

AN ABSTRACT OF THE DISSERTATION OF

Somrudee Meprasert for the degree of Doctor of Philosophy in Geography presented on September 19, 2006.

Title: The 2004 Indian Ocean Tsunami: Tourism Impacts and Recovery Progress in Thailand's Marine National Parks

Abstract approved:

James W. Good

Gordon E. Matzke

The 2004 Indian Ocean tsunami raised concern among marine park managers and hazard mitigation professionals about the significant impact of major coastal hazards on marine park natural resources and ecosystems. The main reason for this concern is the strong linkage of marine parks and their rich assortment of ecosystem services to coastal community social and economic well-being, particularly as it relates to park tourism. This relationship was examined for marine national parks (MNPs) along Thailand's Andaman coast in the aftermath of the devastating 2004 tsunami.

Four principal issues were examined: the impacts of the tsunami on marine parks and how they affected the tourism economy; the recovery efforts undertaken and their effectiveness; other actions that, if taken, might have improved preparedness and made recovery efforts more effective; and how marine parks might be made more resilient to natural disasters in the future.

The principal method used to address these issues was a Delphi expert opinion process, supplemented by field investigations, interviews, and spatial data collection and analysis. Four specific parks with different degrees of tsunami impacts were selected as a basis for this study.

Direct and indirect tsunami impacts to the business community were judged to have the most significant effects on tourism, followed by the direct impacts of the tsunami on the built environment and associated infrastructure. Social, health and

safety impacts and impacts to natural resources and ecosystems were of lesser importance to the park tourism. However, recovery actions taken to rebuild infrastructure and park-serving facilities inside and outside park boundaries were judged most effective at helping to get park tourism back on its feet; tourism recovery actions associated with natural resources, the business community, and social services were judged to be only moderately effective. Numerous barriers and constraints to marine park tourism recovery were identified, some natural, but most human-caused.

An idealized set of preparedness, response, and recovery actions were also identified and prioritized. These proved useful in designing planning guidelines that will help marine parks evaluate their vulnerability, set priorities for mitigation and preparedness, and become more resilient to hazards in the future.

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The 2004 Indian Ocean Tsunami:
Tourism Impacts and Recovery Progress in Thailand's Marine National Parks

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Somrudee Meprasert

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APPROVED:

Co-Major Professor, representing Geography

Co-Major Professor, representing Geography

Chair of the Department of Geosciences

Dean of the Graduate School

I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes releases of my dissertation to any reader upon request.

Somrudee Meprasert, Author

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LIST OF ABBREVIATIONS

DMIP	Disaster Management and Information Programme
DMCR	Department of Marine and Coastal Resources
DRS	Disaster Prevention Research Institute (DRS), Research Center for Disaster Reduction Systems, Kyoto University
FEMA	Federal Emergency Management Agency
GIS	Geographic information system
ICM	Integrated Coastal Management
IUCN	International Union for Conservation of Nature and Natural Resources
MNP	Marine National Park
MNPD	Marine National Park Division
MONRE	Ministry of Natural Resources and Environment
MPA	Marine Protected Area
NGO	Non Governmental Organization
NPWPCD	National Park, Wildlife and Plant Conservation Department
NOAA	National Oceanic and Atmospheric Administration
PMBC	Phuket Marine Biological Center
SCUBA	Self-Contained Underwater Breathing Apparatus
TAT	Tourism Authority of Thailand
UNEP	United Nations Environment Programme
WTO	World Tourism Organization

LIST OF THAI LOCAL WORDS

Thai	English
Ao	bay or gulf
Hat or Had	beach
Hin	pinnacle
Khao	mountain
Khlong	canal
Ko	island
Laem	cape
Mu Ko	group of islands or archipelago
Nam Tok	waterfall
Na Pha	cliff
Tham	cave

*Dedicated to the memory of a great teacher,
Dr. Suraphol Sudara,
Father of Marine Science studies in Thailand.*

The 2004 Indian Ocean Tsunami: Tourism Impacts and Recovery Progress in Thailand's Marine National Parks

Chapter 1

INTRODUCTION

Earthquakes and tsunamis are powerful forces that cause significant loss of life and property as proved by the Magnitude 9.0 Sumatra Earthquake and the following Indian Ocean tsunami on December 26th, 2004. Human life, economic infrastructure, and natural resources in countries surrounding the Indian Ocean were severely impacted by the tsunami that spread throughout the basin. Approximately 250,000 lives were lost. Millions of people were relocated and are still struggling to re-establish their homes and recover their livelihoods. Overall property damage was estimated to exceed \$10 billion US (UNEP 2005a).

The tsunami hit Thailand's Andaman Coast, part of the 954 kilometer (km)-long Malay Peninsula, between 9:30 and 10:30 a.m. local time. Tsunami waves reached as high as 10.6 meters or 34.8 feet in some areas along this coast (DRS, 2005). Lacking any form of tsunami preparedness, mitigation, and warning systems, the impacts to life and property were immediate, widespread, and severe. In April 2005, the Royal Thai Government reported total casualty numbers at 5,395 dead and 8,457 injured, with an additional 2,822 missing (UNEP 2005a). In addition to the immense loss of lives, economic shockwaves were felt throughout the region's tourism industry and the coastal fisheries sector. These are forecasted to cause a 1.2% decline in the national gross domestic product (GDP) (EIU 2005).

The extreme loss of life and destruction of property and livelihood has significantly raised public awareness among Thais and people around the world about the vulnerability of natural and human environments to natural disasters. These impacts also create a demand, especially among concerned Thais, for more

information about how natural disaster impacts affect the tourism sector—a major contributor to national GDP—and how best to foster recovery. Worldwide, little research has been undertaken on this topic and none as it relates to marine parks and protected areas, which are an important tourist attraction along Thailand's Andaman Coast.

The primary goal of this research is to examine the impacts of the December 26, 2004 Indian Ocean tsunami on tourism in marine national parks in Thailand, including how these impacts were addressed in the year following the disaster (2005) to recover this key resource for the tourism sector. A secondary goal was to develop guidelines for hazard vulnerability assessment and mitigation in order to promote more resilient marine parks and more rapid and effective recovery following future disasters.

To achieve these goals, several objectives were identified along with methods to achieve them. Objectives include exploring the direct and indirect impacts of the tsunami on the Andaman Coast marine national parks, the effects on tourism in these areas, what has been done to recover tourism and what remains to be done, and how all of this information might be used to create a generalized model for assessing risk and vulnerability in marine parks and other marine protected areas.

The primary method for achieving these objectives was a modified Delphi approach to gather and synthesize expert opinions on these issues. This was supplemented by two field investigations by the author (immediately after and one year after the tsunami), review of documents about the event and about disaster mitigation generally, and the organization of spatial data in a geographic information system (GIS) to better understand and visualize impacts and potential mitigation strategies.

Sixteen Thai marine national parks (MNPs) are located in the Andaman Sea. Of these, four tsunami-affected parks were selected as study sites: Ao Phang Nga, Hat Noppharat Thara – Mu Ko Phi Phi, Mu Ko Surin, and Laem Son (Figure 1-1). These study sites were deemed representative of affected parks along the coast given their

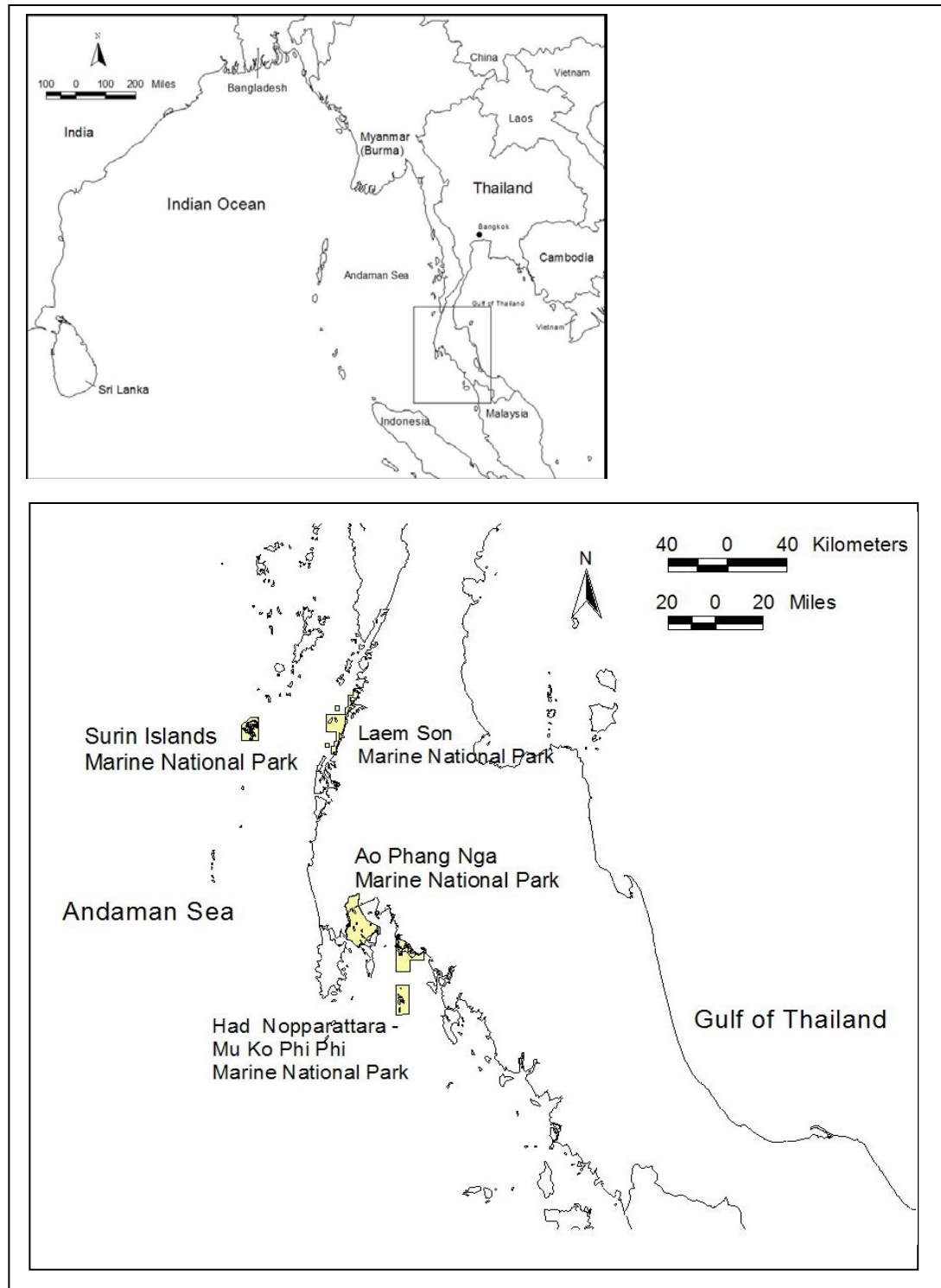


Figure 1-1. Representative MNP study sites selected for this investigation.

protected habitats—particularly coral reefs, one of the parks’ greatest attractions, the differing degrees of tsunami damage, data availability, and the IUCN (International Union for Conservation of Nature and Natural Resources) category (Figure 1-1).

This dissertation is organized as follows. Following this introductory chapter, Chapter 2, the literature review and background chapter, examines a number of topics including marine tourism in Thailand, particularly as it relates to marine national parks on the Andaman coast; the Indian Ocean tsunami of December 24, 2006; the literature on natural hazard and disaster impacts and assessment; and the Delphi technique, one of the principal methods used in this study. Chapter 3, the methodology chapter, describes the study approach in detail, including study goals and objectives and methods for carrying out the study. Chapter 4, the results and discussion chapter, includes an overview of direct and potential indirect impacts of the tsunami on marine parks’ tourism management; presents the results of analysis for each research question; and discusses the results and findings of the research. Chapter 5, the risk and vulnerability assessment technique chapter, outlines a planning approach for assessing park vulnerability and developing strategies for building more resilient MNPs. Chapter 6, the conclusion and recommendations chapter, summarizes the findings of the study and offers suggestions for minimizing negative impacts of natural disaster in marine parks.

Remarks:

A number of caveats apply throughout this dissertation. First, data from a wide variety of sources are used in this study. Much of these data were collected using unique methods, statistics, and formats and thus are often difficult or impossible to compare. These differences are noted in the dissertation where appropriate. Nevertheless, the author found many of the data sets independently useful for the insights they provided.

Economic data are reported in US\$, but because of the impact of the 1997 Asian Economic Crisis on exchange rates, the revenue figures presented in data tables were converted from Thai Baht to US\$ using different exchange rates. Prior to 1997, the estimated currency exchange rate was \$1 equals 25 Thai Baht. Since 1997, the approximate exchange rate is \$1 equals 40 Thai Baht. Another important note is that the revenue figures in some data tables were not calibrated using national and/or global inflation rates. Again, these are noted where applicable.

Given the recent nature of the 2004 Indian Ocean earthquake and tsunami, limited peer-reviewed sources were available for review in this study, e.g., academic journal articles, books, scientific newsletters. The study therefore relies heavily on grey literature, unpublished reports and data from government and NGO sources, and similar information. Every attempt has been made to verify sources, determine and document how the data were collected, and estimate their reliability.

Finally, the metric system of measurement is used throughout this thesis. There are a number of reasons for this. First, most of the map and other data collected for this study were in metric units. Second, the principal audiences and potential users of this study are park officials and marine resource managers in Thailand, all of whom use the metric system. When needed for other applications, the data and results of analysis can be simply transformed to the English system.

Chapter 2

BACKGROUND AND LITERATURE REVIEW

Several avenues of background and literature review are explored here to provide the economic, technical, and methodological groundwork for this study. The nature and importance of tourism in Thailand is reviewed, particularly as it relates to the Andaman Coast. Marine national parks on the Andaman Coast are characterized, including their important and growing role in fostering tourism based on coral reefs and other marine resources. The driver for this research—the 2004 Indian Ocean tsunami—is described in some detail, along with a general description of its impacts on the Andaman Coast and its marine national parks. Studies and methods for assessing natural disaster impacts are also reviewed, including a detailed description of the Delphi technique, the principal data-gathering method used in this study.

2.1 Importance of Tourism in Thailand

Thailand lies in the heart of Southeast Asia and shares borders with Myanmar to the west and north, Laos to the north-east, Cambodia to the east and Malaysia to the south. Its geography played an important role as a buffer zone between the French and the British during their extensive battles over colonized countries in the nineteenth century. Being located between the Indian Ocean and the South China Sea (west end of the Pacific Ocean), its geography not only successfully helped the country avoid domination by foreign powers during the colonial era, but it also provided a well-situated stopover en route to the colonized countries, including Myanmar, Malaysia, Laos and Cambodia. During the colonial era, World War II in the 1940s, and the Vietnam War in 1962-1975, Thailand had been a hub of the region for both sea and air traffic to the colonized countries and to other important battle zones. These war-related visitations for rest and relaxation became the initial source of international tourism to the country (Lan Li Wei Zhang 1997).

Thailand has long been recognized as an agricultural country, with rice production as the backbone of the economy. However, during the past few decades, the tourism sector has transformed the national economic and social structure of the country as a shift from an agriculturally-dominated to service- and industry-dominated economy took place (Figure 2-1). Presently, Thailand's national tourism revenue (classified in service sectors) is the major component of its Gross Domestic Product (GDP) at 46.7%, whereas the agriculture and industry sector contribute 9% and 44.3% to the GDP, respectively (CIA, 2005).

The large and growing tourism sector is not only economically important, it also significantly engages in the country's social structure at both local and national levels, providing a focus for governmental action, training and employment, utilization of nature as tourism resources, and more. Since the Asian Economic Crisis in 1997, the country has heavily utilized tourism as an economic recovery tool. According to Hall and Page (2000), "three national tourism goals stated in Thailand's National Economic and Social Development Plan for 1997-2001 provides clear evidence of tourism's importance in recovering the national economy:

- Foreign currency income to increase by an average of no less than 14 percent per year for all five years of the plan;
- The number of foreign tourist arrivals to increase by an average of no less than 6 percent per year for all five years; and
- The number of Thai tourists traveling in Thailand to increase by an average of no less than 2 percent per year."

Since the regional economic crisis, there have been a number of tourism promotional efforts undertaken by the Tourism Authority of Thailand (TAT). For instance, the "Amazing Thailand" campaign, launched in December 1997, emphasized Thai cultural and natural attractions. The target group for this campaign was international tourists and it was proclaimed a great success. In 2004, the "Unseen Thailand" campaign was launched, but this time was targeted on domestic tourists.

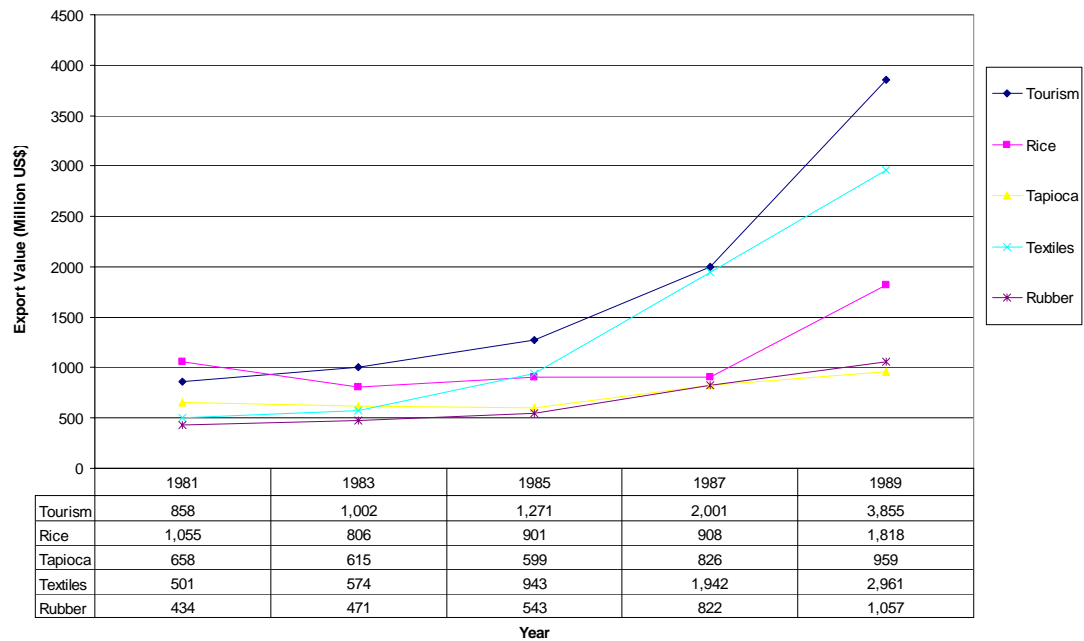


Figure 2-1. Revenue generation from Thailand's export industries 1981-1989 (Million US\$) (Data Source: TAT (1988) cited in Lan Li Wei Zhang, 1997) (1\$ = 25 Baht, approximately).

This campaign aimed to encourage Thai people to travel or have a vacation within Thailand rather than travel abroad. These and other national tourism promotional campaigns have increased the number of tourists to the country and its attractions at a rate of about five percent each year from 1996 to 2003 (TAT 2005). Despite the host of instabilities affecting global tourism in 2005—terrorism, rising oil prices, the Indian Ocean tsunami, other natural disasters, the Severe Acute Respiratory Syndrome (SARS) epidemic in Asia, and other economic uncertainties, the number of international tourists arriving in Thailand was projected to reach 13.38 million people and generate 450,000 million Baht (\$11,250 million US, around \$841 per person per visit) in national revenue (Table 2-1). A variety of data sets that used different calculation methods were compiled by TAT to construct this table, so data for different years are only loosely comparable.

Table 2-1. Actual and forecasted international and domestic tourism in Thailand, 1996-2005 (Courtesy of Tourism Authority of Thailand (TAT 2005)).

Year	International						
	Tourist		Average	Average Expenditure		Revenue	
	Number	Change	Length of Stay	/person/day	Change	Million	Change
	(Million)	(%)	(Days)	(US\$)	(%)	(US\$)	(%)
1996 ^{/1}	7.19	+3.46	8.23	148	+0.34	8,775	+14.99
1997 ^{/1}	7.22	+0.41	8.33	92	-0.92	5,519	+0.63
1998 ^{/1}	7.76	+7.53	8.40	93	+1.12	6,054	+9.70
1999 ^{/1}	8.58	+10.50	7.96	93	-0.23	6,325	+4.48
2000 ^{/1}	9.51	+10.82	7.77	97	+4.23	7,132	+12.75
2001 ^{/1}	10.06	+5.82	7.93	94	-2.93	7,476	+4.83
2002 ^{/1}	10.80	+7.33	7.98	94	+0.16	8,087	+8.17
2003 ^{/1}	10.00	-7.36	8.19	94	+0.55	7,732	-4.39
2004 ^{/2}	12.00	+19.95	8.00	100	+5.97	9,600	+24.16
2005 ^{/2}	13.38	+11.50	8.10	104	+3.75	11,250	+17.19
Year	Domestic						
	Thai Visitor		Average	Average Expenditure		Revenue	
	Trip	Change	Length of Stay	/person/day	Change	Million	Change
	(Million)	(%)	(Days)	(US\$)	(%)	(US\$)	(%)
1996 ^{/1}	52.47	+0.40	2.22	53	+6.41	6,293	+6.20
1997 ^{/1}	52.05	-0.78	2.31	37	+11.58	4,510	+14.66
1998 ^{/1}	51.68	-0.72	2.37	38	+3.18	4,697	+4.16
1999 ^{/1}	53.62	+3.02	2.43	38	+2.26	5,079	+7.42
2000 ^{/1}	54.74	+2.08	2.48	43	+12.79	5,263	+3.61
2001 ^{/1}	58.62	+7.09	2.51	43	-0.89	5,593	+6.28
2002 ^{/1}	61.82	+5.45	2.55	42	-0.77	5,883	+5.19
2003 ^{/1}	69.36	+12.20	2.61	46	+7.98	7,250	+23.22
2004 ^{/2}	73.18	+5.51	2.65	47	+3.87	8,058	+11.14
2005 ^{/2}	76.25	+4.19	2.65	49	+3.69	8,683	+7.76

Note: /1=Actual

/2= Forecasted

Approximate exchange rate: <1997: 1US\$ = 25 Baht; 1997 – 2005: 1US\$ = 40 Baht

2.1.1 Coastal and Marine Tourism on the Malay Peninsula

Among Thai tourism destinations, coastal and marine settings provide a diversity of popular tourist attractions—beautiful beaches, traditional cultures, water sports, and easy-to-access coral reefs, mangrove forests and tropical environments that promote nature-based experiences and adventure. These attractions generate about 70% of the total national tourism revenue in Thailand (Sethapun, 2000). The majority of this

revenue comes from tourism along the Malay Peninsula. This southern peninsula, especially the Andaman Coast to the west, is one of the most fascinating destinations in the country, evidenced by large numbers of passengers at Phuket International Airport.

There are five international airports in all of Thailand: Bangkok, Chiang Mai, Chiang Rai, Hat Yai (on the east coast of the Malay Peninsula), and at Phuket (on the Andaman Coast) (Figure 2-2). Among these, Phuket International Airport on the west coast of the Malay Peninsula ranks second among the five in terms of passenger and cargo volume (AOT 2005). Currently, 10 airlines fly more than 20,000 flights into and out of Phuket International Airport per year, carrying 2.9 million passengers and handling some 12,000 tons of cargo. As an international port of entry, it ranks second after Bangkok International Airport (AOT 2005).

Phuket's airport serves international tourists from countries all over the world that come to enjoy the tourism activities along the Andaman Coast. This area is one of the most important tourism resources of the country, including world famous beaches on Phuket Island and the nearby provinces of Ranong, Phang Nga, Karbi, Trang, and Satun. These beaches and the wide range of tourist services they offer attract millions of tourists each year, ranging from world class hotels on white sandy beaches to relatively primitive, isolated marine national parks on offshore islands. The former, of course, attract mass tourism charters and individuals who prefer western amenities and a high degree of comfort, while the latter attract "nature-based" tourists who are looking for outdoor adventure with few traditional comforts (Smith 1989; Eagles et al. 2002).

