,

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**Figure 2.**
Level of crisis impacts and key actors

**Note:** DMPC = Department of Mitigation and Prevention Committee

<table>
<thead>
<tr>
<th>Project Life Cycle Phases</th>
<th>Disaster Management Phases</th>
<th>Time</th>
<th>Activities</th>
<th>Legend Actors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiation</td>
<td>Prediction</td>
<td>Before</td>
<td>Mitigation</td>
<td>• National DMPC</td>
</tr>
<tr>
<td>Planning</td>
<td></td>
<td></td>
<td>Preparedness</td>
<td>• Provincial DMPC</td>
</tr>
<tr>
<td>Executing</td>
<td>Warning</td>
<td>During</td>
<td>Response</td>
<td>• District DMPC</td>
</tr>
<tr>
<td></td>
<td>Emergency Relief</td>
<td></td>
<td></td>
<td>• Sub-District DMPC</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation (short-term)</td>
<td></td>
<td></td>
<td>• Village DMPC</td>
</tr>
<tr>
<td></td>
<td>Reconstruction (long-term)</td>
<td>After</td>
<td>Recovery</td>
<td></td>
</tr>
</tbody>
</table>

Legend Actors:
- National DMPC
- Provincial DMPC
- District DMPC
- Sub-District DMPC
- Village DMPC

Impact Assessment & Level:
- Low
- Medium
- High

Note: DPM = Department of Mitigation and Prevention Committee
national, regional, organizational, and project level. Lack of coordination among different level of organizations, including governmental agencies, NGOs, International NGOs, donors was found as common problem (Charoenngam and Leungbootnak, 2005).

3) **Supportive laws and regulations.** The supportive laws and regulations will have positive impact on outcomes of disaster management. There were 34 laws that are related to disasters in Thailand. With such different laws for set for different organizations, and without enforcing them, organizations face role and line of authority confusions (Tingsanchali, 2005). Therefore, supportive laws and regulations must be established and they must be enforced so that it will create enabling environment for managing disasters.

4) **Effective information management system.** Another common problem associated with the management of disasters is lack of essential information among key stakeholders (Charoenngam and Leungbootnak, 2005). This information is vital for planning, early warning, and rehabilitation and reconstruction. Therefore, effective information management system and sharing vital information among key stakeholders are necessary for successful outcomes of the disaster management.

5) **Competencies of managers and team members.** Disaster preparedness will not be effective without the participation of the vulnerable community or target beneficiaries (Newport and Jawahar, 2003, p. 33). The disaster management plan managing disasters is usually done by individual project managers and project team members. Their administrative, conceptual, and technical skills are important for planning, implementing, and managing disaster projects.

<table>
<thead>
<tr>
<th>Natural disaster management</th>
<th>Lead-time</th>
<th>Value of lead-time</th>
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</thead>
<tbody>
<tr>
<td><strong>Slow-onset natural hazards</strong></td>
<td></td>
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<tr>
<td>Drought</td>
<td>3-6 months</td>
<td>Crops/agriculture/water management, food security</td>
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<tr>
<td>Revering flood</td>
<td>3-5 days</td>
<td>Saving lives by evacuation of people and livestock to safe havens</td>
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<tr>
<td>Volcanic eruption</td>
<td>48 hours</td>
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<tr>
<td><strong>Quick-onset natural hazards</strong></td>
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</tr>
<tr>
<td>Tsunami (local)</td>
<td>5 mins</td>
<td>Saving lives by evacuation of people and livestock to high ground</td>
</tr>
<tr>
<td>Tsunami (distant)</td>
<td>3 hours</td>
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</tr>
<tr>
<td>Storm/cyclone</td>
<td>48 hours</td>
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<td>Landslide</td>
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**Source:** APDC (2005)

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**Source:** APDC (2005)
successfully. They can be provided with effective development training to increase competencies or organizations can select people with high competence.

(6) **Effective consultation with key stakeholders and target beneficiaries.** Participation of the clients or target beneficiaries is critical for ensuring successful outcomes. Effective consultation of the project planners with, and among, the key project stakeholders, namely donors, local authorities, implementing agency, target beneficiaries in order to formulate an acceptable project strategy and action plan.