2.1.2 Role of Marine National Parks (MNPs) in Malay Peninsula Tourism

Diverse tropical marine ecosystems in Thailand have long served as essential natural resources for the densely populated countryside. These uses are consumptive, fisheries, for example, and non-consumptive, such as tourism amenities and recreational opportunities. Interest in marine conservation, however, is a fairly recent

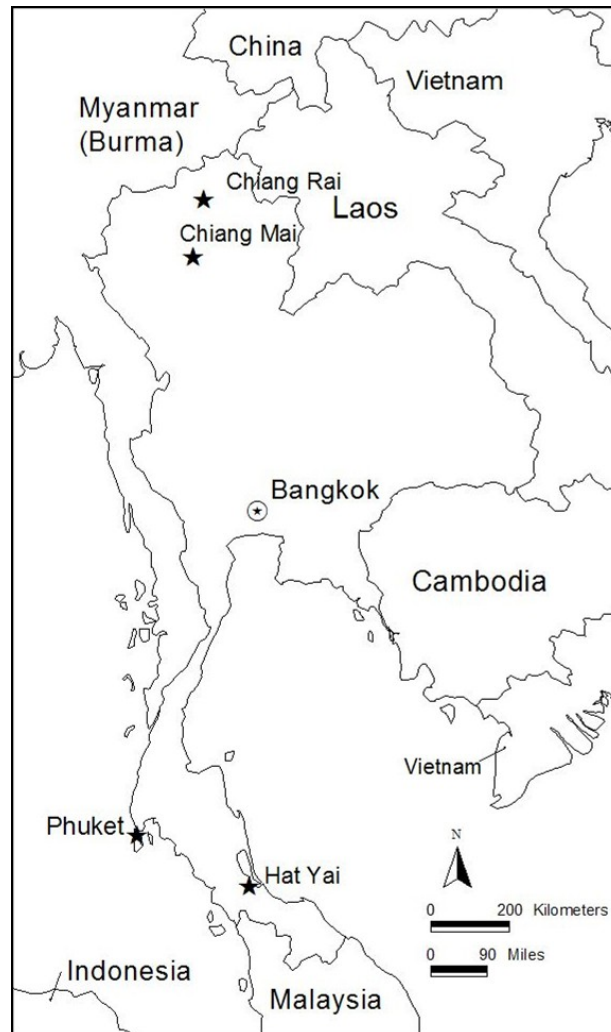


Figure 2-2. Five international airports operated by Airports of Thailand Company Limited: Bangkok, Phuket, Chiang Mai, Chiang Rai, and Hat Yai.

phenomenon. Khao Sam Roi Yot, located on the east side of the Malay Peninsula is a good example. It was Thailand's first marine national park, established in 1966. However, it was not until 1993 that the Marine National Park Division (MNPd) was separated from terrestrial park management (MNPd 2002a).

Presently, there are 21 marine national parks in Thailand, all of which originally were traditional national parks. Few, however, had comprehensive management plans that took marine resources into account. Of these MNPs, 16 are located on the west side of the Malay Peninsula—the Andaman Sea coast, and

together cover 4,821 km² (1,861 square miles), including both marine waters and coastal lands (Sethapun 2000). Although these MNPs cover less than one percent of Thailand's total land area (514,000 km²) and even less of its Exclusive Economic Zone (EEZ), they provide significant resource protection areas for important marine ecosystems and habitats, including pristine beaches, world-class coral reefs, mangrove forests, seagrass beds, as well as adjacent watersheds. These parks thus play an important role in protecting the marine biodiversity of Thailand, as well as supplying valuable opportunities for coastal and marine tourism, scientific research, and public education. The habitats and other characteristics of individual Andaman Coast MNPs are detailed in Tables 2-2 and 2-3.

These park characteristics show the range of unique habitats protected by MNPs on the Andaman Coast as well as the niches they provide for local tourism businesses. Among all coastal and marine habitats, however, coral reefs tend to provide some of the most sought after nature-based tourist experiences, particularly snorkeling and SCUBA diving, where divers get to explore magnificent coral formations, exotic fish assemblages, and a myriad other marine life.

According to the National Park, Wildlife and Plant Conservation Department (NPWPCD) (Sethapun 2000), "over 50 percent of all coral reefs in Thailand are protected within MNP boundaries, including Mu Ko Surin, Mu Ko Similan, Mu Ko Lanta and Mu Ko Chang [in the Gulf of Thailand]. Coral reefs within these parks are in better physical condition and have much higher species diversity and abundance than in other coral reef areas outside these park boundaries." Not surprisingly, these sites attract marine tourists and SCUBA divers from all over the world.

The actual numbers of tourists visiting MNPs on the Andaman Coast have fluctuated in recent years, mostly decreasing. Data from October 2000 to September 2004 are illustrative (Table 2-4 and Figure 2-3). Visitor numbers to the region have followed global tourism trends, due to reasons noted earlier—increasing fuel costs, natural disasters, the SARS epidemic in Asia, and terrorism, often aimed at tourists.

Table 2-2. Andaman coast marine national parks: establishment and areas (Source: Sethapun 2000; UNEP-WCMC 2005).

Marine national park	Total areas (km ²)	Marine areas (km ²)	Year established
1. Tarutao	1,490	1,264	1976
2. Thaleban	196	2	1980
3. Ao Phang Nga	400	347	1981
4. Mu Ko Surin	135	102	1981
5. Sirinath	90	68	1981
6. Hat Chao Mai	231	137	1981
7. Mu Ko Similan	140	124	1982
8. Hat Nopharat Thara - Mu Ko Phi Phi	388	326	1983
9. Laem Son	315	267	1983
10. Mu Ko Petra	494	468	1984
11. Khao Lam Pi - Hat Thai Muang	72	0	1986
12. Mu Ko Lanta	134	109	1990
13. Khao Lak-Lamru	125	0	1991
14. Tarn Boke Koranee	104	0	1998
15. Lam Nam Kraburi	160	64	1999
16. Mu Ko Phayam	347	Na	2000
Total areas (estimated)	4,821 km ² (1,861 square miles)		

Table 2-3. Andaman coast marine national parks: habitats, attractions and activities (Source: MNP 2002b; NPWPCD 2005a).

MNP name	Habitats	Attractions	Activities
1. Tarutao	Fm, Is, Il, Sc	<ul style="list-style-type: none"> • Historic jail • Sea cliffs • Islands • Beaches • Coral reef 	Ac, Bk, Ck, Cg, Cm, Cu, Hk, Hs, Sd, Sn, Wf
2. Thaleban	Fm, Ft, Il	<ul style="list-style-type: none"> • Sea caves • Lagoon • Swamps • Waterfalls • Natural trails 	Br, Ck, Cg, Hk, Hs, Wa, Wf
3. Ao Phang Nga	Fm, Ir, Is, So, Sb	<ul style="list-style-type: none"> • Historical Island • Limestone mountains • Beaches • Islands • Coral reef 	Ac, Ck, Cg, Cm, Cu, Hs, Rf, Sn

Table 2-3. Andaman coast marine national parks: habitats, attractions and activities (Source: MNPD 2002b; NPWPCD 2005a) (continued).

MNP name	Habitats	Attractions	Activities
4. Mu Ko Surin	Fm, Ir, Is, Sc	<ul style="list-style-type: none"> • Sea gypsies • Beaches • Many diving Spots • Natural trail • Coral reef 	Ac, Br, Ck, Cm, Cu, Sd, Sn
5. Sirinath	Fm, Ir, Is, So, Sc	<ul style="list-style-type: none"> • Beaches • Islands • Coral reef 	Ac, Sd, Sn
6. Hat Chao Mai	Fm, Is, Ss, Sc	<ul style="list-style-type: none"> • Hot springs • Beaches • Natural trails • Islands • Coral reef 	Ac, Ck, Cg, Cm, Rf, Sn
7. Mu Ko Similan	Ft, Is, So, Sc	<ul style="list-style-type: none"> • Beaches • Islands • Natural trail • Coral reef 	Ac, Cm, Hk, Sd, Sn, Wa
8. Hat Nopharat Thara - Mu Ko Phi Phi	Fm, Ir, Is, So, Sc	<ul style="list-style-type: none"> • Pre-Historic paintings in caves • Seashell fossil platform • Beaches • Islands • Mountainous natural trail • Coral reef 	Ac, Ck, Cg, Cm, Hk, Hs, Rc, Sd, Sn, Wf
9. Laem Son	Fm, Ir, Is, If, Sc	<ul style="list-style-type: none"> • Beaches • Islands • Coral reef 	Ac, Br, Cm, Sd, Sn
10. Mu Ko Petra	Fm, Is, Sc	<ul style="list-style-type: none"> • Beaches • Islands • Natural trails • Coral reef 	Ac, Cm, Ck, Hk, Sc, Sn
11. Khao Lam Pi - Hat Thai Muang	Fm, Ft, Is	<ul style="list-style-type: none"> • Beaches • Biking Trail • Historical giant mining machine • Sea turtle hatchery • Waterfalls 	Ac, Bk, Cm, Hs
12. Mu Ko Lanta	Fm, Is, Sc	<ul style="list-style-type: none"> • Beaches • Islands • Natural trails • Coral reef 	Ac, Cm, Sd, Sn,
13. Khao Lak-Lamru	Ft, Ir, Is	<ul style="list-style-type: none"> • Beaches • Waterfalls • Natural trail 	Ac, Hk, Wf
14. Tarn Boke Koranee	Fm, Ft, Is, Sc	<ul style="list-style-type: none"> • Pre-Historic paintings in caves • Limestone mountains • Waterfalls • Sea caves • Islands • Natural hiking trails 	Ac, Ck, Cg, Cm, Hk, Hs, Wf

Table 2-3. Andaman coast marine national parks: habitats, attractions and activities (Source: MNPD 2002b; NPWPCD 2005a) (continued).

MNP name	Habitats	Attractions	Activities
15. Lam Nam Kraburi	Fm, Ft	<ul style="list-style-type: none"> • Hot springs • Caves • Waterfalls • Dense mangrove forest 	Ac, Br, Ck, Cg, Cm, Cu, Hk, Hs, Mb, Rf, Wf
16. Mu Ko Phayam	Fm, Ft, Ie, Is	<ul style="list-style-type: none"> • Historical Island • Beaches • Islands • Dense mangrove forest 	Ac, Ck, Cg, Cm, Cu, Hs

Key to MNP habitats and activities in Table 2-3.

Forested Habitats	Fm	Mangrove
	Ft	Subtropical/tropical moist
Intertidal Habitats	Ie	Estuarine waters
	If	Intertidal mud, sand or salt flats
	Ik	Karst and other subterranean hydrology
	Il	Coastal brackish/saline lagoons
	Im	Intertidal marshes
	Ir	Rocky shore
	Is	Sand, shingle or pebble shores
Sea Habitats	Sb	Shallow bays and straits (less than 6m deep at low tide)
	Sc	Coral reef
	So	Open sea
	Ss	Seagrass
Activities	Ac	Activities on Beach
	Bk	Biking
	Br	Bird Watching
	Cg	Cave/Geological Touring
	Ck	Canoeing-Kayaking
	Cm	Camping
	Cu	Cultural Sight Seeing
	Hk	Hiking
	Hs	Historical Sight Seeing
	Mb	Mineral water bathing
	Rc	Rock Climbing
	Rf	Rafting
	Sd	Scuba Diving
	Sn	Snorkeling
	Wa	Wild animal watching
	Wf	Wild flowers seeing

Table 2-4 Tourists visiting MNPs on the Andaman coast, 2000-2004 (Data Source: NPWPCD 2005b).

Marine National Park	2000	2001	2002	2003	2004	Average/Year
1. Tarutao	15987	15933	23539	31159	41253	25,574
2. Thaleban	38083	58853	45551	52603	59143	50,847
3. Ao Phang Nga	156255	310311	223610	212454	239980	228,522
4. Mu Ko Surin	9516	15492	23732	27489	36166	22,479
5. Sirinath	77503	105284	162607	144015	142581	126,398
6. Hat Chao Mai	233834	115436	121603	133574	225425	165,974
7. Mu Ko Similan	17743	40839	49438	50049	71828	45,979
8. Hat Nopharat Thara - Mu Ko Phi Phi	316691	230282	126338	89705	183546	189,312
9. Laem Son	9316	15308	18027	12488	19241	14,876
10. Mu Ko Petra	93137	94294	70327	66562	55137	75,891
11. Khao Lam Pi - Hat Thai Muang	71693	70936	70447	73151	63157	69,877
12. Mu Ko Lanta	34055	32993	23105	20529	43451	30,827
13. Khao Lak-Lamru	19490	17746	15402	18203	17811	17,730
14. Tarn Boke Koranee	230859	314321	90351	119632	90549	169,142
15. Lam Nam Kraburi	29235	55189	37954	5020	605	25,601
16. Mu Ko Phayam	2052	3083	1293	2301	4551	2,656
Total	1,355,449	1,496,300	1,103,324	1,058,934	1,294,424	

Although MNPs visitation has fluctuated, the total number of visitors has exceeded a million people each of these years. The top five visited MNPs are 1) Ao Phang Nga, 2) Hat Nopharat Thara - Mu Ko Phi Phi, 3) Tarn Boke Koranee, 4) Hat Chao Mai, and 5) Sirinath, respectively. All of these MNPs are located on the mainland or on islands that are easily accessible. On the other hand, the least-visited MNPs are 1) Mu Ko Phayam, 2) Laem Son, 3) Khao Lak-Lamru, 4) Mu Ko Surin, and 5) Tarutao. Although Mu Ko Surin and Tarutao offer some of the finest nature-based adventures, their comparative isolation and inaccessibility play an important role in limiting the number of visitors.

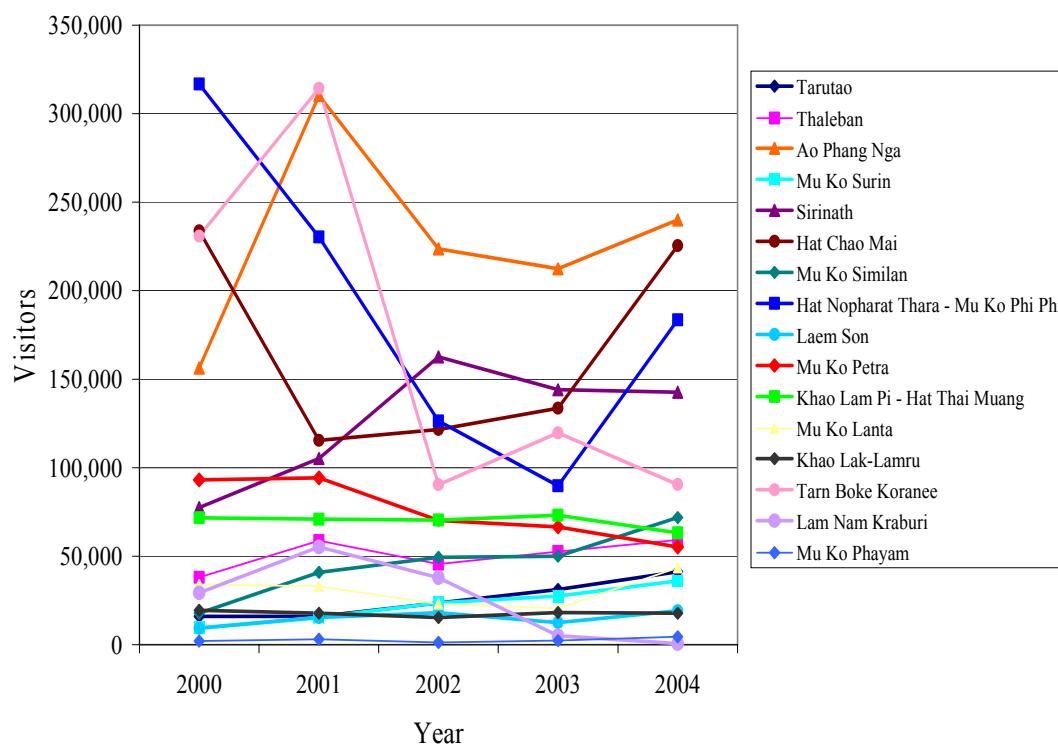


Figure 2-3. Visitors to Andaman Coast, Thailand Marine National Parks, 2000-2004 (Source: NPWPCD 2005b).

Although comparisons among very different sources of data may not be entirely justified, it is interesting to note that in 2003, for example, there were about 2.9 million passengers who arrived at Phuket International Airport (AOT 2005). According to the NPWPCD (2005b) (Table 2-4), 1.06 million tourists visited the Andaman coast MNPs that year. Thus, as many as 40 percent of passengers who arrived at Phuket International Airport potentially visited these parks. Certainly, some of these MNP visitors arrived overland, including increasing numbers of Thai tourists, and some may have visited more than one park. Nevertheless, it does show the significant role of Andaman coast MNPs in Thai tourism.

2.1.3 Tourism's Contribution to Marine National Park Revenues

Marine national park budgets in Thailand are drawn from three sources: national government allocations, park-generated revenues (entrance fees, concessions, fines, etc.), and miscellaneous funding sources (Sethapun 2000). Examples of the latter include international loans from the Japanese Overseas Economic Cooperation Fund (OECF) under the social investment project (Miyasawa plan), small grants to improve tourist facilities from TAT, and other private sector contributions. The increasing popularity of marine park tourism in Thailand during the past few decades is clearly reflected in growing MNP revenues. Particularly important has been park-generated revenues, which are now the second most important source of funds after government budget allocations (Sethapun 2000). Expanding coastal and marine tourism offers many potential new sources of income for MNPs. Examples, some of which are not taken advantage of, according to Eagles et al. (2002), include:

- Park entrance fees
- Recreation service fees, special events and special services, for such things as dive boats, associated guide services, and boat transportation within park
- Concession fees, including charges or revenue shares paid by concessionaires that provide services to park visitors
- Accommodation fees, such as general overnight fee, campsite and room charges
- Equipment rentals, such as canoes, kayaks, snorkeling gear, SCUBA diving gear
- Food sales at general stores and restaurants
- General merchandise sales, including camping and adventure equipment, park-logo clothing, other souvenirs, guide books
- Parking and vessel anchoring fees.

Marine national park revenue generation has increased significantly in recent years, as illustrated by data from 2000 to 2004 (Table 2-5 and Figure 2-4). This is despite the relatively flat numbers of tourists visiting over the same period (Table 2-4

Table 2-5. Revenue generated by MNPs on the Andaman Coast, 2000-2004 in US\$ (Data source: NPWPCD 2005c).

Marine National Park	2000	2001	2002	2003	2004	Average
1. Tarutao	45,393	65,318	174,013	100,704	104,366	86,906
2. Thaleban	7,742	5,639	3,831	7,428	10,265	6,654
3. Ao Phang Nga	75,321	203,682	239,950	675,827	954,768	366,163
4. Mu Ko Surin	39,491	86,841	142,160	203,424	280,804	130,499
5. Sirinath	11,299	22,128	19,805	36,718	53,020	25,180
6. Hat Chao Mai	23,911	29,061	30,426	57,432	123,232	45,393
7. Mu Ko Similan	37,496	122,212	446,036	488,289	668,321	297,914
8. Hat Nopharat Thara - Mu Ko Phi Phi	7,917	25,244	44,962	62,270	86,070	38,972
9. Laem Son	4,907	9,798	9,484	6,827	15,279	8,696
10. Mu Ko Petra	20	3,831	2,326	2,166	6,279	2,550
11. Khao Lam Pi - Hat Thai Muang	4,113	15,062	18,306	18,248	28,119	14,804
12. Mu Ko Lanta	7,243	19,039	41,119	43,372	58,061	28,294
13. Khao Lak-Lamru	1,852	16,612	31,610	40,914	55,903	24,754
14. Tarn Boke Koranee	69	7,389	41,721	43,116	65,911	26,374
15. Lam Nam Kraburi	Na	Na	Na	Na	927	184
16. Mu Ko Phayam	Na	Na	Na	Na	Na	Na

Notes: (1) Revenues were converted from Thai Baht to US\$ using an exchange rate of \$1 equals 40 Baht; (2) Revenues were not adjusted for national or global inflation rates.

and Figure 2-3). Among all MNPs, the top five revenue-generators on the Andaman coast are (1) Ao Phang Nga, (2) Mu Ko Similan, (3) Mu Ko Surin, (4) Tarutao, and (5) Hat Chao Mai. Of these five, Mu Ko Similan, Mu Ko Surin, and Tarutao are considered isolated MNPs and had substantially fewer visitors. This interesting trend is discussed later in this section.

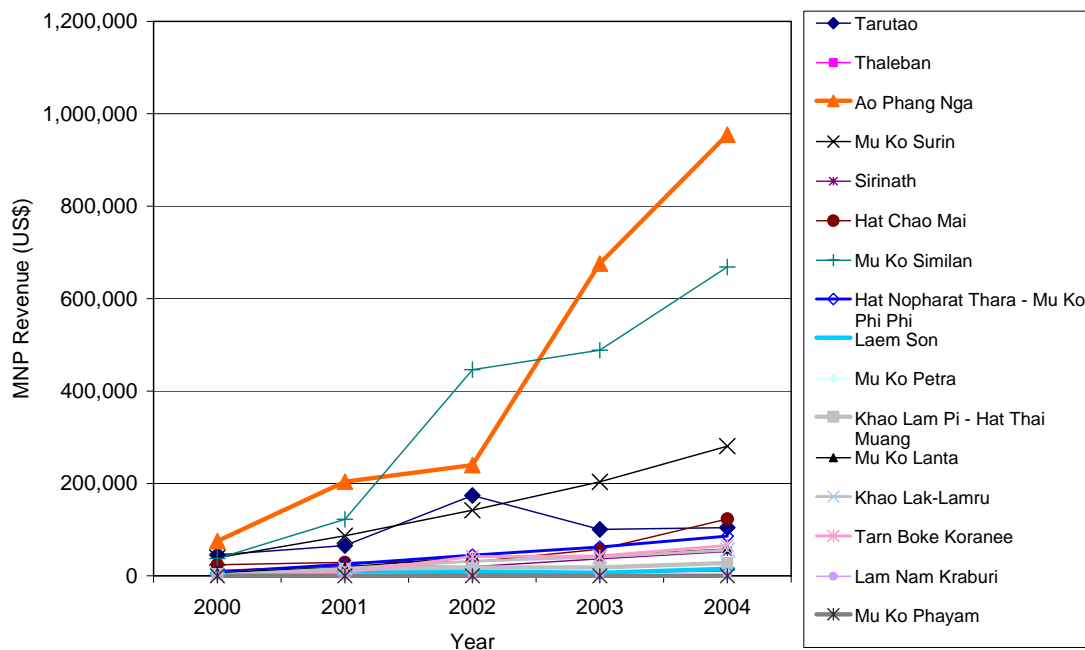


Figure 2-4. Trends in park revenues from Andaman Coast Marine National Parks, 2000-2004 (MNPD 2004) (Source: NPWPCD 2005c).

Changes in revenues generated by the operation of Andaman coast MNPs from 2000-2004 (Figure 2-4) do not correlate well with changes in visitor numbers for the same parks and years, which are relatively flat or even decreasing (Figure 2-3). Although MNPs located on isolated islands have low visitation compared to parks located on or near the mainland, they generate comparatively high revenue. Based on the author's field experience in Mu Ko Surin MNP, the likely principal reason behind this occurrence is the degree of park isolation and accessibility.

Isolation and relative inaccessibility may affect MNP revenue in a number of ways. First, it takes a lot of time and effort to travel from mainland to remote parks. One-day trips are generally not feasible; instead, visitors tend to spend two or more nights in parks before returning to the mainland. Given overnight fees, this significantly increases park revenue without adding to the number of visitors. Second, visitors have no access to general retailers or grocery suppliers and so must buy food and groceries from MNP stores or restaurants that offer food at considerably higher

prices. Third, park isolation effectively limits the number of tour and service operators. Guiding and special recreation services in parks are therefore mostly operated by park officials, allowing them a comparative monopoly. Finally, visitors spend considerable time and effort in planning their trip or vacation to remote MNPs. For this reason, it might be expected that the superior experience visitors enjoy would increase their willingness to pay for park merchandise and souvenirs as reminders of their good time.

The fund built upon the revenue becomes very important for park operation costs which are not covered sufficiently by the government budget alone (Putthaphod Kooprasit, park ranger at Mu Ko Surin Marine National Park, March 9, 2005, personal communication). This fund not only provides significant financial contributions for improving accommodations for visitors, but it also supports any park projects such as nature conservation and protection, technical research, educational and outreach programs, and park services.

Since revenue from tourism plays a significant role in park operation and maintenance, it is challenging for park managers, both at the local and national level, to balance park objectives for marine conservation with providing tourism opportunities for increasing numbers of visitors. The challenge is especially critical for MNPs along the Andaman coast, because the monsoon closes parks there from May through October. For park managers, revenue for an entire year's operation must be generated during the November-April time period. At the same time, it is a difficult time to control the number of visitors and tourists, which at times could overload the park capacity which may cause overuse and damage to reefs and other habitats. Obviously, revenue generation came to a halt when the Indian Ocean tsunami hit many of the Andaman coast MNPs on December 26, 2004, very near the beginning of the 2004-2005 tourism season.

2.2 The 2004 Indian Ocean Earthquake and Tsunami

Thailand is part of the active “Ring of Fire” in Southeast Asia (Figure 2-5). This comprises one of the world’s greatest concentrations of natural geological hazards. The geological hazards both originating in Thailand and from neighboring countries include earthquakes, tsunamis, volcanic hazards, landslides, and land subsidences. Here, the Great Sumatran or Semangko Fault System is the longest known active fault on land that courses through the mountainous-volcanic backbone of Sumatra Island. This fault and the Sunda trench clearly show energetic activities of the converging plates and the Sumatra subduction zone. This active zone is located only 400 kilometers out of the west coast of Thailand (Figure 2-5). It makes this highly populated region one of the most active seismic regions on earth (Nutalaya 2005; Sieh et al. 1994; Fitch 1972).

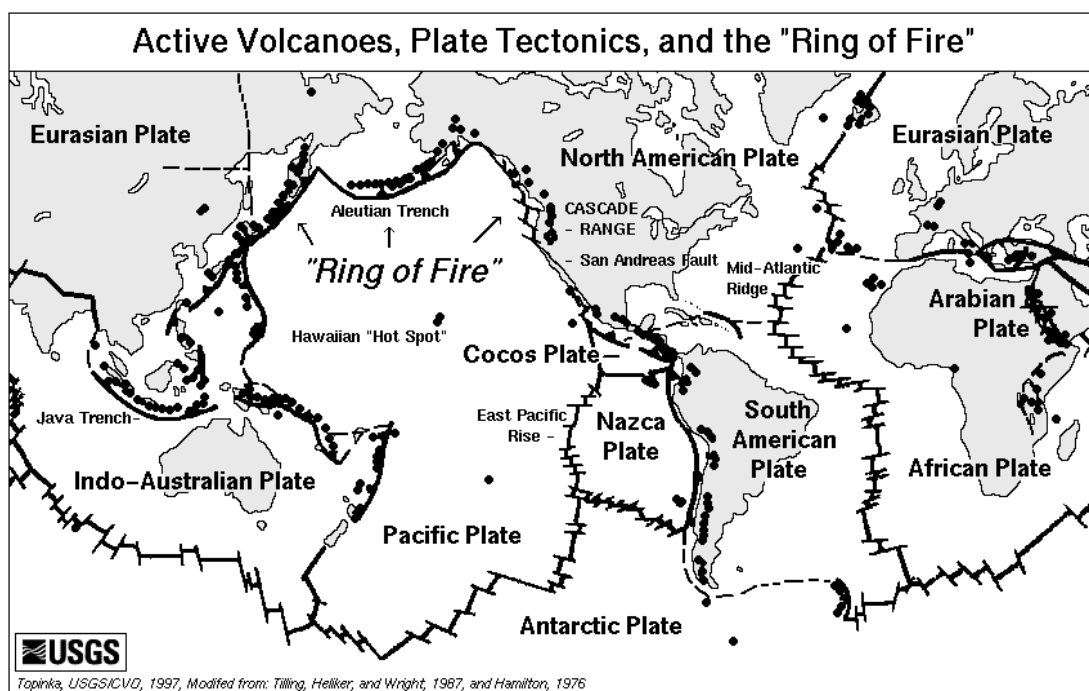


Figure 2-5. The Pacific’s “Ring of Fire” and tectonic plates worldwide (Courtesy of U.S. Geological Survey (USGS 2005b)).

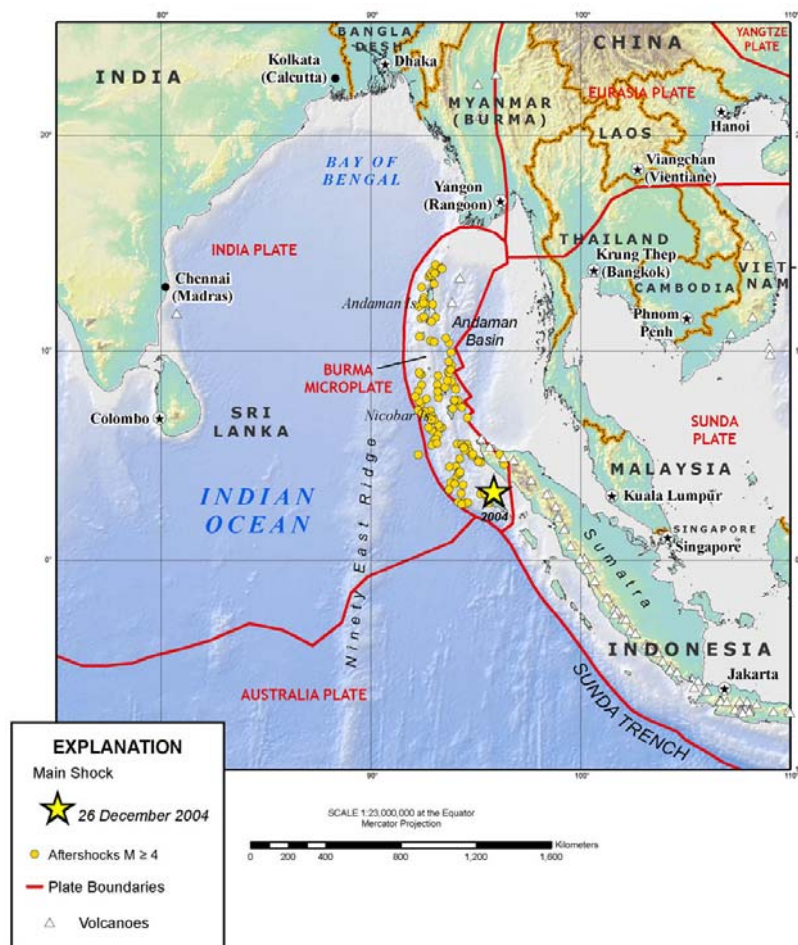


Figure 2-6. Tectonic setting of Thailand and the magnitude 9.0 earthquake that generated the 2004 Indian Ocean tsunami (Courtesy of U.S. Geological Survey (USGS 2005a)).

The 2004 Indian Ocean earthquake—known among geoscientists as the Great Sumatra-Andaman Earthquake of 26 December 2004—confirmed the powerful tectonic energy of the Great Sumatran Fault and the subduction zone (Figure 2-6). This was the largest seismic event on Earth in more than 40 years (Table 2-6). The earthquake was caused by the movement of “the India and Australia plates toward the north-northeast with respect to the interior of the Eurasia plate with velocities of about 60 mm/y in the region of the earthquake” (USGS 2005a). The earthquake ruptured a 1600-kilometer-long portion of the fault boundary between the Indo-Australian and southeastern Eurasian plates (Lay et al. 2005).

Table 2-6. Largest earthquakes in the World since 1900 (Courtesy of U.S. Geological Survey (USGS 2005a)).

Location	Date (Year/Month/Date)	Magnitude	Coordinates	
1. Chile	1960 05 22	9.5	-38.24	-73.05
2. Prince William Sound, Alaska	1964 03 28	9.2	61.02	-147.65
3. Off the West Coast of Northern Sumatra	2004 12 26	9.0	3.30	95.78
4. Kamchatka	1952 11 04	9.0	52.76	160.06
5. Off the Coast of Ecuador	1906 01 31	8.8	1.0	-81.5
6. Northern Sumatra, Indonesia	2005 03 28	8.7	2.08	97.01
7. Rat Islands, Alaska	1965 02 04	8.7	51.21	178.50
8. Andreanof Islands, Alaska	1957 03 09	8.6	51.56	-175.39
9. Assam - Tibet	1950 08 15	8.6	28.5	96.5
10. Kuril Islands	1963 10 13	8.5	44.9	149.6
11. Banda Sea, Indonesia	1938 02 01	8.5	-5.05	131.62
12. Chile-Argentina Border	1922 11 11	8.5	-28.55	-70.50

The Great Sumatra-Andaman Earthquake of 26 December 2004 was powerful enough to generate global physical impacts. According to USGS (2005a), massive “landslides and approximately two meters of subsidence were observed in Sumatra. A mud volcano became active near Baratang, Andaman Islands on December 28. Gas emissions were reported in Arakan, Myanmar. Seiches, which is the sloshing of a closed body of water from earthquake shaking, [swimming pools often have seiches during earthquakes] occurred in Jharkhand, Maharashtra, Orissa and West Bengal, India and as far away as Tulsa County, Oklahoma, USA. Water level fluctuations occurred in wells as far away as Florida, Nebraska and Virginia, in the United States.”

Since December 26, 2004, a number of scientific studies place the magnitude of the earthquake at 9.0 to 9.3, though dependable estimates put the magnitude at 9.0 (Kruger and Ohrnberger 2005; Lay et al. 2005). According to the USGS (2005a), however, there is currently no consensus on the “correct” magnitude of this earthquake, given that very large earthquakes like this are difficult to estimate. Despite

this continuing controversy, the massive tsunami triggered by the earthquake is unquestionably the most destructive tsunami in modern history in terms of death toll, uncountable displaced peoples, and property loss. It is also worth noting that not every large earthquake in the ocean generates a tsunami. That large underwater earthquakes may not trigger a large tsunami is evidenced by the 8.7 magnitude Sumatran earthquake on March 28, 2005.

The tsunamigenic capacity of earthquakes depends on many factors, most notably the degree of thrust exhibited by the fault. Tsunamis may also be generated by other mechanisms, such as major submarine slides, eruptions of underwater volcanoes, landslides adjacent to the water, rockfalls, and large asteroid impacts from above (USGS 2005a; Sieh et al. 1994; Bernard and Goulet 1981). Since this study focuses on impacts of the 2004 earthquake and tsunami, its unique genesis and characteristics are discussed in the following sections.

2.2.1 Characteristics of the 2004 Great Sumatra-Andaman Earthquake

The word *tsunami* is Japanese, meaning "harbor wave." Tsunamis are defined by USGS (2005a) as "one or a series of huge sea waves caused by earthquakes or other large-scale disturbance of the ocean floor". Tsunamis are usually referred to incorrectly by many as "tidal waves"; however, they have nothing to do with tides. This specific kind of wave happens when the sea floor suddenly collapses or lifts up, vertically displacing the overlying water. According to Van Dorn (1973), a tsunami generally occurs following undersea earthquakes that have shallow focal depths less than 50 kilometers beneath the sea floor and magnitudes greater than 6.5 on the Richter scale. Nevertheless, not every earthquake magnitude greater than 6.5 generates a tsunami.

The 2004 Great Sumatra-Andaman earthquake occurred on the interface of the India and Burma plates; its faulting mechanism was predominantly thrust with a vertical slip (USGS 2005a). This thrust (reverse) fault or a dip-slip fault happens when

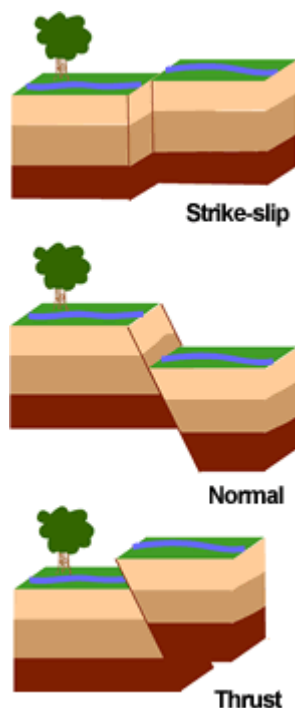


Figure 2-7 Three basic ideal fault types: strike-slip, normal, and reverse (thrust) faults (Courtesy U.S. Geological Survey (USGS 2005a))

the upper block, above the fault plane, moves up and over the lower block (Figure 2-7). This type of faulting is common in many subduction zones around the Pacific “Ring of Fire”, as well as areas around Indonesia, Japan, the Philippines, and the U.S. west coast. Offshore Indonesia, the India Plate is being subducted beneath the Burma Plate, creating great compression force (Geist 2005b). Additionally, Fitch (1972), in his classic paper on plate convergence in Southeast Asia and the Western Pacific, explained in detail that the Sumatra subduction zone is characterized by a decoupled fault, in which nearly pure thrust faulting occurs along the interplate thrust and transcurrent, and strike-slip faulting occurs in the overriding plate.

Regarding to the tectonic setting of Thailand and Southeast Asia (Figure 2-5), the Sumatran subduction zone is oriented oblique to the Sunda Trench axis. This oblique subduction zone is created by the oblique direction of the converging India Plate. Geist (b) (2005) adopted Fitch’s (1972) idea of the Sumatran Thrust and suggested two potential ways of the crust’s rupture during this oblique compressional

motion: (a) oblique motion on a single fault (termed *oblique faulting* or *thrust/right-lateral faulting*); or (b) two separate faults that accommodate the normal and parallel components of motion (termed *decoupled faulting* or *pure thrust faulting*).

These two potential ways of plate rupture help explain how the Great Sumatra-Andaman earthquake triggered the gigantic tsunami. During the earthquake, the rupture created a great vertical movement of the sea floor. It also produced a high amount of slip on a long segment of the inter-plate thrust fault. The rupture occurred beneath water depths of approximately 2 to 4 km (Geist 2005). Bilham (2005) explained the reaction of the global seawater after being displaced by immediate seafloor movement “shifts in the sea floor displaced more than 30 km³ of seawater, generating a tsunami that traveled to the Antarctic, the east and west coasts of the Americas and (with lessening amplitude) the Arctic Ocean. The reduced volume capacity of the Bay of Bengal and the Andaman Sea, caused by the net uplift during the earthquake, has raised the global sea level by about 0.1 mm”. All of this evidence gathered by modern technologies confirmed Van Dorn’s (1973) basic assumption that a tsunami occurs only when large areas of the sea floor are vertically dislocated. The sea surface is immediately altered to conform in shape to the sea floor change. Then, following the conformation, waves spread out in all directions like a ring pattern.

Based on all information mentioned previously, there are many geophysical factors that involved the generation of the 2004 tsunami. In a nutshell, there are three fundamental factors that contributed to the tsunami-genesis (Geist 1999; Geist 2005b; Van Dorn 1973; Bernard and Goulet 1981).

1. *Magnitude of the underwater earthquake.* It is the most important factor that can be used to determine the size of a tsunami. The size of a tsunami is consistent with its earthquake moment magnitude.
2. *Mechanism of the earth’s crust movement.* As mentioned in the previous section, the rupture of the converging plates during the great 2004 earthquake can be an oblique faulting or decoupled faulting. In this case, almost all of an earthquake’s

energy was released in a thrust motion. Therefore, it efficiently generated a large tsunami.

3. *Centroid*. The focal depth at which the earthquake's rupture begins or the location of the center of energy release is a factor to determine the magnitude of tsunami energy. The deeper the centroid the more energy released. The 2004 tsunami fits in this case. A recent study conducted by Nettles (2005) indicated that most of the energy release from the great 2004 earthquake took place in deep water. That resulted in the high energy tsunami.

2.2.2 Will Tsunamis Happen in the Gulf of Thailand?

In Thailand, the recent tsunamigenic earthquake and the findings of scientific studies on the west coast certainly raise questions among the general public regarding tsunami-prone areas on the east coast of the country. The east coast of Thailand facing the South China Sea is the most country's highly populated area. It includes Bangkok, the capital city. The bathymetry of the east coast in the Gulf of Thailand is very shallow (less than 100 meters depth) and lies on a wider continental shelf compared to the deep and short shelf of the Andaman coast (more than 2,000 meters depth). The wide and shallow continental shelf gradually drops near the offshore waters of Vietnam in the South China Sea (Figure 2-8). These basic differences influence the possibility of a tsunami event in this east coast region.

The nearest active Subduction zone on the east coast of Thailand is in Philippines' water, part of the Ring of Fire. According to George W. Moore (Courtesy professor in Paleotectonics, Department of Geosciences, Oregon State University, October 10, 2005, e-mail communication), the level of a tsunamis' impact on the east coast of Thailand should be less than the recent one on the west coast. He also indicated that a "tsunami requires a magnitude 7.5 earthquake. The Luzon Thrust [near Manila Trench and the active volcano, Mount Pinatobo] would be the greatest threat." Although a tsunami can wrap around islands and landmasses, the landmasses of Vietnam (Indochina Peninsula), Spratly Islands, and Palawan Islands may decrease the

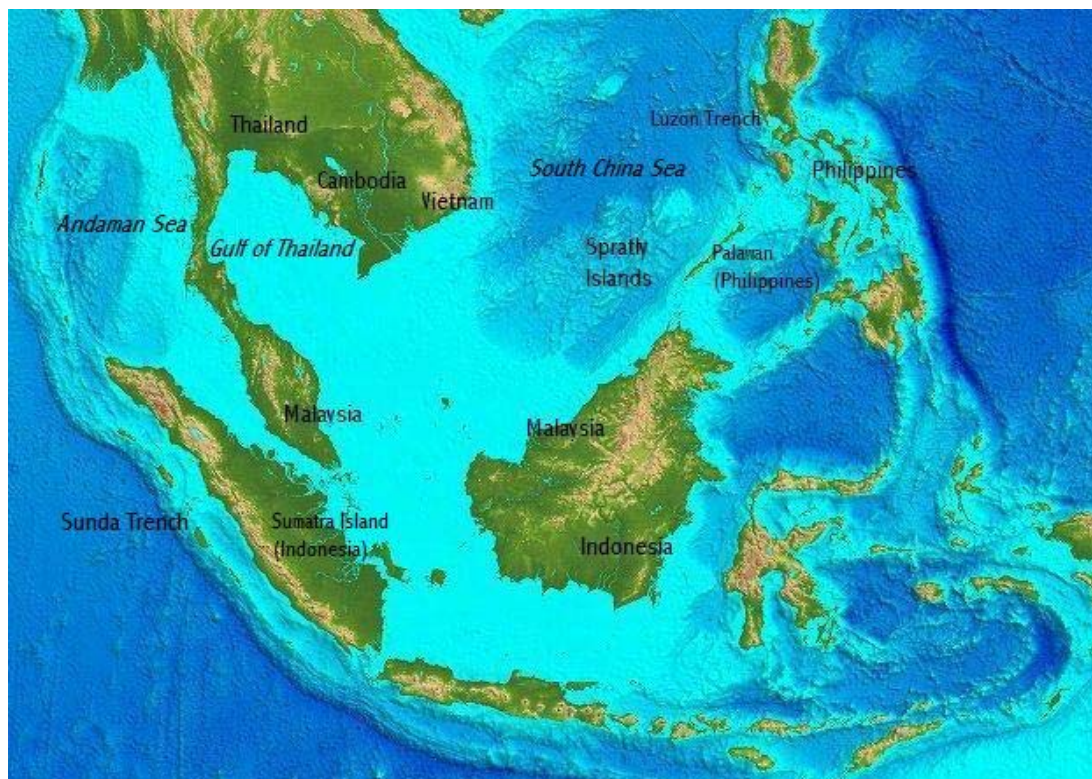


Figure 2-8. Bathymetry of Southeast Asia region (Courtesy: Earthstar Geographics 2005, uses with permission).

tsunamis' force. Therefore, the prone areas would be the southern-most part of east coast Thailand (George W. Moore, courtesy professor in Paleotectonics, Department of Geosciences, Oregon State University, October 10, 2005, e-mail communication). Although the shallow water on the east coast would minimally reduce a tsunami, the closeness of the Andaman Sea and Sunda Thrust to the west coast versus the longer distance to the Luzon Thrust would help reduce tsunami force (Figures 2-8).

In the next sections, other significant tsunami events that happened in the region are described. The different nature of the tsunami when it travels in the deep and shallow water is discussed. Characteristics of a tsunami when the wave approaches land are also explained.

2.2.3 Nature of the 2004 Indian Ocean Tsunami

Although the Sumatra-Andaman earthquake and the resulting tsunami are unprecedented in area and magnitude, the event has historical resemblances in this region. Since 1797, at least seven large magnitude earthquakes that generated tsunamis are recorded (USGS 2005b); Bilham (2005); Lay et al. 2005) (Table 2-7). A number of studies that investigated morphology of coral microatolls on the islands of the outer arc ridge west of Sumatra Island and the trench both long before the 2004 earthquake and after the earthquake verified this record. Using stratigraphic analysis of fossil and living microatolls, the findings indicated several sudden uplifts and slow submergences in this region in the past few thousand years (Sieh et al. 1994, 1999, 2005; Zachariasen et al. 1999). Sieh et al. (2005) in his recent study also found that “coral microatolls on the fringing reefs of northwestern Simeuleu island emerged as much as 150 cm during the 2004 earthquake.” Undoubtedly, these large seafloor vertical displacements resulted in a tsunami. Seven major tsunamis that were the result of seven large tsunamigenic earthquakes in this subduction zone, are described in Table 2-7.

Besides the investigations of fossils and living coral reefs, examinations of depositional and erosional signatures in the coastal landscape can provide a history of tsunami events in localized areas (Bryant 2001). A number of studies on tsunami deposits have been done on the coastal areas of the Andaman Sea and Indonesian region in order to gain knowledge of tsunami history (van den Bergh et al. 2003; Naruse and Fujino 2005; Harper 2005). A recent study conducted by Harper (2005) found a one-meter thick bedded-shell deposit exposed on the west coast of Thailand at the headland at Ao Nang in Krabi Province (south of Phuket Island). The deposits yielded radiocarbon ages of 1425 and 1410 AD. Because evidence of a high sea level stand at 1400 AD does not exist, this bedded shell deposit is perhaps the result of a tsunami event or an extreme storm event that happened around 1400 AD. Although there is no confirmation, if this deposit is the result of a tsunami event, it suggests a

Table 2-7. Seven significant tsunamis in the region since 1797 (Courtesy U.S. Geological Survey (USGS 2005a)) (Note: Blanks mean “no data”).

Location	Year	Magnitude	Reported damages
1. Near the central part of the western Sumatra generated a tsunami that flooded Padang	1797	8.4	More than 300 fatalities
2. Near the south coast of the western Sumatra triggered a huge tsunami that flooded the southern part of western Sumatra	1833	8.7	Numerous victims
3. A tsunami that came from the southeast and flooded the coast of the Nias Island	1843		Many fatalities
4. All the western coast of Sumatra	1861	8.5	Several thousand fatalities
5. In the Andaman Island region generated a 1 m high tsunami on India's eastern coast	1881	7.9	
6. Krakatau explosion	1883		36,000 fatalities, primarily on the islands of Java and Sumatra
7. Andaman Islands earthquake	1941	~7.7	Anecdotal accounts exist of a tsunami; however, no official records exist.

recurrence interval of about 500 to 600 years for a large magnitude tsunami event in this region.

Tsunamis can be divided into two types, distant (or major) and local (National Ocean Survey 1976; USGS 2005c). A distant tsunami is a series of waves that move away from the epicenter area. With its great wavelength, this type of tsunami can travel across the oceans as evidenced by the 2004 Indian Ocean tsunami and the 1960 Chilean tsunami. On the other hand, local tsunami waves have a shorter wavelength. While a major tsunami may cause damage to distant coasts several hours after it is generated, local tsunamis strike suddenly. Therefore, based on this information, the tsunami that struck the Andaman Coast in Thailand on December 26, 2004 was a distant tsunami.

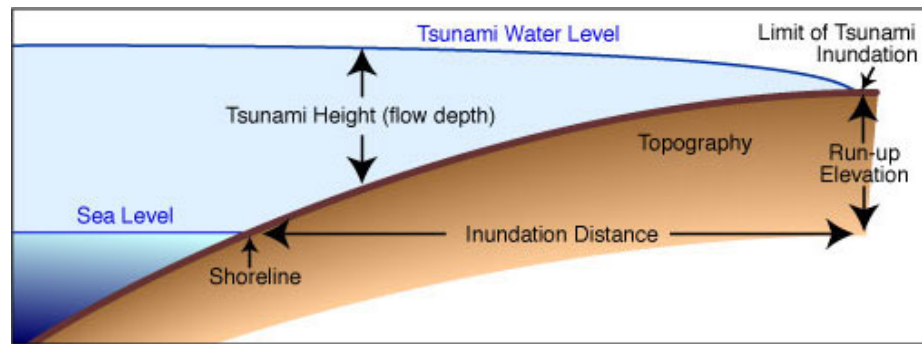


Figure 2-9. Tsunami characteristics, run-up and inundation (Courtesy U.S. Geological Survey (USGS 2005c)).

The 2004 Indian Ocean tsunami was generated in deep water and traveled outward with high energy. In the deep ocean, wavelength (from wave crest to wave crest) may be a hundred miles or more but with a wave height of only a few feet or less. The waves may reach speeds exceeding 500 miles per hour (NOAA 2002). In the 2004 Indian Ocean tsunami, by analyzing digital and analog tide gauge recordings obtained from the Australian National Tide Center and the Indian National Institute of Oceanography, “the theoretical value of the tsunami velocity for the average water depth in the Indian Ocean (3.4 km) is 653 km/hour” (Pulli 2005). Despite complicated local bathymetry that influences specific run-up height, its high speed means high energy intensity that amplifies the run-up height. On the west coast of Thailand, the wave heights were varied ranging between less than 1 meter and more than 10 meters (see DRS (2005) for more detail). This evidence confirmed the unique characteristics that “the factors controlling the size, shape, speed, and landing of tsunami are complex. The qualities of tsunami are the result of not only the triggering event, but what lies along its path” (Yasuda 2005).