(7) **Effective communication mechanism.** Project success is strongly linked to communication and co-operation between stakeholders. Trust resulting from effective communication between the task managers and the coordinator is the key success factor whereas team cohesion is the second most important factor for project success. In other words, such effective communication is described as a collaborative working relationship. It should be maintained between the project owner and project manager, with both viewing the project as a partnership (Turner and Muller, 2004). Thus, effective communication mechanisms must be established among key stakeholders.

(8) **Clearly defined goals and commitments by key stakeholders.** It is common in international development project that project team management and stakeholders lack commitment (Youker, 1999; Diallo and Thuillier, 2004). A project having clear and exact goal(s) with clearly stated purpose which is accepted by all involved in the efforts, and with having their views are integrated and a clear final date of completion is strongly and significantly relate to project success, find that clear goal and objectives are the most important CSF in their study which captured the “real world” experiences of people active in project management. Thus, project goals must be clearly defined. And key stakeholders must share agreement and commit to them.

(9) **Effective logistics management.** Effective logistics management is necessary before, during, and after the disasters. Most transportation problems stem from transportation bottlenecks, lack of coordination for relief works, and poor national transport infrastructures (port, road, rail, and air). Disaster logistics include people, expertise, and technology. Employing a new technology such as geographic information system and remote sensing tools can enhance capacity to coordinate among organizations for more effective logistics management.

(10) **Sufficient mobilization and disbursement of resources.** A resource planning determines what resources (people, equipment, and materials) are needed in what quantities to perform project activities (PMBOK® Guide, 2004). One of the most commonly found problems associate with projects is “shortage of resources”. Lack of adequate resources and poor or no analysis of major risk factors can lead to a number of problems resulting in termination and suspension of the project (Youker, 1999; Diallo and Thuillier, 2004). “Adequate funds/resources” is found as one of the most CSFs in practice.

**Conclusions**

This study has proposed an integrated approach for disaster management. The integrated approach includes both proactive and reactive strategies aimed for disaster management before, during and after periods. Disaster management can be conceived as public project
management. Similar project life cycle phases are compared between the disaster management and project management. It is common that many developing countries, which are mostly prone to disaster lack proactive strategies for early warning, mitigation and preparedness. When disaster occurs, without the proactive approach, severe damages and devastation resulted in. The last tsunami, which caused many people dead and lost of natural and personal property, has always reminded people of their careless mistakes for disaster risk management. With the integrated approach, lives of many people can be saved. This study analyzes and specifies the problems and discusses the lessons learned from the recent case study of tsunami in the country. To successfully adopt the integrated approach, the set of CSFs identified should be carefully considered for effective disaster management. Above all, the principal stakeholder of the disaster management is the government. Thus, motive and commitment of those political leaders and their willingness to adopt the proposed integrated approach is critical for saving people’s lives, natural resources, and personal property and promoting sustainability for disasters prone areas in the country.

References
Project Management Body of Knowledge Guide Book (2004), Project Management Institute, Newtown Square, PA.


Further reading


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1. Marini Othman, Mohammad Nazir Ahmad, Azizah Suliman, Noor Habibah Arshad, Siti Sarah Maidin. 2014. COBIT principles to govern flood management. *International Journal of Disaster Risk Reduction* **9**, 212-223. [CrossRef]


5. Bingunath Ingrige (1) and Keith Jones (2) Dr, Crawford Lynn, Langston Craig, Bajracharya Bhishna. 2013. Participatory project management for improved disaster resilience. *International Journal of Disaster Resilience in the Built Environment* **4**:3, 317-333. [Abstract] [Full Text] [PDF]


15. Gayani Karunasena. Sustainable Post-Disaster Waste Management: Construction and Demolition Debris, 251-267. [CrossRef]


17. Pablo Maya Duque, Kenneth Sörensen. 2011. A GRASP metaheuristic to improve accessibility after a disaster. OR Spectrum 33:3, 525-542. [CrossRef]


27. Jaime Santos-Reyes, Alan N. Beard. Information Communication Technology and a Systemic Disaster Management System Model 294-308. [CrossRef]