According to Lipa et al (2005), the complicated nature of tsunamis can be explained in the following theoretical equations. As mentioned above, the tsunami’s wavelength is always far greater than the water depth. The relationship between the wave velocity (V) and water depth (d) can be defined as:

$$V(d) = \sqrt{gd}$$

Where V is the wave velocity (m/s)
 d is the water depth (m)
 g is the gravitational acceleration (m/s²)

In addition, the relationship between the wave period (P) and wavelength is given by the shallow-water dispersion equation, which defines how the wavelength changes with the water depth:

$$\lambda(d) = P \sqrt{gd}$$

Where λ is the wavelength (m)
 P is the wave period (s) (the time between successive waves)
 d is the water depth (m)
 g is the gravitational acceleration (m/s²)

These equations help explain the nature of tsunamis when they approach the coastlines. Among the unique aspects of this kind of wave, its amplified run-up height is the most important factor influencing intensity of damage from a tsunami. There are a number of natural factors contributing in tsunami run-up height in coastal areas. NASA's Earth Observatory (2005) analyzed several pairs of satellite images and compared before and after views of a portion of the western coastline of Thailand in Phang Nga province, about 50 kilometers north of the island of Phuket. An interesting pattern of damage along the coast was found. Long and smoothly curving beaches were severely devastated, not the land that juts into the ocean. Five potential factors were involved in this damage pattern (Geist 1999; Pacific Tsunami Museum 2005; NASA's Earth Observatory 2005; Bernard and Goulet 1981; Bryant 2001):

1. *Bathymetry or topography of the local seafloor.* This is a fundamental factor. As the high-speed tsunamis come ashore, the waves compensate their speed loss by increasing in amplitude. Without any wave breaker, the beaches that gently sloped toward the ocean allow any wave that comes ashore to sweep further inland. This explains why rocky coastlines that drop into the deep ocean are not as affected. However, in the big picture, the coasts more prone to the full impact of tsunami are coastlines with narrow shelves such as the east coast of Japan. This might explain why narrow continental shelves in Thailand such as Khao Lak coastline in Phang Nga province received high tsunami run-up heights.
2. *Orientation of the coast facing tsunamigenic sources.* Although a tsunami can wrap around islands or landmasses, the direction of coastlines facing the tsunami source can play an important role in determining run-up height and damage pattern. As the tsunami wave fronts travel toward the coastline, the turbulent fronts directly strike the coasts facing the wave front rather than the coasts facing the opposite direction of the approaching waves. As evidenced by the 2004 Indian Ocean tsunami, run-up height varied on the east and west coasts of Phuket Island, Thailand. In general, the east coast of the island received very low run-up height compared to very high run-up height on the west coast that faced the tsunamigenic source, Sumatra Island (DRS 2005).
3. *The actual shape of the shoreline.* The headland itself may have contributed to the damage on its sides. Wave heights can be increased when concentrated on headlands. Waves approaching the point would tend to be diffracted, or broken up, sending additional energy into the beaches on either side of the point. This would result in amplified waves along the beaches. Wave heights also can be concentrated when traveling into bays having wide entrances that become progressively narrower. Therefore, bowl-shaped beaches and/or bays resulted in high run-up heights (e.g. high run-up height at Phi Phi Don island).
4. *Vegetation patterns, offshore coral reef, and water breaker.* An offshore coral reef can disperse the energy of a tsunami and decrease the impact force on the

shoreline. Coastal forests (e.g. mangrove forests or coastal trees) can be energy absorbent. This effect is clearly seen on developed coastal land that had less dense vegetation to mitigate the wave's impact. Man-made water breakers can reduce the energy of a tsunami but, at the same time, they can alter wave direction and send additional energy into the beaches.

5. *Tide*. Although tide has nothing to do with the occurrence of the tsunami, it can contribute to the degree of tsunami damage. The tide pattern of the Andaman Coast is semi-diurnal (two high and low tides per day of about equal range). The 2004 tsunami approached the coast around 10 AM on December 26, 2006 during high tide period between neap and spring tides (based on sea level data from from Ko Tapao Noi station, the tidal range on that day was 1.80 meter (5.40 feet) while tidal range of neap and spring tides at this station were 0.68 meter and 2.39 meter, respectively) (Hydrographic Department, Royal Thai Navy 2004). Hence, one can imply that the high tide of that time contributed to the high degree of tsunami damage on that day. The damage may be less if the tsunami arrives the coast during low tide.

In addition, a number of instances observed in tsunami-affected areas confirmed that human development likely modified the run-up behavior of the tsunami. In Thailand, during the author's post-tsunami field observation on Phuket Island, Kata and Patong beaches, many structures including hotels, concrete roads, and restaurants were seen to be built on sand dunes. These structures were damaged by the tsunami. On the contrary, on Karon Beach, which is located between the Kata and Patong beaches, all structures are built behind the natural sand dune, and none of these were damaged. The same thing also happened in Sri Lanka. Liu et al. (2005) indicated that "in the town of Yala, one tourist resort, for the purpose of better scenic views, had removed some of the dune seaward of its hotel. The hotel was destroyed by the tsunami. Substantially larger water elevations and greater damage observations were found near the hotel, as compared to neighboring areas located behind unaltered dunes."

Qualitative observation and analysis of site-specific quantitative data collected by IUCN's research team in Southern Sri Lanka also confirmed a clear relationship between damage to inland areas with human modifications in the seaward/beach front environment (Bambaradeniya et al. 2005). They found the tsunami wave swept inland with a greater force in areas where natural sand dunes have been removed and/or converted into managed landscapes such as coconut plantations, oil palm plantations, and home gardens. In these areas, substantial coral mining had occurred in response to material demands for construction. This resulted in more extensive damage to inland areas by the tsunami. The instances of natural protection by dense mangrove forests and thick sea grass beds found in Phang Nga Province (north of Phuket Island) also appeared to mitigate coastal erosion in the intertidal zones. Basically, by removing the natural coastal protection in a localized area, a conduit was created through which the tsunami energy could flow more freely (Liu et al. 2005; Bambaradeniya et al. 2005).

It is clear that the run-up height of a tsunami depends on many factors. Therefore, at present, accurate predictions of tsunami run-up in specific locations are still questionable. When these numerous factors and their interrelationships are better understood, predictions of run-up height will be better calculated and will provide better warnings and hazard assessments. The destructiveness of a tsunami will be described in detail in the following section.

2.2.4 Tsunami Damage

As evidenced by many video clips and photos taken when the 2004 Indian Ocean tsunami hits coastal areas, many lives were suddenly taken during the first series of tsunami waves. Then, after the ocean returned to normal, there was extensive, dreadful and chaotic damage survivors had to cope with. Using criteria from Bernard and Goulet (1981) and the study of the H. John Heinz III Center for Science, Economics, and the Environment on the hidden costs of coastal hazards (Heinz Center 2000), this dissertation defines the damages of the tsunami into two categories based on their

sequence and time frame: (1) direct impacts or primary damages and (2) indirect impacts or secondary damages.

Direct impacts or primary damage usually are physical damage that happens when tsunamis sweep across coastal areas with the powerful force of waves attacking coastlines and structures. According to Bernard and Goulet (1981), the primary damage can be done by three main factors: inundation, wave impacts on structures, and erosion. During this time, the great force of the tsunami strikes shore protection structures (both natural and man-made), as well as piers, marinas, villages, and other structures near the shore. The damage may be caused by “four potential forces:

- Strong currents produced by waves overtopping the structures.
- The direct force of the surge produced by a wave.
- The hydrostatic pressure created by flooding behind a structure.
- Erosion at the base of the structure” (Bernard and Goulet 1981).

The powerful force of tsunami run-up also creates a great destructive energy during its drawdown period. Floating debris, carried back and forth by the extreme drawdown of the water level when the waves recede, forcefully hit floating people and destroying structures in its path. Damage includes lives that are lost, structural damage, severe coastal erosion, immediate coastline changes, etc.

Indirect impacts or secondary damage follows the primary damage. These impacts are more distant from the event in both time and succession and may continue for many years (Heinz Center 2000). Secondary damage is caused by floating debris, sewage, and chemical pollution following destruction, or damage of intake, discharge, and storage facilities. The indirect impacts also include impacts on human dimensions on the coastal areas which are psychological impacts from sudden losses, disease and sanitation problems from destroyed sewage systems and potable water, impacts on business community, etc.

In order to categorize damage in more detail, the study of the Heinz Center (2000) study is employed. The study used hurricane Hugo, which attacked the east

coast of the USA in 1989, as an initial model, and divided major damage from coastal disasters into four categories:

- Built environment
- Business community
- Social, health, and safety
- Natural resources and ecosystems.

According to the Heinz Center's study (2000), the direct impacts that happened immediately during and after coastal disasters were safety-needed (human lives), natural resources and ecosystem, and the built environment whereas impacts on the business community usually happen after the primary damage. Focusing on the impacts of 2004 Indian Ocean tsunami, type of damage in each of these sectors are described in the following section.

Built environment

Built environment is defined here as a man-made structures including rip-rap shore protection, marinas, piers, houses, roads, schools, power plants, etc. According to the Heinz Center (2000) study, elements of the built environment vulnerable to coastal hazards can be categorized into eight groups:

- Transportation infrastructure, e.g. roads, fuel facilities, ports, marinas, railroads, airports
- Utility and power infrastructure, e.g. electric power plants, water storage, water treatment plants, communication infrastructure and network (telephone and internet)
- Resident buildings, e.g. family housing, retirement and nursing facilities, jails, apartment complexes
- Economic enterprise, e.g. commercial shopping centers, banking and business services, entertainment and recreation complexes

- Governmental service facilities and related private facilities , e.g. city halls, courthouses, police and fire stations, hospitals and clinics, emergency shelters, military bases
- Public and private education facilities , e.g. schools, universities, libraries
- Interior property, e.g. manufacturing and related business equipment, plumbing and electrical systems
- Transportation stock, e.g. cars, trucks, ships, aircrafts.

Direct impacts of tsunamis on the built environment are usually seen as physical damage that happens immediately after the earthquake or tsunami strikes. The lesson learned from the 2004 tsunami and recent 2005 hurricane season in the Gulf Coast of the United States reveals that there is a strong linkage between damage to the built environment and other sectors (natural resources, social, and business). Focusing on the recent tsunami, damage to the built environment resulted in both direct and indirect social impacts. It is true that the more damage the structures, the greater floating debris. Besides the powerful turbulent waves, floating debris from destroyed structures hit floating people and took many lives. After the sea level receded, the extensive scene of destruction and the loss of loved ones caused dreadful psychological trauma and emotional distress to the survivors.

Damage to the built environment also created debris and toxic pollutants that were swept into the ocean or coastal water. The bulky and abrasive debris can mechanically break fragile coral reefs while toxic pollutants such as pesticide and herbicide can immediately kill marine life and enter the food chain. Moreover, floating or toxic debris can pollute coastal water and beaches and scare tourists away. This leads to the loss of tourism and the collapse of the business community.

Business community

Damage to the business community is usually categorized as an indirect impact. According to the Heinz Center (2000), it is no surprise that business disruption is

correlated with the extent of damage to structures that house businesses. This statement was confirmed in Thailand where tourism dominated areas that were severely destroyed. The tsunami disaster not only created extensive damage to buildings that housed tourism facilities, e.g. hotels, resorts, tour operators, and restaurants, it also had dreadful psychological impacts on the decision-making process of tourists to return to affected areas.

Although the buildings and businesses can survive the physical damage, they are still impacted by “halo effects” of the destroyed landscape. Moreover, horrible pictures publicly presented in the media strongly affect tourist actions and decisions. Therefore, the influences of media during and after the disaster can play significant roles in either worsening or recovering the business community (Kerle 1997; TAT 2005).

Social, health and safety

Impacts of tsunamis and other coastal disasters on human lives can be both direct and indirect. Examples of impacts that fit in the direct category include loss of human life, psychological trauma, disruption of social services, loss of employment, loss of public and private transportation, and individual and family stress. In the tsunami disaster, human lives were lost by drowning or debris during the time of the tsunami run-up and drawdown on the coastline. The direct impact on lives lost from 10 countries surrounding the Indian Ocean in South Asia and East Africa affected by the powerful waves were reported. According to UNEP (2005a) and USGS (2005a), in total, at least 212,290 people lost their lives, 129,001 are missing, 8,457 are injured, and 1,112,538 were displaced by the earthquake and following tsunami (Table 2-8).

In Thailand, the tsunami not only took human lives, it also heavily affected the region’s way of life. Survivors who lost their whole family had to cope with emotional distress. Many children became orphans. Schools and other public facilities were destroyed. Local unemployment immediately increased because tourism, fisheries, and agriculture along the Andaman coast were severely affected. This directly generated

Table 2-8. Summary of the 2004 Indian Ocean tsunami impacts in 16 countries
(Data source: UNEP 2005a; USGS 2005a) (Note: Blanks mean “no data”).

Countries	Dead	Missing	Injured	Displaced
1. Indonesia	164,891	114,897		412,438
2. Sri Lanka	30,900	5,400		552,600
3. India	10,700	5,600		112,500
4. Thailand	5,393	3,062	8,457	
5. Somalia	150			5,000
6. Maldives	82	26		21,600
7. Malaysia	68	6		4,200
8. Myanmar	90	10		3,200
9. Tanzania	10			
10. Seychelles	3			
11. Bangladesh	2			
12. Kenya	1			
13. Madagascar				1,000
Total	212,290	129,001	8,457	1,112,538
14. Mauritius	Some damage			
15. Mozambique	Tsunami was observed, but no damage reported			
16. Australia	Tsunami was observed, but no damage reported			

stress on individuals, families, and communities. Psychological trauma certainly impacts both the local people who live by the sea and tourists who might decide not to visit the affected area.

Natural resources and ecosystems

Direct impacts to natural resources and ecosystems are defined as the physical damage directly associated with the tsunami event—tsunami run-up and drawdown, other causes of floating debris, and saltwater flooding and intrusion. Primary impacts include damaged coral reefs, coastline changes, coastal erosion altered coastal canals and rivers, destroyed coastal forests, habitat loss due to turbid seawater and saltwater intrusion, surface freshwater and ground water contaminated by seawater and others.

Indirect damage to natural resources and ecosystems is not only sequences of primary damage but it is also linked to damage and impacts to the built environment

(Heinz Center 2000). Examples include extensive spread of debris, spilled fuel, sewage, industrial waste, and leakage of household toxic chemicals (pesticide, herbicide, heavy metal substances) that can release pollutants into coastal and marine environments. Focusing on damage that occurred in Thailand, impacts to coral reefs, sea grass beds, mangrove forests, coastal erosion, surface and ground water, and land subsidence are among the most important.

The following section reviews methods and techniques used in assessing the risk and impact of natural disasters that are helpful in designing the study plan for the present research.

2.3 Natural Disaster Impact Assessment

The primary purpose of this section is to review methods used in assessing natural disaster impacts. The review particularly focuses on how to assess natural disaster impact on tourism in natural settings, especially national parks in marine or coastal areas. This section first examines several post-disaster impact studies worldwide with special focus on the assessment methods using in the 2004 tsunami impact assessment. Then, the risk and vulnerability assessment strategies proposed by a number of international organizations are reviewed.

2.3.1 Risk and Impact Assessment of Natural Disasters

Studies of risk from and impact of natural disasters are interdisciplinary in nature. A number of studies, including the study of the Heinz Center (2000), have been conducted by several researchers from various disciplines, including marine biologists, resource geographers, and disaster relief managers. In general, the assessment studies investigate disaster impacts on two main categories: impacts on the human environment and impacts on the natural (physical and biological) environment. Although the Heinz study classified the costs and impacts of hurricanes into four categories, these mainly fit into two main groups: human impacts (social, health, and

safety, and business community) and physical impacts (built environment and natural resources and ecosystems).

Disaster assessment studies are typically conducted after every disaster. However, the time period between the occurrence of the disaster and the beginning of the assessment can vary from one day to many years. This time gap and the length of the data collection period of each study depends on its specific purpose. For example, the study of tsunami impacts on the human and natural environment in Sri Lanka began one day after the disaster and three days were spent to gather data from field observations (DMIP 2005). On the other hand, the study of hurricane impacts in South Carolina was conducted nine years after the disaster and took one year to gather data (Heinz Center 2000). This variation is presented in Table 2-9.

Based on reviewed literature, disaster assessment studies typically employ inductive and qualitative methods in data collection. These methods allow the researchers to deeply explore facts regarding the impact and risk of each natural disaster. The studies usually begin with specific observations with the intent to identify general factors that control what is being observed (Babbie 2001). Hence, field observation is a fundamental technique for this kind of study. This is confirmed by frequent usage of field observation techniques that appear in most of reviewed literature (Table 2-9).

Informant interviews are also typically used in impact assessment studies regardless of study time gap between the occurrence of disaster and the beginning of study (Table 2-9). This qualitative technique is widely employed with the purposes of enriching data from field observations and gathering information for questionnaire design. Individual interviews allow the researchers to conduct informant interview at the convenience of interviewers or interviewees with less formality. Therefore, this technique can be done in both *ex situ* (off-site location) and *in situ* (on-site or in original location) environment, for example, an interview with local fishermen on Sunday morning at the village pier, an informative discussion regarding recovery efforts during lunch break with a disaster relief manager, or a telephone interview with

Table 2-9. Methods and techniques applied in natural disaster impact assessment studies.

Studies	Disaster types	Risk/Impact Assessment	Study sites	Study Time Frame		Methods						
				Time after the disaster	Data collection period	1	2	3	4	5	6	7
The Heinz Center (2000)	Hurricane (Hugo)	Human and natural environment	Charleston, South Carolina state	9 years	1 year			X				
Wood (2002)	Earthquake and tsunami	Port and harbor communities	Oregon and Washington		NA	X	X	X	X	X	X	
Heyder (2001)	Floods, tornadoes, wildfires, hurricanes	Tourism in Florida	Florida state	6 months	3 months		X					
Faulker and Vikulov (2001)	Floods	Local tourism	Katherine Town, Australia	1 year	NA	X						
Mazzocchi and Montini (2001)	Earthquake	Tourism economy	Umbria, Italy	1 month	8 months				X			
Kerle (1997)	Earthquake and volcanic eruption	Local and national level tourism	Philippines	5-6 years	2 months	X	X		X	X		
California legislature (1990)	Earthquake	California's tourism industry	California state	1 year	3 hours							X
Beattie (1992)	Wildfire and volcanic eruption	Tourism in terrestrial national parks	Yellowstone NP and Mt St Helens	4 years, 12 years	NA	X			X	X		
Baker (1994)	Volcanic eruption	Perception of local residents on tourism	Mt St Helens	13 years	2 months	X	X		X	X		
UNEP (2005a)	Tsunami	Human and natural environment	Tsunami affected countries	one week	2 months					X		
Obura and Abdulla (2005)	Tsunami	Marine environment	Seychelles	1 month	5 days					X		
Bambaradeniya et al (2005a)	Tsunami	Marine environment	Southern Sri Lanka	2 weeks	5 days					X		
Bambaradeniya et al (2005b)	Tsunami	Environment and socio-economy	Eastern Sri Lanka	2 month	6 days	X	X			X		
DMIP (2005)	Tsunami	Human and natural environment	Sri Lanka	1 day	3 days	X			X	X		
Coral Cay Conservation (2005)	Tsunami	Coral reefs	Mu Ko Surin MNP, Thailand	2 months	2 months					X	X	
European commission joint research center (2005)	Tsunami	Land cover changes	Tsunami affected countries		NA					X	X	
Samek et al (2004)	Tsunami	Land cover changes	Banda Ache		NA					X	X	
Chang and Rizos (2005)	Tsunami	Land cover changes	Indonesia		NA						X	

1= Interview; 2 = Questionnaire survey; 3 = Panel studies; 4 = Literature review; 5 = Field observations; 6 = Remote sensing and GIS; 7 = Public hearing

an international relief donor. However, effective interviews need skillful interviewers to convey the discussion toward the objective. In many cases, interviews with a worksheet or list of questions (so called “semi-structured”) are conducted to enhance data completion and consistency.

Panel studies, face-to-face focus groups, and public hearings are alternative forms of the qualitative approach to obtain verbal, in-depth information. However, these methods are used only in a few studies. Their high cost and the difficulty to gather all participants in the same place at the same time require a large amount of money and labor. These techniques are used in large scale projects (at state level or regional level) such as the public hearing by the California legislature on the impact of natural disasters on California’s tourism industry (California Legislature 1990), the Heinz Center (2000) study, and a two-day workshop on the Oregon coast to evaluate the vulnerability of ports and harbors in the Pacific Northwest region (Oregon and Washington State) (Wood 2002). In spite of their high cost and preparation time, these methods can be done in a relatively short time period (e.g. three hour public hearing, two day workshop) and provide a large amount of useful information.

The questionnaire survey technique normally appears in disaster impact assessment studies conducted at least two months after the occurrence of a disaster (Table 2-9). Questionnaires can be distributed to participants by several modes of delivery including the internet, mail delivery, in-person delivery, and through publication delivery. The selection of delivery modes depends on several factors related to the study such as the study objective(s), size of population, characteristics of the participants and the geographical scale of the study area. The reviewed literature indicates that the questionnaire survey process takes about 2-3 months to complete. In order to enhance data from this process, researchers usually conduct supplemental interviews with selected informants for in-depth information.

Literature review is the most fundamental approach in conducting any research. However, based on the reviewed literature, this technique may face limitations due to the freshness of the disaster. Researchers may experience difficulty

in finding academic journals or reports due to the peer review or publication process. Therefore, according to Table 2-9, the document review technique seems to be helpful in order to gather secondary data or assessment reports done by relief organizations or local government one year or more after the disaster. However, the improvement of communication technology, especially internet technology, during the past few decades has dramatically transformed disaster impact assessment studies. Regarding the 2004 tsunami impact assessment studies, researchers used this approach to find existing impact assessment methods and adapt them to properly fit their study goals. Information and reports posted on the internet help reduce redundancy of studies in the chaotic time of post-disaster. This may increase the effectiveness of the recovery effort.

Remote sensing (RS) and geographic information systems (GIS) have become the prominent tools in assessing risk and disaster impacts. These techniques quickly provide a big picture of disaster impact status and geographic information that is vital in disaster relief and recovery planning. With special reference to coastal hazard vulnerability studies, Wood (2002) applied aerial photos (orthophotoquads) along with GIS technology to integrate multiple layers of natural, socio-economic, and hazards information providing an ideal tool for earthquake and tsunami assessment. The application of these techniques helped in setting priorities for increasing community resiliency to earthquake and tsunami hazards.

Satellite images, aerial photos, and GIS play important roles in assessing disaster impacts and in prioritizing humanitarian relief and environmental recovery efforts. In Thailand, two months after the 2004 tsunami, Coral Cay Conservation (2005) used Ikonos high-resolution satellite images, GIS, and field observations to evaluate coral reef damage in Mu Ko Surin MNP. The study provides very useful data in term of quantitative and qualitative geographic information for recovery efforts. Snap-shot satellite images during the tsunami propagation toward coastal waters also provide opportunities for scientists to learn more about the nature of tsunamis which would help reduce tsunami impacts in the future. Moreover, in Banda Aceh, pairs of

before-after satellite images allowed geographers and other scientists to see immediate landcover changes due to the waves within hours after the receded. Land classification derived from remote sensing data in a GIS was used to effectively locate relief effort distribution (Samek et al. 2005).

Based on the information mentioned above, this study has selected a number of techniques in order to enhance data collection. How these techniques are tailored to the overall framework of this study is described in the Methods chapter. The following section reviews existing risk and vulnerability assessment methods designed by several organizations that were useful in constructing guidelines for marine parks to use in evaluating their degree of vulnerability.

2.3.2 Vulnerability Assessment Methods for Marine Parks

This section provides fundamental information about risk and vulnerability assessment. It also aims to review several natural hazard risk and vulnerability assessment guidelines that were proposed by a number of expert groups and organizations. This section consists of two separate parts. The definitions and concepts of risk and vulnerability assessment—what are hazards, risk, and vulnerability?—are reviewed first. This is followed by justification of the assessment—why it is important and who conducts this assessment?

Definitions and concepts of vulnerability assessment

Terminology in the field of hazard and risk reduction is varied in meaning depending on perception of authors and researchers. This leads to slightly different approaches in risk identification and vulnerability assessment (see Heinz Center 2000; NOAA, Coastal Services Center 1999; FEMA 1997; Smith 2004 for more detail). In this study, with the primary goal of reducing impacts from natural disasters, especially from coastal hazards in marine parks, these existing definitions were compiled and tailored to specially fit the study goal.

Here, ‘hazard’ means an event or physical condition that is a possible source of danger to human life or interests. It has potential to cause deaths, injuries, property damage, agricultural loss, environmental damage, business failure, or other types of damage or loss. Focusing on coastal locations, hazards include but are not limited to coastal erosion, land subsidence, earthquakes, tsunamis, hurricanes (tropical storms), storm surges, windstorms, flooding and salinization of surface and ground waters.

In Thai word for the risk, ‘sieng’, refers to ‘chance’ or ‘gamble’. In this study, risk associated with a coastal hazard refers to potential losses as consequences of a hazard described as expected probability, frequency, potential area impact, or magnitude (FEMA 1997).

The term ‘vulnerability’ in risk reduction refers to weakness or susceptibility to physical injury or to negative effects from hazards (NOAA, Coastal Services Center 1999). Since these direct and indirect negative impacts from coastal hazards were the prime concern in this study, the definition and classification of vulnerability established in the Heinz Center study was applied here (Heinz Center 2000). According the Heinz study, ‘vulnerability’ means the characteristics of the society or environment affected by the hazard that lead to damage and loss. Vulnerability was classified in the context of the four impact categories:

- 1) vulnerability of the built environment
- 2) vulnerability of safety, health, and social systems
- 3) vulnerability of the business community
- 4) vulnerability of natural resources and ecosystems

These vulnerability categories were interconnected by the natural and societal conditions of the potential affected areas. Therefore, it is important to consider each of these vulnerabilities when conducting the assessment.

According to the definitions given above, in this study, vulnerability assessment refers to a general framework or method to evaluate risk and vulnerability of the society and environment associated with a specific hazard within or nearby marine parks. The assessment considers the degree of risk and vulnerability in terms

of frequency, potential area affected and magnitude of the consequences. This process provides vital information to prioritize initiatives for mitigation or adaptation of policies and practices to the hazards, especially in the tropical marine parks.

Justification for conducting vulnerability assessment in marine parks

Why is vulnerability assessment so important? The answer is simple: we have to know where we are so we can map out where we are going (NOAA, Coastal Services Center 1999). The findings and the process of vulnerability assessment provide marine park managers an idea of where and how their parks are vulnerable to a specific hazard. This information helps guide their decisions on hazard mitigation and adaptation.

Due to the nature of marine parks, all are vulnerable to natural hazards and ‘risk’ cannot be eliminated. Instead, marine park authorities have to assess and manage risk and vulnerability in order to reduce the magnitude of disaster loss and damage that potentially impacts park resources, visitors and most important—the natural environment—which marine parks are established to protect. In addition, besides protecting natural resources and ecosystems, managing ecosystems for recreation is one of marine parks’ major goals (Eagles et al. 2002). For this reason, marine parks have to take seriously the vulnerability of visitors or tourists into account. Tourists and visitors not only play an important role in supporting the park’s economy and participating in conservation outreach but they are also very vulnerable to hazards. They do not necessarily understand the local language of the park they visit and they are unlikely to be familiar with the park setting (World Tourism Organization 1998). The negative impact on visitor safety and the image of marine parks as tourism destinations could be long lasting and affect the park’s financial system in the long-term.

Hence, there are a number of reasons why conducting vulnerability assessments in marine parks is so important. The assessment is a crucial step in disaster prevention and preparedness which significantly reduces the need for disaster relief and recovery. Therefore, it should be integrated into the park development

policy and planning at local, regional, multilateral, and national levels. The risk and vulnerability reduction framework also involves both natural and societal conditions; consequently, multidisciplinary participation from stakeholders at all levels from the local community through the national agencies is required (NOAA, Coastal Services Center 1999; Wood 2002; Pearce 2005).

2.4 Delphi Technique

The Delphi technique is the method used to acquire expert opinion throughout this study. In this section, four separate topics related to the Delphi technique are explored. The history and application of the technique is explained first. This is followed by the justification for using the technique in this study. Then, strengths of this technique are presented, followed by its weaknesses and possible risks.

2.4.1 What Is the Delphi Technique?

The Delphi technique received its name from the ancient Greek city named Delphi. Delphi was a city where Greeks came to ask questions of the oracle, and the city was considered to be the center of the universe (Ancient Greece Organization 2005). In the early 1950s, using the Delphi method in forecasting the future emerged again as a modern method for the use of expert opinion in defense research. The subject of this first Delphi study was the “application of expert opinion to the selection, from the point of view of a Soviet strategic planner, of an optimal U.S. industrial target system and to the estimation of the number of A-bombs required to reduce the munitions output by a prescribed amount” (Linstone and Turoff 1975).

Since 1950s, researchers and other professionals have found the Delphi method to be a powerful and flexible tool in replacing subjective opinion with objective data and replicable methods. Although its first application on a technological forecast led to the misunderstanding that Delphi was primarily a forecasting method for decision making, it is not (Martino 1993). In the social science arena, the Delphi method has been used in planning, policy evaluation, forecasting and issue-exploration as a

problem-solving technique. Nowadays, applications of the Delphi method can occasionally be found in a variety of disciplines including medical education, fishery and wildlife management, tourism and recreation management, land use planning, water resource management, political geography, regional studies, and marine environmental management.

In essence, the Delphi method aims to constructively and systematically collect intuitive judgment and opinion from experts in the specific topic through an iteration of questionnaires. During the Delphi process, responses from all panel members are provided as feedback for their review and re-evaluation. The feedback and interaction among the expert panel is completely anonymous. Panel members' identities are kept confidential from each other throughout the process. Therefore, the principal characteristics of the Delphi technique that distinguish this method from other conventional methods such as face-to-face focus group and mail survey are anonymity, iteration with controlled feedback, and statistical response (Martino 1993).

2.4.2 Why Is the Delphi Technique Applicable to this Study?

The Delphi technique is suitable in cases where issues or problems are highly complex and essentially subjective in nature, and absolute answers are unknown or difficult to obtain (Linstone and Turoff 1975; Martino 1993; Garrod 2003). The specific objectives of this study are unprecedented to the marine park stakeholders and are subjective. Moreover, because of the freshness of the disaster, no historical data exist. Thus, intuitive opinion from an expert panel is the best possible source of information to address the study's goals.

The Delphi technique has been used often in natural resource geography where the subjective minds of humans interact with facts of physical science. Examples include agricultural land management (Pease and Coughlin, 1996), sustainable tourism management (Miller 2001; Kaynak and Macaulay 1984), marine pollution control (Side 1986), water resource management (Taylor and Ryder, 2003), environmental assessment (Richey et al. 1985a and Richey et al. 1985b), and public policy regarding

climate change and water management (de Loe 1995). In the specific field of tourism risk management, recent research done by Cunliffe (2005) used the Delphi technique to forecast risks from natural and anthropogenic hazards that might have an impact on the tropical tourism industry from 2001-2050. However, until now, there is no application of the Delphi method on the coastal disaster impacts in marine park tourism.

2.4.3 Strengths of the Delphi Technique

The Delphi technique has several positive aspects. According to Martino (1993) and Stohr and Fraidenburg (1986), the first major advantage of the technique is that the anonymity of the panelists allows each member to freely express his or her opinions without being influenced by the reputation of other members who may present agreement or argument. Second, the anonymity also encourages “outliers” to present their divergent ideas along with their personal rationales without relying on debating skills. This results in a wide spectrum of ideas. Third, iteration with controlled feedback along with anonymity gives panelists chances to re-evaluate their opinions without anyone else knowing they have changed. Fourth, the feedback also permits the moderator to control the direction of group interaction and discussion to move toward the original objectives.

Fifth, the statistical group feedback gives two important values: central tendency (e.g., mode and median) and statistical dispersion (e.g., standard deviation and Inter-Quartile Range) for the questionnaires, providing helpful information for the panelists’ re-evaluation process. Sixth, the anonymous discussion via the feedback throughout the Delphi process allows geographically-dispersed experts to communicate without traveling. Finally, the carefully considered, in-depth, peer-evaluated expert opinions that are unique features in the Delphi technique tend to reduce unreliability of the “snap judgments” collected from questionnaire- or interview-based survey or face-to-face group interaction (Garrod 2003; Martino 1993).

2.4.4 Weakness of the Delphi Technique

The major weakness of the Delphi technique is its strong dependence on expert panels. According to Wheeler et al. (1990) and Martino (1993), the most important step in the Delphi method is the selection of the panel members. The selection of experts must reflect and include several schools of thought. For example, the expert panel for this study should consist of participants from related institutions including academic institutions, tourism managers, park managers, etc. Also, panels should include participants knowledgeable at the local, regional and national levels.

Therefore, balancing the panel members by controlling the drop-out rate throughout the process is a critical task for the moderator. An imbalance of panel members due to high drop-out rates can skew responses toward one school of thought. This may require to immediate termination of the study due to the quality-control issue (Garrod 2003). Moreover, the iterative process takes time and effort from the moderator and expert panel to complete each round. This may cause high operation cost and may be unacceptable for some participants.

Chapter 3

METHODS

This chapter consists of four parts. First, the goals and objectives of this study are explained. Second, the rationale in selecting study sites on the Andaman coast is provided, and specific locations are identified and are briefly described. Third, techniques used to approach each objective are explained, including the rationale for using each of these techniques for the different objectives. Finally, the Delphi technique—used to gather expert opinion regarding several of the objectives—is explained in greater detail.

3.1 Purpose

The primary goal of this research is to explore the impact of the December 26, 2004, Indian Ocean tsunami on tourism in marine national parks in Thailand, including how these impacts were addressed in the year following the disaster (2005) to affect recovery of tourism in marine parks. Based on the results of these analyses, a secondary goal is to develop hazard risk and vulnerability assessment guidelines for marine parks that can be used to examine multiple hazards and promote appropriate mitigation strategies that will build resilience and capacity for more rapid and effective response and recovery. These goals grew out of the author's field observations following the December 24, 2004 tsunami in affected marine national parks (MNPs) and interviews with recovery-effort stakeholders during January-April 2005. To address these goals, five objectives were identified:

1. To explore, qualitatively and quantitatively, the direct and indirect impacts (in time and space) of the 2004 Indian Ocean tsunami on MNPs in Thailand.
2. To determine how these tsunami impacts affected tourism in MNPs during the year following the disaster (2005).

3. To identify actions taken by the MNP authority and the related sectors to recover MNP tourism in the year following the disaster (2005) and to explore effectiveness of these actions.
4. To identify the full range of actions needed to recover MNP tourism and their relative priority.
5. To translate the results of this study into hazard risk and vulnerability assessment guidelines for marine parks to evaluate their degree of risk and vulnerability and choose appropriate mitigation strategies and tactics, thereby promoting marine park resilience and effective response and recovery.

To reach these objectives, four affected MNPs on the Andaman Coast, Thailand were selected for study and evaluation. The next section provides the rationale for selecting these study sites.

3.2 Selection of MNPs for Tourism Impact Evaluation

There are 16 MNPs on the Andaman Coast, Thailand. Each of these parks received a different level of tsunami damage depending on its location, geography, degree of development, and other factors. Of these 16 MNPs, 11 (69 percent) have significant coral reef ecosystems within their boundaries. According to the rapid assessment report conducted by Department of Marine and Coastal Resource (DMCR 2005), the degree of coral reef damage in these MNPs caused by the 2004 tsunami range from zero to more than 50 percent. Because of the importance of coral reefs to MNP tourism, four of these reef-containing marine national parks in the Andaman Sea were selected as study sites to investigate the tsunami impacts on marine tourism, namely, Ao Phang Nga MNP, Hat Noppharat Thara – Mu Ko Phi Phi MNP, Mu Ko Surin MNP, and Laem Son MNP.

These sites were selected for a number of reasons. First, as noted above, each park provides a protected area for the coral reef ecosystem within the park boundary and adjacent areas (see Section 2.1.2 for details on habitat existing in each park). These parks also contain other diverse habitats and settings such as mangrove forests,

sandy beaches, seagrass beds, limestone outcrops and island settings. Due to their uniqueness in providing coral reef ecosystem-related activities and attractions such as snorkeling and SCUBA diving, these parks have been popular destinations among domestic and international tourists during the past decades.

A second reason these parks were selected is that each received a different degree of coral damage, based on the rapid assessment conducted by DMCR (2005). Based on the rapid assessment, coral reef damage at parks was classified into four categories: *None*, *Low*, *Moderate*, or *High*. These four categories of damage were represented by the four selected parks (Table 3-1 and Figure 3-1).

A third basis for study site selection was that these four marine parks were the subjects of post-tsunami scientific investigations focusing on coral reef damage, beach erosion, and park facility destruction, conducted by DMRC; the Department of National Parks, Wildlife and Plant Conservation; and various international donors. Because of the freshness of the 2004 tsunami event, which limited the availability of information generally, it was critical to select sites with available data.

Finally, based on their management regimes, these selected marine parks were categorized by the International Union for Conservation of Nature and Natural Resources (IUCN) under Category II, National Parks, which by definition are managed with tourism and recreation as a primary goal and with secondary goals of preservation of species and genetic diversity, and maintenance of environmental services. They thus provide a strong representation of this category and a basis for comparison to marine parks generally. The four selected sites thus represent appropriate study sites to examine impacts of the 2004 tsunami on tourism in marine national parks.

Table 3-1. Four coral reef damage categories and four selected study sites (Data source: DMCR 2005).

Marine national park	Number of underwater investigation stations**	Average percentage of damage at each diving station	Coral reef damage category
1. Ao Phang Nga	0*	0%	None
2. Hat Nopharat Thara – Mu Ko Phi Phi	19	1 – 10%	Low
3. Mu Ko Surin	21	11 – 30%	Moderate
4. Laem Son	11	31 – 50%	High
<p>* The diving survey had not been done in Ao Phang Nga marine national park based on the assumption that this bay did not receive any impact from the tsunami due to its protected geography (located east of Phuket Island and surrounded by many islands).</p> <p>** Number of underwater investigation stations approximately refers to number or area that coral reef existence in each MNP.</p>			

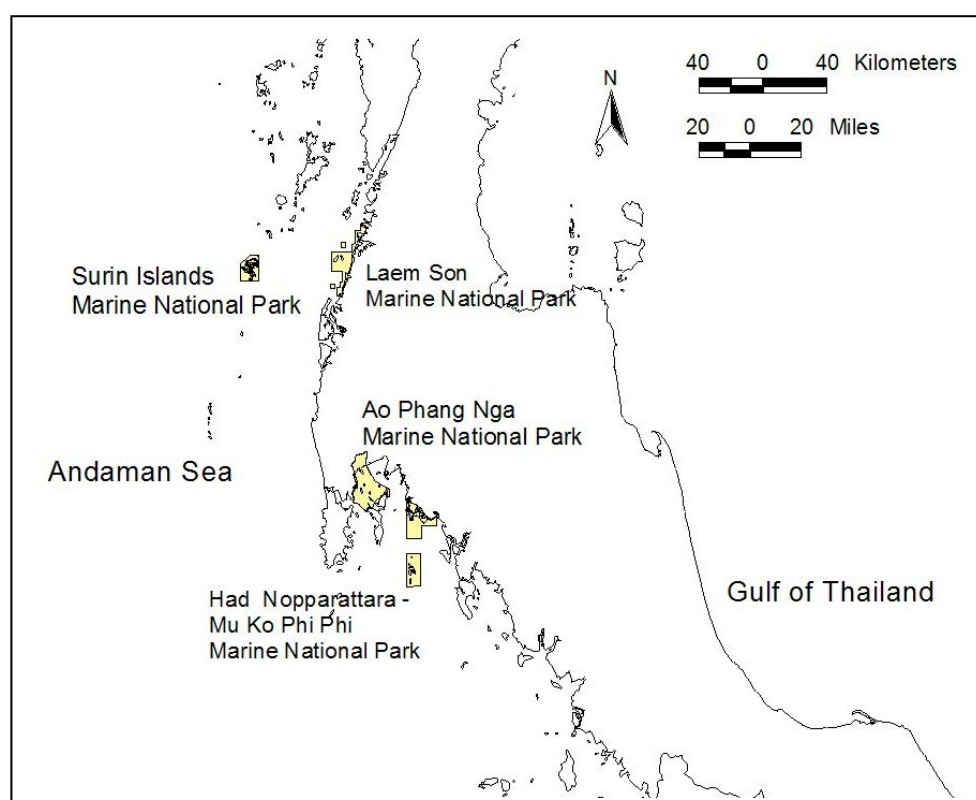


Figure 3-1. Locations of the four Andaman Coast marine national park study sites.

3.3 Methods and Techniques

This study employed six methods and techniques to achieve the research goals:

- field investigations by the author (immediately after and one year after the tsunami);
- a review of documents about the event and about disaster mitigation generally;
- application of the Delphi technique to gather and synthesize expert opinion;
- supplemental interviews with key informants;
- organization of spatial data in a GIS to better understand and visualize impacts and potential mitigation strategies;
- evaluation and adaptation of existing risk and vulnerability assessment.

Each of these is explained below. A summary of methods and techniques used to address each objective is presented in Table 3-2. The overall framework presenting the interrelated outcomes of this study is illustrated in Figure 3-2.

3.3.1 Field Observations

Immediately after the tsunami (January-April 2005), the author conducted field observations in affected MNPs and surrounding areas on the Andaman coast. Observation activities included creating a photo journal and attending local and thematic meetings on needs and impacts that occurred in the studied areas. During this period, a number of non-structured interviews with park stakeholders were also conducted with park rangers, staff, tour operators, park authorities, researchers, divers, and international donors. This process helped refine research questions and site study selection criteria in the next stage of research.

A post-disaster photo journal from field observations also provided a clear illustration of the impacts when making comparisons between before-and-after-disaster photos from the study sites, especially photos of December 2003 and January 2005 from Mu Ko Surin marine national park. References for information gathered during field observations and informal interviews helped immensely during the

literature review stage, and also helped establish a list of experts which was used in the Delphi expert process.

One year later, a second post-tsunami field assessment was conducted for the four study sites, from January to March, 2006. The following field activities were conducted during the one-year post-tsunami field assessment:

1. Gather data to construct tsunami run-up maps of the four study sites.
2. Gather before and after aerial photos or satellite images of the study sites.
3. Conduct on-the-ground photo documentation.

The invaluable first-hand information gathered from field observations contributed to Objectives 1, 2, 3 and 4. For Objective 1 (tsunami impacts on MNPs), the first field investigation provided the opportunity to observe and document directly the degree of damage and destruction within and surrounding the study areas, whereas the second field investigation focused on the on-the-ground examination of the signs of recovery from impacts to both the natural and built environments one year later.

For Objective 2 (tsunami impacts on tourism in MNPs), the general goal of the observations was to investigate impacts of the disaster on tourism resources in parks including natural environment, park facilities in parks, and business communities involved in park tourism. The second field observation done in four selected MNPs, however, was conducted with another specific purpose. This observation carefully assessed park damage that affected the tourism sector. Photos taken from these study areas, especially from Mu Ko Surin MNP, were used to compare before and after the tsunami to provide a general idea of the impacts on tourism resources.

For Objective 3 (recovery efforts, their effectiveness, and constraints), the first field observation conducted immediately after the tsunami disaster provided the opportunity to explore and document immediate response actions that the MNP authority and other related sectors undertook to recover MNP tourism. The second field investigation aimed to document all efforts that had been undertaken in the year following the event—2005. The investigations in the field provided the author with

on-the-ground information and a sensible point of view as to whether response and recovery efforts were fruitful, wasteful, or even worsened the situation. The author also investigated influences of nature in recovering from tsunami impacts during the subsequent monsoon season (April through September 2005).

For Objective 4 (all possible recovery actions), the second field observation from January to March 2006 was also important for identification of the full range of actions needed to recover tourism in MNPs, particularly things that had not been done but would have been very helpful. With basic knowledge obtained from literature reviews, the author assessed the damaged situations and identified actions that might be appropriate and tailored for MNPs in Thailand as well as parks in other tropical areas.

3.3.2 Literature Review

The literature review provided both intensive and extensive data and information relevant to the 2004 tsunami disaster and this study. Here, “extensive” means studies and literature regarding natural disaster impacts on natural areas worldwide. Examples included studies of hurricane damage in the Gulf of Mexico areas (Heyder 2001), the volcanic eruption at Mount Saint Helens in 1980 (Baker 1994), and wildfires in Yellowstone National Park (Beattie 1992). “Intensive” literature review refers to reports and studies that specifically focused on the 2004 tsunami. Examples include studies of coral reef damage in Thai MNPs, rapid assessments of tsunami impacts on coastal areas in Sri Lanka, and post-tsunami geological surveys in the Seychelles (DMCR 2005; DMIP 2005; Obura and Abdulla 2005).

Due to the freshness of the disaster, this study utilized diverse types of documents regarding impacts of the tsunami from various available sources. Types of documents included journal articles, reports from international organizations, governmental reports, non-governmental organization (NGO) reports, unpublished statistics from local government agencies, donors’ reports, and economic analysis reports. Minutes from local government agency and donor meetings, and proceedings

from conferences regarding the disaster were also reviewed. These documents were gathered mainly by personal contacts with Thai governmental officials and from reliable internet sources. A number of documents from other affected countries were also extensively reviewed.

This approach was used in many stages of the study. During the beginning stage, it revealed gaps in the body of research that needed to be filled, and complementarily supported the field observation approach in refining and answering research questions. Specific intentions in applying this technique for each objective are listed below.

For Objectives 1 (tsunami impacts on MNPs) and 2 (tsunami impacts on tourism in MNPs), the literature review contributed to an understanding of the disaster in all affected countries and their impacts on marine park tourism. The review process for Objective 2 was more selective, however, emphasizing MNPs with coral reef ecosystems, a fundamental resource for marine tourism activities. For Objective 3 (recovery efforts, their effectiveness, and constraints), the literature review helped document efforts by various sectors to recover tourism in affected MNPs, particularly the four study sites. Examples include meeting minutes of MNP authorities and Tourism Authority of Thailand (TAT) regarding post-disaster tourism action plans, reports from international donors, and recent academic research reports. These documents provided useful baseline information for construction of the Delphi expert opinion process. Literature was very useful for accomplishing Objective 4 (all possible recovery actions). It included several previous studies engaging recovery efforts in natural-hazard-affected areas. For Objective 5 (risk and vulnerability assessment guidelines), the intent of this process was slightly different from the other objectives. Reviews of risk and vulnerability assessment strategies, particularly the natural hazard vulnerability assessment models, were investigated. These provided initial information and guidelines for the author in transforming results of Objectives 1 through 4 into a risk and vulnerability assessment model that can be applied to MNPs subject to natural disasters.

3.3.3 Delphi Expert Opinion Technique: Iterative Questionnaires

The Delphi technique is a systematic way of gathering qualitative data and information from a group of experts. This technique was fundamental to the first four objectives - gather opinions and experiences from resourceful persons involved in marine park management and disaster recovery. Expert panel members for the Delphi process were selected from relevant fields and affiliations. Information was gathered through the series of iterative questionnaires and semi-structured interviews, all part of the classic Delphi process (Rotondi and Gustafson 1996; Nanthachai 2002; Martino 1993). This technique contributed to outcomes for each of the first four objectives, as explained below. The details of this method including expert selection and other procedures are explained later in Section 3.4.

For Objective 1 (tsunami impacts on MNPs), the author asked the panel members to express their experiences and opinions of the impacts of the 2004 tsunami on MNPs. The final product of this process was a consensus on direct and indirect impacts of the disaster on affected MNPs, organized into four impact categories: social systems and safety, natural resources and ecosystems, built environment, and business community. This consensus served as a primary resource for addressing Objective 2 (tsunami impacts on tourism in MNPs). Panel members, using their knowledge and experience from the past year's activities, were asked to score the degree to which each direct or indirect impact affected marine park tourism,. For Objective 3 (recovery efforts, their effectiveness, and constraints), the Delphi process was used to develop a consensus on key recovery efforts accomplished by various sectors. This is one area where the diverse panel make-up was important for identifying a broad array of actions accomplished by many different responders and aid groups. The experts were also asked to rate the degree of effectiveness of each response/recovery action. The author employed a 10-point rating scale in order to justify the score. At the same time, constraints faced by response/recovery actors during the past year were also documented. For Objective 4 (all possible recovery actions), knowledge gained from Objective 3, together with information gathered during document review, helped

characterize a full range of actions needed to more fully and rapidly recover MNP tourism. Relative priorities for each type of action were also provided by the experts. Information and lessons learned from Delphi panel experts contributed to the vulnerability assessment guidelines that comprised the final step in this study. These guidelines summarize for marine park managers worldwide the knowledge needed to reduce risk from natural disasters in the future.

3.3.4 Informant Interviews

Although the majority of data and information for each objective were collected using the Delphi expert process, supplemental informant interviews provided useful qualitative and in-depth information beyond those quantitative results. The in-depth conversations conducted during a Delphi process had been demonstrated in previous studies, for example, by Pease and Coughlin (1996). Rotondi and Gustafson (1996) also found that supplemental conversations helped combine the efforts of individuals with diverse experiences, expertise and wisdom, and to direct these efforts toward the achievement of a common goal. Interviewees, however, were not limited to experts serving on the panel. A number of other informants who were involved in marine park management and park tourism were also interviewed. This technique was used in all research objectives to enrich data collection and to explain the reasons behind the experts' decision.

Supplemental informant interviews were especially useful in addressing Objective 3 (recovery efforts, their effectiveness, and constraints), particularly when combined with on-the-ground data and findings from field observations. The interviews also helped to identify other actions that might have been done during the past year or other actions that need to be carried out in the following years (Objective 4 (all possible recovery actions)). Gaps, constraints, and meaningful recommendations regarding the recovery efforts were also discovered during this process. Interviews with several internationally recognized experts in the field of natural disaster and

coastal zone management were particularly useful in constructing the risk and vulnerability assessment model (Objective 5).

3.3.5 Data Compilation and Presentation Using GIS and Cartographic Techniques

GIS and cartographic techniques were used mainly for Objectives 1, 2, and 5. The author compiled data and information gathered from field observations and expert opinions onto a geographic format. A number of maps were constructed to present results and findings. Digital and paper maps from several sources were acquired. GIS layers of related themes produced by Environmental Research Institute Chulalongkorn University were used to construct based maps for this study. Maps of affected areas both at the 1:50,000 and 1:250,000 scale obtained from the Royal Thai Survey Department were also used along with detailed maps of the affected marine national parks from the National Park, Wildlife and Plant Conservation Department to verify and complement attributes of the base maps.

Satellite images and aerial photos given by the Global Change System for Analysis, Research and Training Regional Center (START RC), the Geoinformatics for Thailand (GISTHAI), and Earthstar Geographics LLC provided the author the general geographic and geologic formation of the affected areas. Specific maps regarding coral reef damage and tsunami run-up height presented in this study were constructed based on reports from several reliable sources including the Department of Marine and Coastal Resources (DMCR 2005), Ministry of Natural Resources and Environment (MNRE 2005), and Coral Cay Conservation (2005).

Based on the above information, the author constructed a number of GIS themes to create maps. Example themes are marine park facilities, number of provincial casualties, location of damaged coral reefs, and tsunami run-up height in each study site. The GIS was also used to design maps showing steps in the proposed marine park vulnerability assessment model (see Appendix N).

3.3.6 Evaluation and Adaptation of Existing Risk and Vulnerability Assessment Techniques

To address Objective 5 (marine park vulnerability assessment guideline), existing methods for assessing risk and vulnerability were identified and evaluated for applicability to MNPs. Extensive document reviews were conducted to gain a general perspective on risk and vulnerability assessment techniques, with intensive focus on techniques used by NOAA's Coastal Services Center, which has dealt extensively with such assessments for hurricane-prone areas. Also particularly useful were the Heinz Center (2000) report, *The Hidden Costs of Coastal Hazards: Implications for Risk Assessment and Mitigation* and Wood et al. (2002), *Vulnerability Assessment of a Port and Harbor Community to Earthquake and Tsunami Hazards*.

A number of methods and techniques were used with each objective. A summary of methods and techniques used for each objective is presented in Table 3-2. Furthermore, these five interrelated objectives also resulted in five interconnected results: (1) a compilation of tsunami impacts on MNPs, (2) the degree to which each tsunami impact affected the tourism sector in parks, (3) recovery efforts accomplished in the first year following the tsunami that helped mitigate tourism impacts, (4) a list of possible recovery/mitigation actions that would be useful to reduce the degree of tsunami impacts on tourism, and (5) guidelines for risk and vulnerability assessment of natural disaster in tropical MNPs. These interconnected outcomes and the overall framework of this study is presented in Figure 3-2.

3.4 Delphi Technique and Expert Opinion Collection

This section addresses the methods and procedures used in the Delphi technique. It includes a description of the expert panel selection process, the questionnaire design, the data collection process, and data analysis techniques. Here, the author acted as "a moderator" and the Delphi experts were called "panel members or panelists". The majority of the Delphi process was conducted by the moderator in Thailand. The use of the Delphi research design for this study is summarized in Figure 3-3.

Table 3-2. Summary of methodologies and techniques used in each objective.

Methodologies and techniques	Objectives				
	1	2	3	4	5
1. Field observations	X	X	X	X	
2. Literature review	X	X	X	X	X
3. Expert opinion using Delphi technique	X	X	X	X	X
4. Supplemental informant interviews	X	X	X	X	X
5. Data compilation and presentation using GIS and cartographic technique	X	X			X
6. Evaluation and adaptation of existing risk and vulnerability assessment models					X
Note: Objective no. 1 To document, qualitatively and quantitatively, the direct and indirect impacts (in time and space) of the 2004 Indian Ocean tsunami on MNPs in Thailand. 2 To determine how these tsunami impacts affected tourism in MNPs during the year following the disaster (2005). 3 To document actions taken by the MNP authority and the related sectors to recover MNP tourism in the year following the disaster (2005). 4 To identify the full range of actions needed to recover MNP tourism and their relative priority. 5 To translate the results of this study into a risk and vulnerability assessment guideline for marine parks to evaluate their degree of risk and vulnerability which is believed to promote marine parks' resilience and led to more effective recovery.					

3.4.1 Delphi Expert Selection Process: Selection Procedure and Criteria

The basic goal of the Delphi technique is to include extreme opinions, specific schools of thought, and minority as well as majority views. Therefore, the expert selection process could be considered the most important stage in the Delphi study since the technique heavily relies on opinion and personal experience of the selected experts. Based on reviewed Delphi literature, however, there was no rigid rule on how many experts should serve as panel members in order to reach this essential goal. The number of panel members can vary from 10 to a few hundred experts depending on the specific purposes of each study. Garrod (2003) mentioned regarding this concern that instead of finding a fixed number of experts: “any Delphi panel should be able to demonstrate a good balance of professional and academic backgrounds, personal and professional interests, and national locations”. Martino (1993) and Ziglio (1996) also emphasized that a panel member should be selected for knowledge and practical

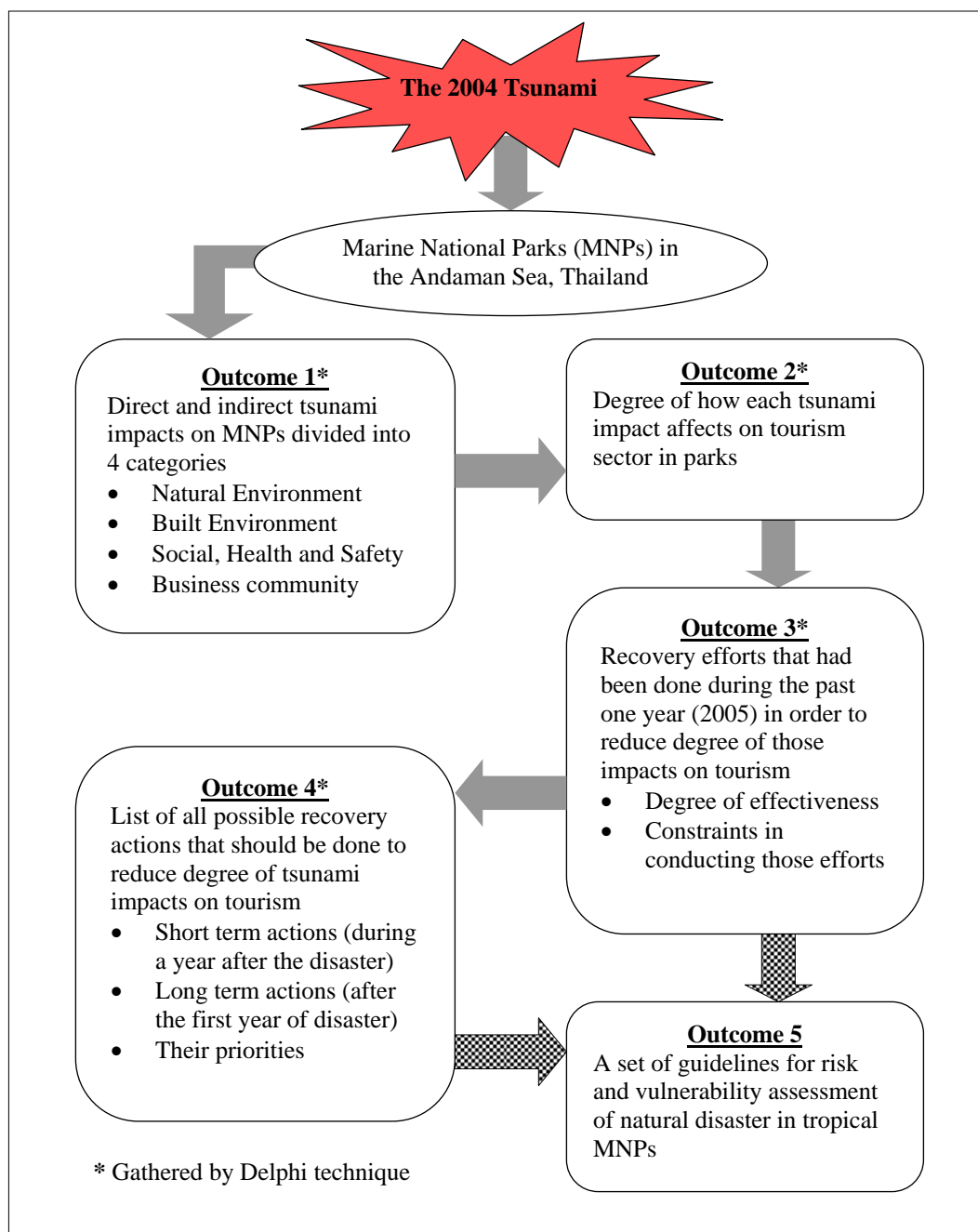


Figure 3-2. Interrelated outcomes and overall framework of this study.

engagement with the topic or issues under investigation. Therefore, individual expertise and balance of members' expertise are the key decisive factors in the expert selection process.

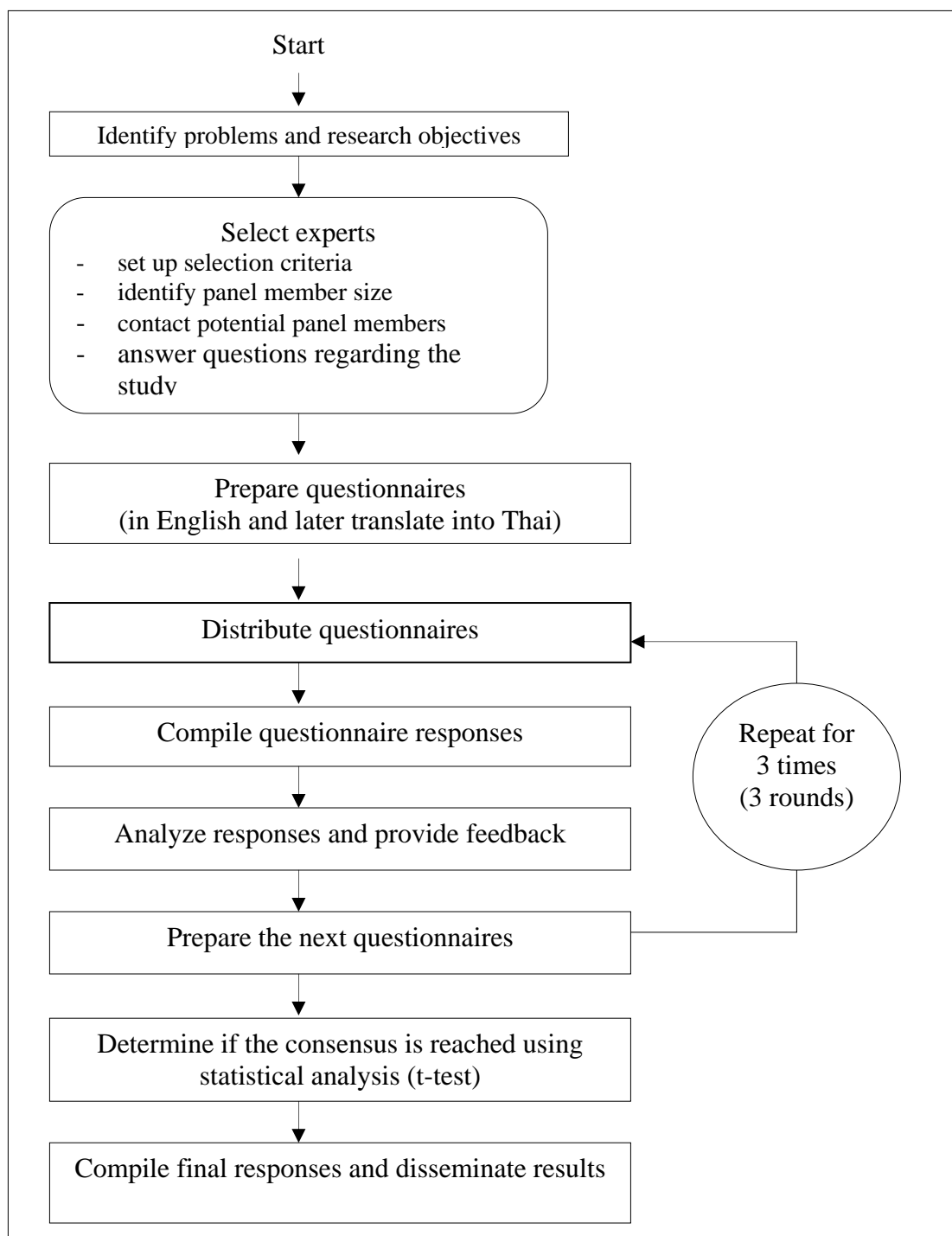


Figure 3-3. Delphi research design for this study (Modified from Kaynak and Macaulay 1984).

The Delphi technique was used to obtain the opinions of the expert community on specific subjects; therefore, the panel members in this Delphi study were selected with particular criteria to be representatives of the expert community rather than randomly picked from a large expert domain. This was a significant point that made the Delphi selection method different from a traditional public opinion poll.

With these notions in mind, the experts participating in this study were selected with a number of criteria and procedures. The moderator considered that a panel with 20 members was large enough for differing views to emerge among the panel members. At the same time, it was small enough to allow questionnaires to be turned around in a timely manner. Due to the fact that the moderator and all of panel members were Thai, the questionnaire and semi-structured interviews were conducted in the Thai language. This offered the freedom for the members to respond and express their experiences in their own mother tongue.

A universal method for identifying potential members of an expert panel does not exist (Linstone and Turoff 1975; Richey et al. 1985a; Richey et al. 1985b; Martino 1993). Consequently, a “modified snowball” technique for choosing candidates was specifically developed for this application. The researcher selected six notable experts who had closely engaged with the impacts of the tsunami in the affected marine national parks in Thailand within one year after the disaster. These six professionals were selected from six different fields or affiliations to be representatives from diverse schools of thought regarding the 2004 tsunami. These six professionals were called “starters”. These six representatives were as follows:

1. Marine national park manager and planner (National Park, Wildlife and Plant Conservation Department)
2. Tourism promoter and manager (Tourism Authority of Thailand, TAT)
3. Academic researcher
4. Tour operator that led diving and snorkeling tours in MNPs
5. Marine and coastal resource manager (Department of Marine and Coastal Resources, DMCR)

6. Non-government organization (NGO) or environmental activity group.

These six starters were selected because they had been closely involved with the MNPs and its tourism resources before and after the 2004 tsunami disaster. They also were well-known and had strong connections to the tsunami recovery task forces in their organizations.

Each of these six starters was contacted by the moderator. The moderator provided information regarding objectives and principal goals of this study and sought their participation. Starters were then asked to identify and prioritize a list of 10 knowledgeable persons for possible expert panel participation: “Please identify 10 individuals that you consider to be knowledgeable persons in the impacts of the 2004 tsunami on tourism in marine national parks. They may be from any occupational status, such as marine national park planners and managers, tourism officers, academic researchers, tour operators, environmental groups, media, or from the lay public. They need not be physically located in the tsunami affected areas, but must be knowledgeable about the impacts of this disaster and have potential capabilities in answering the questions regarding impacts of the disaster on marine national parks. The following criteria in expert selection are provided as guidelines for your consideration. Please include yourself, if appropriate.”

Nominees could be suggested by their “position” if their name was not known, for example, chief of park ranger at a study site. Selection criteria established for this study were designed to ensure the experts had the necessary knowledge and skills to address several rounds of questions throughout the study. The following criteria were used to judge the suitability of the panel members:

1. They had working experience in at least one of the selected study sites before and after the 2004 tsunami. Working experience included, but was not limited to, conducting research in MNPs, operating tours in MNPs, being a SCUBA diver, etc. The selected study sites were four affected marine national parks in the Andaman Sea, Thailand, namely:

- Ao Phang Nga
 - Hat Nopharat Thara – Mu Ko Phi Phi
 - Mu Ko Surin, and
 - Laem Son.
2. They had working experience regarding tourism planning or operations in natural settings.
 3. They had visited *at least one* of the affected marine national parks in the Andaman Sea after the disaster.
 4. If they did not meet the above criteria, they had to be accepted as knowledgeable persons who had some involvement in recovery efforts of the disaster in marine national parks.

The balance of panel members was a key “quality control” measure for the Delphi technique. Therefore, the following criteria were used to maintain the balance of the panel members through out the study:

1. the panel comprised approximately 20 members
2. the panel included no more than one-fourth (five people) of the members sharing the same affiliation, profession, or academic background
3. the panel comprised *at least two experts* who are knowledgeable regarding each selected site.

The initial selection of panel members started from a list of potential participants nominated by six starters (6×10 , $n = 60$). From the list of 60 nominees, the moderator selected approximately 20 knowledgeable persons nominated most frequently. Those who had been nominated by at least two other people were first chosen. Then, the remaining panel members were selected from those who were nominated once. Nevertheless, this selection process had to agree with the panel member balancing criteria.

Since the nominated experts were usually busy and the Delphi technique required time and thoughtful effort from each panel member to be available for the full sequence of the questionnaire, the moderator had to establish a priority ranking among

the potential panelists. In setting this priority, the most significant consideration during the initial search is the degree of expertise (Martino 1993). Then, considerations such as likely availability and probable willingness to serve can be taken into account.

After the list of nominees was gathered, the moderator contacted each potential panel member, inviting him or her to participate in this study. They were assured of confidentiality regarding all individual responses. The invitations for those nominees who were geographically spread were done via telephone communication. According to Rotondi and Gustafson (1996), it was very important to give clear information regarding the study to the potential participants at this invitation stage, so they would understand how the process worked and whether or not they were capable to commit their time and efforts during the series of questionnaires.

3.4.2 Questionnaire Design

One important reason why the Delphi technique was appropriate for this study was because it was an exercise in group communication among a panel of geographically dispersed experts. It also allowed panel members to deal systematically with a complex problem or task. Due to the dispersed nature of the experts, a series of questionnaires were sent, either by express mail, electronic mail, fax machine, or in person, to the pre-selected expert panel members. During the Delphi process, each questionnaire responded to by a panel member was identified by “Identification Number” to prevent any bias or other anonymous issues that might occur. Only the moderator could link the ID number on the questionnaire with each member. The procedures of the Delphi technique used through out this study are identified below. The procedures had moved toward expected outcomes of each objective:

- Objective 1: Consensus on tsunami impacts in MNPs
- Objective 2: Level to which each tsunami impact influenced tourism in MNPs

- Objective 3: Consensus on recovery efforts actually undertaken, along with their effectiveness; and a consensus on response/recovery constraints over the course of the first year's efforts, i.e., 2005
- Objective 4: Consensus on tsunami and tourism recovery actions that ideally would have been accomplished (or should be accomplished in the future), along with their priority

Round one (R1)

The questionnaire for the first round posed the problem of tsunami impacts in broad terms and encouraged specific answers and general comments using unstructured questions in an open-ended format. To provide clarity, several examples of potential impacts identified during the literature review process were provided at the start (see Appendix D). These examples were designed to help panel members get started, but were not provided as a limit to their freedom to make their own responses.

The R1 questionnaire was divided into five main sections. The first four sections corresponded with the four categories of tsunami impacts to be analyzed: built environment; business community; social, health, and safety; and natural resources and ecosystems (Heinz Center 2000). Each of these four sections was itself comprised of four parts, as explained below.

The first part of each section of the questionnaire addressed Objective 1, providing an initial list of tsunami impacts in MNPs that was created by the moderator and based on field observation and the literature review. Panel members were asked to affirm or modify particular impacts on the list or add to them based upon their experiences.

The second part of each section addressed Objective 2, wherein panel members were asked to identify tsunami impacts from part one that influenced the tourism sector in MNPs. Later, their responses were classified as either direct or indirect impacts.

The third and fourth parts of R1 addressed Objective 3. An initial list of recovery efforts had been developed in advance, based mainly on literature review and field observation. Members were asked to suggest or add other efforts that they experienced, were aware of, or had been accomplished by their organizations. Constraints that she/he had faced or observed others dealing with during the year 2005 were also solicited, for example, “What obstacles did you face regarding the tourism recovery efforts?”.

The last part of R1 (section 5) is related to Objective 4. Open-ended questions asking for additional response/recovery efforts that should have been undertaken after the disaster were posed. This section allowed the members to express their thoughts and experiences freely (see Appendix D for details). The informative answers from this section were compiled in a list format for use in Round Two.

Round Two (R2)

After gathering results of R1, the moderator summarized and transformed them into a set of questions for R2. The R2 questionnaire was divided into six sections. Each of the first four sections had four parts. The first part focused on Objective 1 and included a complete list of tsunami impacts identified by panel members. To provide comprehensive feedback, panel members again were asked to add any other impacts they deemed important.

The second part addressed Objective 2. Using the same list of tsunami impacts from R1, panel members were asked to score each of the tsunami impacts with respect to the degree of influence that impact had on the tourism sector in MNPs. Here, a 10-point rating scale was used to determine the relative intensity of different impacts (from “Most influence” to “No influence at all”).

The third and fourth parts of R2 addressed Objective 3 and included a list of recovery efforts from R1 that panel members were asked to score with respect to their level of effectiveness. The 10-point rating scale was used in this section ranging from

“Most effective” to “Not effective at all”. A list of constraints gathered from R1 was also presented to members and they were asked to add to that list if needed.

The fifth part of all six main sections was specially added in the R2 questionnaire. The members were asked to prioritize each effort. The 3-point rating scale was utilized ranging from “Very urgent”, “Moderately urgent”, and “Less urgent” (see Appendix F for details).

The moderator also added a sixth section to accommodate panel members who wanted to note positive impacts of the tsunami.

Round Three (R3)

The moderator compiled and analyzed all data collected from R2. The R3 questionnaire was divided into seven main sections and, as with earlier rounds, the first four sections each had four parts addressing Objectives 1, 2, and 3.

In the first part, panel members were asked if they wanted to suggest additional tsunami impacts. The second part asked to re-evaluate their original answers regarding the impact of the tsunami on the tourism sector in MNPs and included with a statistical summary of the entire group’s responses (see Appendix H for details). The third and fourth parts of R3 asked panel members to re-evaluate their original answers regarding recovery actions in the light of statistical feedback from the whole group—median, mode and Inter-Quartile Range (IQR) were provided, along with each member’s previous assessment. The fifth section asked members to re-evaluate their original answers regarding the ideal set of tsunami recovery actions in the light of feedback from the other panel members. In the sixth section, positive impacts of the tsunami on MNPs that had been identified by panel members were presented for evaluation and additions.

In the last section, space was provided for members to give suggestions or additional comments regarding this research, including the benefits and drawbacks of the Delphi technique in this study. This complicated questionnaire design was

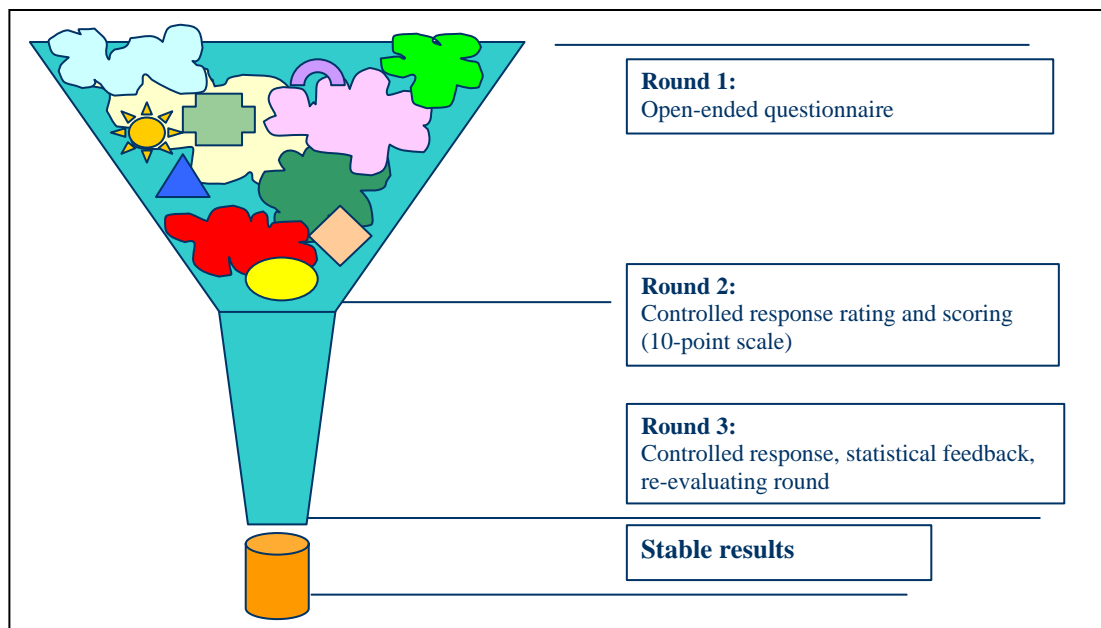


Figure 3-4. Funnel concept of questionnaire design in the Delphi technique.

simplified in the funnel diagram (see Figure 3-4). Outcomes and specific Delphi procedures for each research objectives are summarized in Table 3-3.

3.4.3 Data Collection Process

After the moderator contacted and explained the research to each potential participant, the first round (R1) questionnaires were distributed. The questionnaires were delivered in person to participants who lived or worked in Bangkok. For participants who worked or lived in/near the four study sites, the questionnaires were sent by Express Mail Services (EMS) which required addressee's signature verification.

This first round package contained an introductory letter regarding the project, a cover letter, the questionnaire, and a self-addressed, stamped envelope. Here, the moderator preferred to use participants' response as documentation of the consent rather than obtaining a signed consent. The justification for waiving of documentation of signed consent had been added to the protocol and cover letter with the elements of

Table 3-3. Outcomes of each questionnaire round for each objective and task (or general questions) of each round.

	Basic questions for each questionnaire round			
	Objective 1	Objective 2	Objective 3	Objective 4
Round One (R1)	<ul style="list-style-type: none"> A list of tsunami impacts was provided as initiative. Semi-structured questions asking the members to suggest additional impacts or make any correction. 	<ul style="list-style-type: none"> Using information gathered for Objective 1, members were asked which impacts influenced tourism in MNPs. 	<ul style="list-style-type: none"> An initial list of recovery efforts that had been done were provided as examples. Members were asked to suggest or add other efforts that they knew or had been done in their organizations. What were constraints that she/he faced? 	<ul style="list-style-type: none"> Open-ended questions asking for additional efforts that should be done after the disaster.
Round Two (R2)	<ul style="list-style-type: none"> Results of R1 were presented as questions for R2. Members were asked to revise or add additional tsunami impacts. 	<ul style="list-style-type: none"> Members were asked to score the level of each impact that influenced tourism in MNPs. 	<ul style="list-style-type: none"> Members were asked to rank level of effectiveness from the list of recovery efforts gathered from R1. A list of constraints was presented to members and they were asked if they would like to add more constraints. 	<ul style="list-style-type: none"> List of all possible recovery efforts was compiled. Members were asked to give priority for each effort.
Round Three (R3)	<ul style="list-style-type: none"> Members were asked to revise or add additional tsunami impacts. 	<ul style="list-style-type: none"> Members were asked to re-evaluate their original answers with feedback from the whole group. The results were finalized. 	<ul style="list-style-type: none"> Members were asked to re-evaluate their original answers with feedback from the whole group. The results were finalized. 	<ul style="list-style-type: none"> Members were asked to re-evaluate their original answers with feedback from the whole group. The results were finalized.
Expected outcome(s) of each objective	<ul style="list-style-type: none"> Consensus of tsunami impacts in MNPs 	<ul style="list-style-type: none"> Degree of each tsunami impact on tourism in MNPs 	<ul style="list-style-type: none"> Consensus of recovery efforts during the year 2005 Effectiveness degree of each effort Consensus of constraints 	<ul style="list-style-type: none"> Consensus of all possible recovery actions Priorities of these actions
<p>Note: Objective no.</p> <p>1 To document, qualitatively and quantitatively, the direct and indirect impacts (in time and space) of the 2004 Indian Ocean tsunami on MNPs in Thailand.</p> <p>2 To determine how these tsunami impacts affected tourism in MNPs during the year following the disaster (2005)</p> <p>3 To document actions taken by the MNP authority and the related sectors to recover MNP tourism in the year following the disaster (2005)</p> <p>4 To identify the full range of actions needed to recover MNP tourism and their relative priority</p>				

consent. To enhance effective communication with panel members, the moderator also used telephone calls and email.

The moderator set up a three week duration between distributing and retrieving Round 1 questionnaires. Due to the limited time frame and positive response as documentation of the consent, after the deadline, all un-retained questionnaires were dropped from the contact list. At the end of Round 1, two out of 25 people were dropped out (92% remained). This left 23 participants for Round 2. Although the drop out slightly affected the balance of the panelists' professions, the proportions of panelists still met the Delphi expert balance criteria (see section 3.4.1).

All completed Round I questionnaires were analyzed and transformed into the Round 2 questionnaire format. The Round 2 questionnaires along with self-addressed, stamped envelopes were then sent to 23 panel members via EMS. For this round, the moderator personally met with some panel members who lived or worked in/near the study sites. Unstructured interviews with some panelists were conducted after panelists completed the Round 2 questionnaire. These interviews helped enrich the information gained from Rounds 1 and 2.

Again, the duration between distributing and retrieving Round 2 questionnaires was set for three weeks. The moderator also used telephone calls and email to keep in contact with all participants. After the deadline passed, there were three people out of 23 participants who dropped out (87% remained). This left 20 participants to serve on the panel for Round 3. Again, this 13% drop out rate from Round 2 somewhat affected the panelists' profession balance; overall, however, the Delphi panel still met the balance criteria (see section 3.4.1). Moreover, the dropped participants' answers which had been included and used to construct the Round 2 questionnaire were answered by the remaining participants. Therefore, their drop out did not affect the Round 2 questionnaire construction and results (see Appendix A for description of the Delphi expert panel).

For Round 3, it was very important to retrieve all completed questionnaires because the statistical summary was calculated using responses from all 20 panelists.

Therefore, the deadline for returned questionnaires was not established. All 20 questionnaires were returned for a 100% response rate.

3.4.4 Data Analysis

Martino (1993) notes that “one of the advantages of Delphi is that the statistical response includes the views of “outliners” as well as “centrists””. Hence, the Delphi technique aims to display disagreement and, at the same time, to provide the reason behind the divergence. The Delphi process uses summary statistics to communicate the feedback among the whole group of members. With this in mind, the moderator chose to make this process as simple as possible. The summary statistics had two purposes:

- 1) To show how different data seem similar or have central tendency (mode, mean, or median); and
- 2) To show how they differ or have statistical dispersion (standard deviation (SD), variance, range, inter-quartile range (IQR), or absolute deviation).

The selection of statistics to reveal these characteristics vary from one study to another in the literature, depending on the specific purposes and the rating scale used. A number of studies used mean and standard deviation (Miller 2001; Green et al. 1990). Median and IQR were used by Martino (1993), and two studies used mode and median to emphasize the central tendency of the data set (Pease and Coughlin 1996; Nanthachai 2002).

In this study, which used a 10-point rating scale, the moderator found that median, mode, and IQR were the most practical and appropriate values for explaining results related to each study objective. Here, median and mode showed the central tendency of the data set. The median is the number in the middle of a set of numbers which is the location of the center of a group of numbers in a statistical distribution. The calculation of median was easy and simple to understand for the moderator and for the panel members. Moreover, the median gave a measure that was more realistic in the presence of minority or outlier values than the mean.

Mode is the value that has the most frequent number of observations. The moderator simply called it “most popular vote or most popular value”. Its simplicity made the feedback of the panel members easy to interpret by each member. Additionally, unlike the mean or average value, the mode was not influenced by outliers or skews. Therefore, the mode and median gave a more accurate indication of central tendency than the mean.

IQR is a measure of dispersion. When the data were arranged in order of magnitude (i.e., ranked), the quartiles were three numbers which divided the data into four groups (4 quarters) each having approximately the same number of values. IQR value is usually presented along with median value because median is the middle value of the whole data set or Quartile 2. IQR is the difference between the upper and lower quartiles or the range of the middle 50% of the data.

Consequently, using these three values (mode, mean, and IQR) in the statistical summary as feedback to panelists was simpler and more meaningful than using mean and SD values. These values were presented in the Round 3 questionnaire as supplemental information for each panel member to be used during the re-evaluation process. For a quick reference and for convenience during the revision process, these values were presented side-by-side with the previous vote of each member (see Appendix H).

In order to judge the success of the Delphi sequence, Martino (1993) noted: “Delphi sequences are considered as successful when they reach stability, that is, when there is no further change from round to round, with the reasons for divergence clearly displayed..... The original design for the Delphi can be open-ended in terms of number of rounds”. However, in this study, the moderator selected the number of rounds to fit the study’s time frame and budget while the rest of the study process still mainly followed the original Delphi principles. Moreover, according to Linstone and Turoff (1975), Stohr and Fraidenburg (1986), and Martino (1993), three rounds usually are enough to obtain a consensus among the responses. Additional rounds are likely to reveal slight change and cause excessive iteration. Additional rounds would

also require more effort from participants, possibly leading to frustration and a higher drop-out rate among the expert panel. For these reasons, there were three Delphi rounds in this study.

The moderator also analyzed the stability or a significant convergence or divergence of opinion from R2 and R3 using t-test. The primary purpose of this analysis was to measure the level of dependency or “goodness of fit” between the two data sets (results of R2 and R3). This determined whether the two data sets were likely to come from the same two underlying populations that had the same mean. The analysis showed whether the two data sets were “associated” or “independent” using the appropriate degree of freedom and threshold. In this study, the number of data (n) was n = 20 in both rounds (round 2 and 3) with no panel member drop out. With this condition, the nature of data sets was “paired”.

Chapter 4

RESULTS AND DISCUSSION

The impacts of the 2004 Indian Ocean tsunami on Thailand's Andaman Coast and its people, economy, institutions, and natural resources led to what has probably been the nation's most extensive post-disaster recovery effort ever. Several marine national parks, one of the key visitor attractions in the region, were especially hard-hit by the tsunami. Considering events in four representative marine national parks, this chapter documents the impacts of the tsunami, how tourism was affected, and recovery efforts undertaken in 2005—the year following the disaster. The results are mainly derived from the Delphi process, supplemented by post-disaster rapid assessment data and site visits by the author.

The chapter has nine parts, the first of which characterizes the Delphi expert panel. The following four sections are inter-related and present the results and analysis of the Delphi expert opinion survey. These address the first three objectives posed in this dissertation—tsunami impacts, recovery efforts, and constraints to recovery. They are further organized according to the four impact categories examined: (1) natural environment, (2) built environment, (3) business community, and (4) social systems and human safety. The sixth section presents additional priority recovery actions for marine national parks (MNPs) and the associated tourism sector. These address the fourth objective of the research. The next section examines differences in Delphi panelists' opinions based on their professions to determine if there are any patterns that might explain the results. The eighth section describes the positive impacts of the tsunami on marine national park management identified by the panel—this was not part of the original inquiry, but virtually all panelists noted examples. Finally, the last section examines how study findings played out in the four different MNP study sites.

4.1 The Delphi Expert Panel

In selecting panelists to examine the impacts of the 2004 tsunami on MNP tourism, the goal was to identify a group of experts whose diverse opinions and intuitive judgment were based on direct experience with the tsunami itself, and/or in post-event tsunami impact assessment or recovery. The “snowball” process for selecting the 20-member expert panel for this Delphi exercise is outlined in the methodology chapter. Briefly, based on her field experience in the wake of the tsunami, the author recruited six knowledgeable “starters” and asked them to nominate 10 others who fit the desired profiles for the expert team. Twenty knowledgeable persons who were nominated most frequently and were able to commit their time through out the whole process were asked to serve on the expert panels.

It is noteworthy that the experts in this Delphi study were selected based on specific criteria that identifies them as representatives of the expert community rather than randomly-picked individuals from a large domain. Therefore, these selected experts were not samples of the whole population. The Delphi expert selection process is thus quite different from a typical random-sample selection process used in public opinion polls.

Although 20 experts might seem like a small number, their different fields and affiliations provided a good representation of diverse experience and schools-of-thought regarding the 2004 tsunami. The experts came from six professions that involved in the tsunami recovery efforts including (1) academic researchers, (2) marine and coastal resource managers (Department of Marine and Coastal Resources, DMCR), (3) marine national park managers and planners (National Park, Wildlife and Plant Conservation Department), (4) non-government organizations or environmental activity groups, (5) tourism promoters and managers (Tourism Authority of Thailand, TAT), and (6) tour operators that lead diving and snorkeling tours in MNPs. Twelve of them (60 percent) were males and the rest (40 percent) were females. Their ages ranged between 25 to 59 years old.

In addition, the selected experts were well-educated; 60 percent possessed master's-level degrees and 20 percent doctoral degrees. They also had intimate knowledge of one or more of the four MNP study sites: (1) Ao Phang Nga MNP, (2) Hat Nopharat Thara-Mu Ko Phi Phi MNP, (3) Mu Ko Surin MNP, and (4) Laem Son MNP. A detailed description of the makeup and characteristics of the expert panel is included as Appendix A.

4.2 Natural Resources and Ecosystems: Tsunami Impacts, Response and Recovery in MNPs

The 2004 tsunami had both direct and indirect impacts on MNP *natural resources and ecosystems*. Direct impacts were the immediate physical damage to marine and terrestrial ecosystems, associated habitats, and plant and animal communities caused by the tsunami itself. Indirect impacts to natural resources and ecosystems were those occurring later in time, such as those associated with debris cleanup and disposal, spilled fuel, sewage, industrial waste, and leakage of household toxic chemicals.

4.2.1 Impacts of the 2004 Tsunami on MNP Natural Resources and Ecosystems

The 20 Delphi experts identified a variety of tsunami impacts on natural resources and ecosystems within and/or around marine park boundaries. The impacts/damages were classified into five categories as follow.

a) Changes in Offshore Bathymetry and Upland Topography. The series of tsunami waves striking the Andaman coast entrained huge amounts of offshore sand and drove it onshore, resulting in immediate bathymetric changes, especially nearshore, and deposition of sand inland to the extent of tsunami inundation. The powerful waves also killed fish and benthic-dwelling organisms and dramatically changed habitat configuration and conditions offshore, breaking and grinding up fragile corals, and uprooting submerged vegetation and mangroves. Onshore, there was

virtually no physical damage to rocky headlands, while low-lying sandy shorelines and adjacent areas received the brunt of tsunami forces. Severe beach erosion and destruction of beach forests altered habitat conditions there. In the field, the author found that shore-anchoring *Casuarina* trees and coconut were heavily damaged, uprooted by the powerful force of tsunami waves that loosened and eroded the underlying soil strata (Figure 4-1). Incidentally, impacts to these beach forests were not in the DMCR (2005) rapid impact assessment and only anecdotal information exists on how these ecosystems actually fared.

Other coastal habitats were also damaged, including nesting areas for sea turtles and shorebirds. In some areas, previously white sand beaches were covered by black, dirty-looking fine sediments and debris. The tsunami also created, transported, and deposited a huge amount of debris—building remnants, vehicles, trees and other abrasive materials—that exacerbated direct physical damage to both marine and coastal resources and ecosystems. These changes, particularly to offshore coral reefs and associated sandy bottoms, also had the indirect impact of adversely affecting popular diving sites within marine parks.

Based on the author's field observations, the kind of damage each park area experienced related to the localized tsunami run-up height, the extent of inundation inland, the type of sediments offshore, and where these sediments were deposited. With respect to study area parks, beach and onshore natural systems damage was most significant at Had Nopparattara-Mu Ko Phi Phi and Mu Ko Surin. At the latter park, the barrier beach separating two islands was completely breached and destroyed, although it has begun to reestablish itself naturally over the past year.

b) Impacts on mangrove and seagrass beds. In a few areas, seagrass beds and mangroves were uprooted or were covered over by sediment carried onshore by the tsunami. Mangrove forests cover approximately 700 square miles (1,814 square

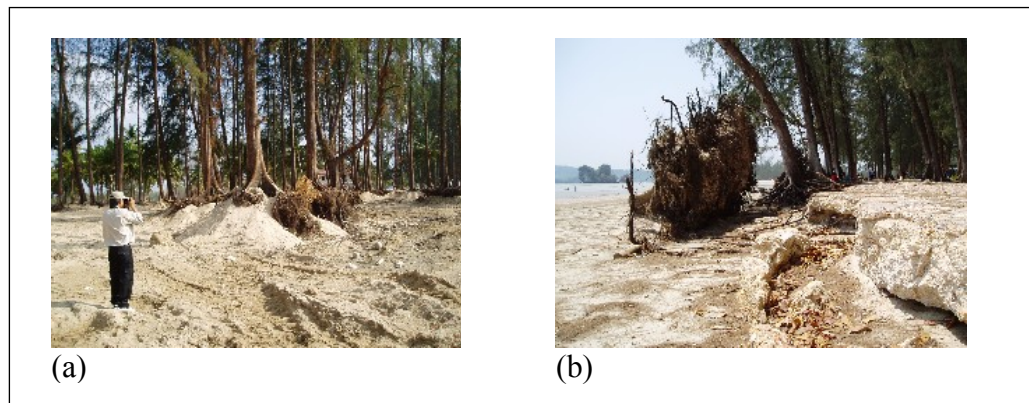


Figure 4-1. Heavily eroded beach and damaged beach forest (*Casuarina* trees) in (a) Laem Pragarung area, Phang Nga province and (b) Had Nopparattara-Mu Ko Phi Phi Marine National Park (Somrudee Meprasert photos).

kilometers) along the Andaman Coast. According to DMCR's (2005), only about 1 square mile or 3 square kilometers of mangrove were completely destroyed—less than 0.2 percent of the total area. Damage to seagrass beds was somewhat greater, but also low, with just 1.5 percent of all inspected seagrass habitats lost. Of these mangrove and seagrass beds lost, only a small fraction was located within or adjacent to marine national parks.

c) Impacts on coral reefs. As noted earlier, coral reefs and associated biological communities were directly damaged by the forces of tsunami waves and entrained sediment and debris. Because coral reefs are vital to tourism activities and fisheries in the region, a high priority was given to assessing the extent of tsunami damage to these resources. From December 30, 2004 to January 15, 2005, the Department of Marine and Coastal Resources (DMCR) of the Ministry of Natural Resources and Environment (MONRE), together with Thai research institutions and the private sector, conducted a rapid impact assessment of coastal resources damage, focusing on coral reefs, seagrass beds, mangrove forests, and water quality. Although the rapid assessment methods used were controversial among participating marine

biologists, public demand for data and a limited timeframe for the assessment left no alternatives (Chavanich et al. 2005).

The survey team selected 174 sites across the six affected provinces both inside and outside marine national parks. These sites included popular snorkeling and SCUBA diving sites as well as sites not well-known among tourists and tour operators (DMCR 2005). At the regional level, the surveys found that 13 percent of the total coral reefs selected for assessment were substantially impacted. The impacts were varied and depended upon the extent of geographic exposure to wave forces, nearshore bathymetry that focused waves in some areas more than others, and nearby human development and associated debris generation. In general, four major types of damage to corals were found during the investigation:

- Coral colonies were upended or had fallen down
- Branches or portions of coral colonies were broken off by heavy drifting objects or debris
- Sand sliding along the reef slope led to breakage of corals
- Heavy erosion/entrainment of shallow seabed areas resulting in sediment smothering of corals

Among affected marine national park reefs, Mu Ko Surin National Park's shallow-water corals located in the channel between its North and South Islands experienced some of the most significant impacts. Large coral boulders were entrained and made landfall on sandy beaches and what remained of reefs offshore were covered by tsunami sand deposits (Figure 4-2).

A number of efforts were undertaken by volunteer divers to clean up floating debris; unfortunately, this ended up creating more damage to fragile coral surviving the tsunami. At the same time, marine national parks were closed for general tourist visitation due to coral reef damage and other park facility destruction.

d) Impacts on animal behavior. Although the rapid assessment survey method did not permit detailed scientific investigations, Delphi panelists who participated in

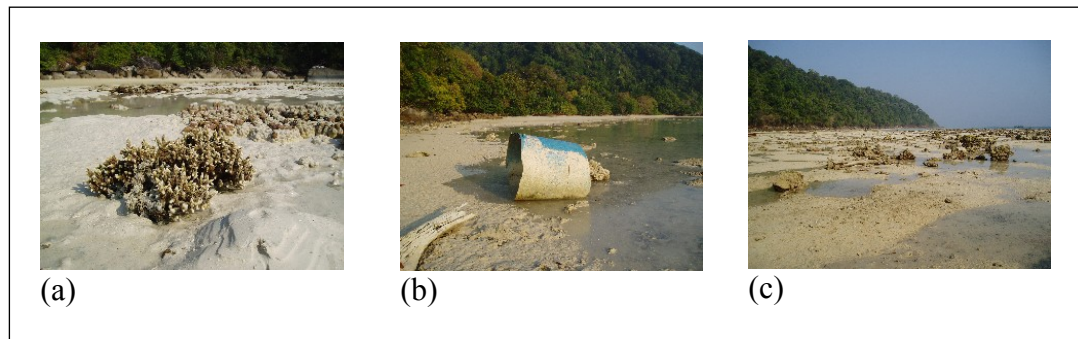


Figure 4-2 (a) Shallow-water coral reefs were smothered by tsunami sand deposits. (b) Debris from infrastructure broke fragile coral. (c) Coral boulders from nearby channel were carried ashore by forceful waves (Somrudee Meprasert photos at Mu Ko Surin Marine National Park, March 2005).

the survey anecdotally noted apparent changes in behavior of some marine fish and other marine life that they surmised was due to physical damage to habitats. Sea turtles and dolphins, for example, were stranded on beaches and inland by direct impact of the powerful waves and fish on reefs seemed dispersed.

e) Impacts on freshwater and land resources. Seawater intrusion into freshwater supplies—both surface and groundwater—made them unpotable for both human and animal consumption, killed trees and other vegetation, particularly beach forests and peat swamp forests, and reduced the productive capacity of coastal agricultural lands. This issue became important immediately after the tsunami and the weeks following the event as drinking and stock water became scarce.

Based on UNEP (2005a) data and the author's field observations, the tsunami inundated low-lying coastal areas from one to three kilometers inland. The distance at any given site was a function of local topography and intervening wave-dampening vegetation and structures; generally, the more gradual the slope, the farther the tsunami traveled. Saltwater intrusion thus immediately contaminated many surface water reservoirs and resulted in lack of potable water for survivors. The hydrostatic run-up and drawback of receding waves altered groundwater levels as well, contaminating well water and mixing it with sewage from local treatment

ponds. Decomposing human bodies and drowned stock, and other released pollutants further degraded surface and well water. The Department of Health, Ministry of Public Health team sampled water from wells in the six affected provinces and found particularly significant contamination in wells in Phang Nga and Phuket provinces (UNEP 2005a). The major causes of contamination were coliform bacteria, likely from human and animal waste and salt from sea water intrusion.

4.2.2 Tourism Effects of Tsunami Damages to MNP Natural Resources and Ecosystems

Once tsunami impacts on natural resources and ecosystems were identified, Delphi panelists were asked to estimate the extent to which each type of impact affected marine park tourism. In this section, rating scores from Delphi Rounds 2 and 3 are presented and simple statistics—mode, median and inter-quartile range (IQR)—used to reveal trends and skewness of the panelists’ opinions (Table 4-1).

Generally, the panelists reached a high degree of consensus about how tsunami damage to natural resources and ecosystems affected MNP tourism, identifying and rating 11 significant impact types (Table 4-1). Half of the panelists agreed that “pointed and sharp debris on beaches which threaten tourist safety” had the most impact on marine park tourism (mode = 10). People simply would not go to beaches where they had to watch their every step; it was essential that beaches be thoroughly cleaned before allowing tourists back in. They also agreed that “Some pristine-looking, white sand beaches were covered by black and dirty-looking sediment” also highly impacted park tourism; they thought that many tourists would perceive this as residual pollution or at least unsightly (mode = 8). However, this statement has high IQR value (IQR = 4, based on the 10-level rating scale). This means the panelists had divergent opinions regarding this impact, perhaps related to differences in panelists’ expertise and their experience at different study sites. The statement was particularly applicable to one park; others were less affected.

Table 4-1. Tsunami impacts to MNP *natural resources and ecosystems* and the degree to which these impacts affected tourism.

Delphi Panel-identified Tsunami Impacts on Natural Resources and Ecosystems	Effects on Tourism ¹					
	Round 2			Round 3		
	Mode	Median	IQR	Mode	Median	IQR
Pointed and sharp debris on beaches threaten safety of tourists.	10	6	5.25	10	6.5	3.5
Some pristine-looking white sand beaches were covered by black, dirty, potentially polluted sediments.	4	5.5	4.25	8	6	4
Damaged coral reef and sea-fan reduces number of diving sites.	7	7	4.5	7	7	3
Huge amount of debris both inland and underwater reduced natural aesthetics.	7	7	2.5	7	7	0.75
Altered nearshore currents and sedimentation caused turbid coastal water.	7	5.5	4	7	5.5	3.75
Seagrass beds in some areas are completely smothered by sand and sediment.	6	5.5	3.25	6	5.5	2.5
Seawater intrusion into surface and underground water system caused beach forest and peat swamp forest deterioration; also caused lack of potable water for local people.	5	6	4	5	6	2
Immediate changes of coastal bathymetry altered coastal ecosystem both inland and underwater. It possibly causes behavior changes in marine animals in feeding and migrating. It also might reduce amount of fish and some kinds of marine animals.	5	5	3.75	5	5	2
Eroded beaches, dying mangrove and dying beach forest reduce landscape aesthetics.	4	6	3.25	4	5.5	3
Changes of coastal bathymetry and beach slope threaten navigation and tourism safety.	2	4.5	4	2	3	3
Changes in coastal bathymetry and underwater condition made it difficult for visitors to find regular diving destinations.	1	3	4	1	2.5	3.25

¹ Rating scale for tsunami-related tourism effects ranged from 1 (lowest effect) to 10 (highest effect)

A reduction in the number of available diving sites, associated with damage to coral reef and sea-fan communities, also was judged to highly effect park tourism (mode = 7). The panelists agreed as well that the “huge amount of debris both on

land and underwater reduced natural aesthetics” and “altered nearshore currents and sedimentation that resulted in turbid coastal water” also highly impacted park tourism (mode = 7).

Panelists also agreed that certain identified impacts did *not* have significant impacts on park tourism, in particular “navigation and tourism safety caused by changes in coastal bathymetry and beach slope” (mode = 2) and “immediate changes of underwater condition which caused difficulty in finding regular diving destinations” (mode = 1). Again, all of these results are summarized in Table 4-1.

4.2.3 Response and Recovery Efforts Focused on MNP Natural Resources and Ecosystems

After panelists evaluated the degree to which each identified impact affected marine park tourism, they were asked to identify recovery efforts taken in 2005 that focused on natural resources and ecosystems. They also were asked to judge the effectiveness of these measures in facilitating recovery of tourism in marine national parks. Rating scores from the two final rounds are presented here, with mode, median and IQR values used to identify trends and skewness of panel data (Table 4-2).

The 20 Delphi panelists identified 12 principal actions that had been undertaken to facilitate recovery of natural resources and ecosystems (Table 4-2). Among these actions, the panelists agreed that the Marine Park Division’s closure of certain damaged diving destinations to allow natural recovery was the most effective action (mode = 9) with respect to long-term benefits to tourism. The installation of new anchoring buoys within park boundaries coordinated by Department of Marine and Coastal Resource (DMCR) and Marine Park Division ranked second in effectiveness (mode = 8), given the importance of these facilities to avoiding additional damage by visitors. Clean-up activities on land and in the water undertaken by volunteer divers, the military, DMCR, NGOs, and park staff was also highly rated with respect to tourism recovery (mode = 8).

Table 4-2. Response and recovery efforts undertaken in 2005 to mitigate damage to *natural resources and ecosystems* in MNPs and the effectiveness of these efforts on tourism recovery.

Delphi Panel-identified Response-Recovery Actions for Natural Resources and Ecosystems	Effectiveness of Response-Recovery Action ¹					
	Round 2			Round 3		
	Mode	Median	IQR	Mode	Median	IQR
Closed some damaged diving destinations to allow natural recovery – Marine Park Division.	9	8	3.5	9	8	3
Installed new anchoring buoys within park boundaries – by DMCR and Marine Park Division.	9	8	3	8	8	3
Clean-up of land and underwater areas – volunteer divers, military, DMCR, NGOs, and park officials.	8	8	1	8	8	0.5
Repaired damaged corals and seafans – volunteer divers, university staff, park officials, and private business volunteers.	7	7	1.5	7	7	1.5
Designed artificial reef to replace damage diving sites – universities and DMCR.	7	5	4.5	7	6.5	4
Initiated educational and tourism promotional project within marine parks – DMCR, NGOs, and Tourism Development Division.	7	6	3	7	6	3
Replanted mangrove and beach forests – school children, adult volunteers, NGOs, and DMCR.	7	7	2	7	6	2
Assigned new activity zones within park boundaries to allow for recovery – universities and Marine Park Div.	4	5	2.5	6	6	3.5
Designed underwater trail for divers – universities and DMCR.	6	6	3.5	5	6	2
Designed trails in mangrove forest – DMCR.	8	5	3.5	5	5.5	2.25
Mitigated the lack of potable water issue due to seawater intrusion – National Park Department and Department of Underground Water.	5	6	2	5	5	1.75
Transplanted and replanted corals – marine biologists, DMCR, and volunteer divers.	5	5	2	5	5	1

¹ Rating scale for response-recovery action effectiveness ranged from 1 (lowest effect) to 10 (highest effect)

In contrast, actions taken by the Thai National Park and Underground Water Departments to mitigate seawater intrusion impacts on potable water supplies received a lower effectiveness score (mode = 5), although it was unclear why. The

panelists also believed the planting and transplanting of broken corals done by marine biologists, DMCR, and volunteer divers as only moderately effective (mode = 5) with respect to tourism recovery. Five other recovery actions rated moderately high in effectiveness (Mode = 6 or 7) (Table 4-2).

4.2.4 Constraints and Barriers to Effective Recovery of Natural Resources and Ecosystems

After the panelists identified recovery efforts and their effectiveness, they were asked what problems, if any, were encountered and what specific barriers or obstructions there were. It was reasoned that lessons learned from failures or less-than-successful efforts would be very helpful for designing future post-disaster recovery efforts. In this section, obstacles and constraints to recovery of natural resources and ecosystems important to marine park tourism identified by Delphi panelists are presented, grouped into five categories.

a) Weather and Marine Environment Conditions. The tsunami disaster struck the Andaman Coast in late December 2004. Those engaged in recovery efforts thus had about four months (January to April 2005) to conduct initial cleanup operations and recovery projects prior to onset of the 2005 monsoon season (May to November). The 2005 monsoon was also quite strong, with numerous major storms. Strong winds and ocean currents significantly delayed offshore assessment and recovery operations, including underwater debris cleanup. Environmental conditions underwater were also problematic in some areas due to huge amounts of decaying vegetation and other debris, generally turbid seawater, and a separate layer of very turbid seawater near the bottom that reduced visibility and created difficulties for underwater operations. This was a particular problem at Had Nopparattara-Mu Ko Phi Phi MNP.

b) Lack of Qualified Volunteers. Volunteers who participated in recovery efforts often lacked a basic understanding of coastal environments and skills to conduct underwater operations. In some cases, this resulted in additional damage to marine environment, for example, loss of recoverable corals. The lack of experienced and skilled personnel also made the recovery process one of trial and error, resulting in delays and a waste of limited financial resources. Appropriate equipment to remove and clean up bulky and heavy underwater debris was also limited.

c) Inadequate Financial Resources. Financial resources to undertake natural resource and ecosystem recovery operations were limited and dwindled quickly in the months following the disaster. At-sea, underwater operations and monitoring of progress are much more expensive than similar land-based operations, and the results are less visible. This may be one reason why it was difficult to get the necessary financial resources to undertake and monitor recovery processes in the marine environment. It is likewise expected that long-term recovery monitoring will be difficult to justify.

d) Fragmentation of Recovery Efforts. Fragmentation of government agency responsibilities, lack of communication and collaboration (both between and within governmental levels, and with NGOs), inconsistent policies, and poor management of funds all contributed to difficulties and confusion in recovery efforts. Bureaucratic regulations of government agencies slowed the delivery of needed financial resources and in some cases prevented the purchase of critical cleanup and other equipment and materials. The lack of coordination and agreement among scientists about what needed to be done sent a confused message to recovery workers and resulted in a kind of ‘paralysis’ situation with little being done in some areas (Deborah Brosnan, Tsunami Reef Action Fund, July 7, 2006, personal communication). Limited local involvement in natural resource recovery efforts threatened the continuity of a long-term recovery process, given the lack of buy-in.

e) Inappropriate Aid. National governmental agencies and large NGOs with several layers of management took advantage of recovery resources and activities to promote their own agendas, competing to take “credit” but not focusing on the quality or effectiveness of their activities (James Comley, head of marine science researcher, Coral Cay Conservation, April 25, 2005, personal communication). Due to the donors’ limited time frame for involvement, governmental agencies and NGOs accelerated the distribution of donated money to meet deadlines, rather than certified needs. This caused ineffective and often inappropriate uses of relief and recovery funds.

4.3 The Built Environment: Tsunami Impacts, Response and Recovery in MNPs

Impacts of the 2004 tsunami on the *built environment* were mostly direct, being caused by wave forces, tsunami inundation and flooding, and the ebb and flow of debris-laden salt water during the event. Included in this category are damage to the transportation infrastructure, utility and power infrastructure, residential buildings, commercial buildings, governmental service related private facilities, public and private education facilities, interior equipment and property, and transportation stock. These *built environment* impacts also resulted in indirect impacts in each of the other impact categories used for this study: *natural resources and ecosystems*, the *business community*, and *social, health and safety environments*; they are discussed in those sections. The results presented here focus on the built environment and are based mainly on the Delphi panel’s findings, but also on the author’s field investigations and other post-event surveys and assessments.

4.3.1 Impacts of the 2004 Tsunami on the Built Environment of Marine National Parks

Delphi panel members identified a variety of tsunami impacts on the built environment within and/or adjacent to marine parks along the Andaman coast (Table 4-3). Park offices, park rangers’ dormitories, infirmaries, tourist bungalows and

Table 4-3. Tsunami impacts to MNP *built environments* and the degree to which these impacts affected tourism.

Delphi Panel-identified Tsunami Impacts on the Built Environment	Effects on Tourism ¹					
	Round 2			Round 3		
	Mode	Median	IQR	Mode	Median	IQR
Park offices, park ranger dormitories, infirmaries, built landscape destroyed.	10	8	5	10	8	3.5
Exhibition areas, nature trails, and interpretative signs/exhibits damaged or destroyed.	9	8.5	3	9	9	3
Potable water wells/reservoirs contaminated by saltwater and bacteria causing lack of potable water in parks.	9	9	2	9	9	1.5
Bungalows, campgrounds, and tourism facilities damaged or/and destroyed, resulting in temporary closures of marine parks.	8	8	3.25	8	8	2
Diving gear and facilities both for snorkeling and SCUBA are damaged or lost.	8	8	2	8	8	1.5
Basic infrastructures including electric power, water lines, and communication network destroyed.	8	8	1.5	8	8	1
Park offices, park ranger dormitories, infirmaries, built landscape destroyed.	8	7	3.25	8	7	2
Basic infrastructure and communication networks destroyed, isolating parks and reducing tourist safety.	8	8	1.5	7	8	2
Images of destroyed and damaged areas in national/international media show poor condition of tourism destination/facilities and cause sadness among tourists.	7	7	3.5	7	7	2.25
Piers that accommodate tourists, parks staff boats, and private transports between mainland and marine parks damaged or destroyed.	8	7	2.5	7	7	1.5
Sea Gypsy village—the Moken tribe—completely destroyed.	5	6	3.25	7	7	3
Damaged or lost diving buoys cause inconvenience for divers and tour operators.	5	7	3.5	5	6	2.25

¹ Rating scale for tsunami-related tourism effects ranged from 1 (lowest effect) to 10 (highest effect)

campgrounds, and park infrastructure—electric power, drinking water, and communication networks were damaged or destroyed at one or more parks. Education facilities including exhibit buildings, nature trails, and interpretative signs

also were likewise damaged or destroyed. Transportation stock lost included park ranger and local tour operators' boats, cars, and trucks. In several parks, piers and wharves that accommodated tourist and park staff vessels used to ferry people and supplies to and from the mainland were damaged or destroyed. In one park, Mu Ko Surin, the village of the Moken tribe—local sea gypsies—was completely destroyed. Navigation infrastructure, such as buoys for anchoring at diving destinations, was reported lost in several parks. Some parks were especially hard-hit and lost most of their built facilities and equipment while others received only small amounts or no damage.

4.3.2 Tourism Effects of Tsunami Damages to the MNP Built Environment

Once tsunami impacts on the built environment were identified, panelists were asked to estimate the extent to which each type of impact affected marine park tourism. As with other impact categories, rating scores from Delphi Rounds 2 and 3 are presented and simple statistics—mode, median and inter-quartile range (IQR)—used to reveal trends and skewness of the panelists' opinions (Table 4-3).

The 12 principal built environment impacts identified in Table 4-3 had differing effects on tourism. Among them, “destroyed park offices, park ranger dormitories, infirmaries, and built landscape” had the highest degree of impact on marine park tourism (mode = 10). Panelists also voted that damage to “exhibition areas, nature trails, and interpretative signs/exhibits” highly affected park tourism (mode = 9). Moreover, contaminated potable water wells/reservoirs by saltwater and bacteria causing lack of potable water in parks also highly affected park tourism (mode = 9).

On the other hand, “damaged or lost diving buoys causing inconvenience for divers and tour operators” had low impacts on park tourism (mode = 5). Based on the researcher's field observation, this was due to the quick and effective collaborative work among various agencies in fixing this problem. Tour operators, universities, marine national parks, and volunteer divers all together fixed and replaced new

buoys during the first months after the disaster. So, while it could have been a problem, it was quickly resolved.

4.3.3 Response and Recovery Efforts Focused on the Built Environment

Built environment response and recovery efforts were among the most visible actions taken in the first days after the disaster and throughout 2005. Interestingly, built environment response and recovery efforts were deemed by the panel to be more effective than actions undertaken to mitigate other categories of impacts. This is discussed further in Section 4.7.

The panelists identified 11 principal types of recovery actions focused on the built environment. Among these actions, construction of new park offices, new office supplies, new cafeteria, and new dormitory organized by Marine Park Division, Pollution Control Department, and foreign agencies were rated as most effective with respect to marine national park tourism recovery (mode = 9). The panelists also rated several other actions as quite important to recovery of the built environment in parks, including installation of tsunami warning systems by the Marine Park Division; restoration of piers and docks by Harbour Department and Marine Park Division; and replacement of damaged or lost buoys with new buoys in and around diving areas by Marine Park Division (mode = 7).

In contrast, the purchase of new rescue boats for emergency response, arranged by the Marine Park Division, was rated as only moderately effective as a recovery action (mode = 5). Interestingly, studies and initiatives by researchers from Thai universities promoting new park zoning and management plans that factored in hazards was rated low in effectiveness with respect to marine national park tourism recovery (mode = 4). This may not bode well for response to future emergency situations (see Table 4-4).

Table 4-4. Response and recovery efforts undertaken in 2005 to mitigate damage to the *built environment* in MNPs and the effectiveness of these efforts in tourism recovery.

Delphi Panel-identified Response-Recovery Actions for the Built Environment	Effectiveness of Response-Recovery Action ¹					
	Round 2			Round 3		
	Mode	Median	IQR	Mode	Median	IQR
Constructed new park offices, new office supplies, new cafeteria, and new dormitory – Marine Park Division, Pollution Control Department, and foreign agencies.	9	7	2	9	8	2
Installed tsunami warning system within parks – Marine Park Division.	8	7	2	7	7	2
Repaired pier and dock – Harbour Department and Marine Park Division.	7	6	2	7	7	2
Replaced damaged or lost buoys with new buoys in and around diving areas – Marine Park Division.	7	7	2.25	7	7	2
Established communication headquarter and network to communicate among marine parks – Marine Park Division.	6	7	1.5	7	7	1.25
Restored and improved park landscape and appearance – universities and tour operator coalitions.	7	6.5	2.25	7	7	1.25
Installed new basic infrastructural system (potable water and electric power) within marine parks – Marine Park Division.	7	7	2.25	7	7	1
Replaced damaged observatory boats and vehicles with new ones – Marine Park Division.	6	7	2	7	7	0.75
Improved Phuket Aquarium at Phuket Marine Biological Center for education and outreach purposes – DMCR and foreign agencies.	5	7	3.25	6	6	3
Purchased new rescue boats for emergency situation – Marine Park Division.	8	7.5	2.25	5	7	2.25
Studied and initiated new park zoning management plan – researchers from universities.	6	6	2	4	6	2.75

¹ Rating scale for response-recovery action effectiveness ranged from 1 (lowest effect) to 10 (highest effect)

4.3.4 Constraints and Barriers to Effective Recovery of the Built Environment

According the Delphi panelists, a number of barriers and constraints adversely affected built environment recovery efforts. These are grouped into four categories below.

a) Weather and Marine Environment Conditions. As with cleanup of the natural environment, the major storms and winds during the 2005 monsoon season significantly delayed transportation of construction materials between mainland and islands and subsequent recovery operations.

b) Inadequate Financial Resources. Budgets for reconstruction of buildings and infrastructure and replacement of docks, boats, and other transportation stock were far less than needed. At the same time the rapid increase in the price of gasoline absorbed funds targeted for other areas.

c) Fragmentation of Recovery Efforts. The lack of a systematic process for financial and logistic assistance resulted in gaps and redundancy of reconstruction efforts. Incomprehensible policies handed down by the national government caused confusion and resulted in inaction by those who were tasked with carrying out recovery efforts, both in the public and business sectors. For example, the Prime Minister promised special funding for recovery efforts without considering that Thai laws and regulations did not allow for that; raised expectations were thus unfulfilled.

Complicated paperwork processes, the lack of overall reconstruction plans, and lack of collaboration among/within agencies delayed the damage assessment process. The time allowed to complete recovery tasks also was inadequate. Lack of clear missions for marine parks and distorted goals associated with pressure to recover tourism quickly contributed to failure of a new zoning process which supposedly designed to solve pre-tsunami problems.

d) Inappropriate Aid. The construction of new park facilities and buildings to help recover tourism was undertaken too quickly and without careful consideration of impacts on natural systems. In parks and areas that feed tourists into parks, new settlements and housing were undertaken by NGO and government donors without careful consideration of relatively primitive local livelihoods. As a result, the uniqueness of local artisanal communities and attractiveness of tourism destinations suffered.

Recently decentralized government agencies (national responsibilities have devolved to provincial and local levels) lacked appropriate understanding of the dynamic nature of marine and coastal ecosystems and tsunami mitigation principles. These misunderstanding led to inappropriate siting of redevelopment and infrastructure, such as new coastal roads, dikes, and re-nourished beaches. These problems would likely have been identified in environmental impact assessment studies, but none were conducted, though required by law. Opportunities to reconstruct facilities and infrastructure with sensitivity to the environment and to hazards were lost in the process.

4.4 The Business Community: Tsunami Impacts, Response and Recovery in MNPs

The *business community* is defined here as all aspects of a business that are not part of the built environment—the customer base, business reputation, trained employees, business equipment, paper digital records, and other tools of the trade. Some of these are direct impacts, but most are indirect impacts. Often, however, these indirect impacts are linked to the direct impacts on the built environment as described earlier. Some may also be independent of direct physical impacts, instead arising from “halo effects” associated with damage to the surrounding environment, perceptions of potential customers, and psychological trauma.

4.4.1 Impacts of the 2004 Tsunami on the MNP Business Community

In accounting for the impacts and costs of disasters, business community impacts are often overlooked or underestimated, especially compared to the loss of buildings and infrastructure and other more visible impacts (Heinz Center 2000). This was the case with business community impacts caused by the 2004 tsunami in Thailand (Table 4-5). Many small and mid-sized tourism-related businesses were devastated. Some business owners, their employees, and family members died in the event or were injured. Accommodations for tourists both within parks and at jumping-off sites on the mainland were not available because hotels or guesthouses were destroyed or damaged. Tour operators' equipment and facilities, such as camping tents, bedding, and diving gear were also damaged or destroyed. Business reputations deteriorated because normal services were interrupted; records also were lost, affecting marketing, finances, and other operations. The result was that many businesses simply disappeared or were slow to restart, hampering the recovery of tourism services.

Psychological trauma also affected business community. Employees of parks and tourism businesses developed a new fear of the sea. They were terrified at the prospect of future tsunamis, of the ghosts of those who were swept into the sea, and other supernatural aspects of the event. Many quit their jobs or emigrated out of the region, contributing to the shortage of skilled help.

Seasonal factors also influenced business community resilience or lack thereof. The affected parks are normally open only six months a year, from November to April, after which the monsoon season begins. Reduced tourist numbers during tourism peak of the 2005 season (December–April) on the Andaman Sea coast resulted in short-term funding gaps for tourism-related businesses, including hotels, boat rentals, and rental vehicles. This contributed to the closure or bankruptcy of some businesses. The temporary closure of marine parks due to the physical damage further contributed to closure of park-related tourism businesses. It

Table 4-5. Tsunami impacts to the MNP park *business community* and the degree to which these impacts affected tourism.

Delphi Panel-identified Tsunami Impacts on the Built Environment	Effects on Tourism ¹					
	Round 2			Round 3		
	Mode	Median	IQR	Mode	Median	IQR
Some businesses are closed due to psychological trauma, lack of financial resources, and no capability to provide services.	10	8	3	10	8	3.25
Business operators are short of money to repair or replace damaged assets. Therefore, they do not have tourism facilities to accommodate tourists.	10	9	2	8	8.5	1.25
Tourism-related businesses are short of skillful or knowledgeable employees due to death or emigration.	8	8	3	8	8	3
Tourism-related business network within and nearby park boundaries, including hotels, rental boats, and rental vehicles is disrupted or non-existent. Tourists thus not served.	8	8	2	8	8	2
Deterioration of business' reputation and reliability due to tourism safety issue.	10	7	4	5	7.5	4.25

¹ Rating scale for tsunami-related tourism effects ranged from 1 (lowest effect) to 10 (highest effect)

also resulted in financial shortfalls for parks because they depend on visitor fees to operate and to manage their facilities.

After identifying tsunami impacts on businesses, Delphi experts were next asked to estimate the degree to which each impact affected marine park tourism. In the next section, scores of the two final rounds are presented, with mode, median and IQR values used to examine trends and skewness of the panel's responses.

4.4.2 Tourism Effects of Tsunami Damages on the Business Community

Following identification of tsunami impacts on the business community, panelists were asked to estimate the extent to which each type of impact affected marine park tourism. As with other impact categories, rating scores from Delphi Rounds 2 and 3 were presented and simple statistics—mode, median and inter-quartile range (IQR)—used to reveal trends and skewness of the panelists' opinions (Table 4-5).

Delphi panelists identified five principal business community impacts that affected the tourism sector in marine national parks (Table 4-5). They indicated that the combination of “psychological trauma and lack of financial resources” had the most significant effect on marine park tourism. This was because businesses near parks had no capability to provide services (mode = 10). This followed by “business operators are short of money to repair or replace damaged assets and therefore do not have tourism facilities or equipment to accommodate tourists” (mode = 8). Park tourism also was highly affected by a post-event shortage of skilled or knowledgeable employees to operate tourism-related businesses; death, injury or emigration were mainly responsible (mode = 8).

Panelists had divergent opinions about the degree to which “deterioration of business’ reputation and reliability due to tourism safety issues”. This issue only moderately affected park tourism (mode = 5), but its high IQR value (IQR = 4.25) showed the divergence noted above.

4.4.3 Response and Recovery Efforts Focused on the Business community

The panelists next identified business community response and recovery actions they were aware of during 2005, coming up with 12 principal actions (Table 4-6). Promotion of an aggressive marketing plan and reduction of tour package price in order to increase customers and to compete with tour operators in unaffected areas was rated as an effective recovery strategy (mode = 9). In addition, promotion of both domestic and international tourism campaigns organized by Tourism Authority of Thailand (TAT), Thai Airways, and tour operator coalitions were both rated highly effective efforts (mode = 8). The panelists also believed that construction of new facilities to accommodate tourists (e.g. restrooms and cafeteria) done by Marine Park Division contributed a great deal to marine national park tourism recovery (mode = 8)

In contrast, efforts to provide financial support to damaged businesses were rated as only moderately effective. Examples of these included low interest loans

Table 4-6. Response and recovery efforts undertaken in 2005 to mitigate damage to the *business community* in MNPs and the effectiveness of these efforts on tourism recovery.

Delphi Panel-identified Response-Recovery Actions for the Business Community	Effectiveness of Response-Recovery Action ¹					
	Round 2			Round 3		
	Mode	Median	IQR	Mode	Median	IQR
Launched aggressive marketing plan – reduced tour package price in order to increase income and compete with tour operators in unaffected areas.	9	7	3	9	7	2.5
Promoted both domestic and international tourism campaigns – Tourism Authority of Thailand, Thai Airways, and tour operator coalitions.	8	8	2	8	8	1.5
Built new facilities to accommodate tourists (e.g. restrooms and cafeteria) – Marine Park Division.	5	7	3	8	7.5	2.75
Arranged marine conservation activities such as debris cleanup dives and beach forest and mangrove reforestation – Marine Park Division, and tour operators.	8	7	2	8	7	2
Organized local tour operator alliances for mutual support and to increase power to negotiate with government agencies – local tourism operators.	7	7	2	7	7	2
Trained local workforces for alternative jobs – Ministry of Labour.	7	5.5	2	7	6	2
Waived marine park entrance fee to promote park tourism – Marine Park Division.	7	5.5	4.5	7	5	4.25
Arranged training courses for staff that were laid-off at affected tourism businesses in 3 impacted provinces to increase their skills and pay them daily allowance – Tourism Authority of Thailand.	6	6	2.25	6	6	2
Recovered physical appearance of hotels that located near park boundary – private owners.	6	6	2	6	6	2
Offered low interest loans to affected businesses – government agencies.	5	5	3	5	5	3
Compensated businesses for basic damages – Department of Disaster Prevention and Mitigation.	5	5	3	5	5	1.25
Extended duration of the tsunami victims' loan – banks.	5	5	1.75	5	5	1

¹ Rating scale for response-recovery action effectiveness ranged from 1 (lowest effect) to 10 (highest effect)

offered by government agencies to affected businesses, compensation given to business for basic damages done by Department of Disaster Prevention and Mitigation, and extension of loans to tsunami victims by banks were among the least effective efforts (mode = 5).

4.4.4 Constraints and Barriers to Effective Recovery of the Business Community-Environment

Many of the same constraints and barriers in recovery of natural resources and ecosystems, and the built environment also affected the businesses as they tried to regain their footing. Those identified by the Delphi panel are discussed below.

a) Lack of Financial Resources. Banks and other funding sources, including direct government aid, had complicated and unclear policies for releasing grants or loans to businesses victimized by the tsunami. Small- and mid-scale tourism businesses especially did not fit in funding sources' financial aid criteria, and so were left only with the option of higher-rate "soft loans". As a consequence, to buy new assets or market their reopened businesses, some owners had to rely on private or local 'out-of-system' moneylenders.

b) Fragmentation of Recovery Efforts. Ambiguous governmental policies caused confusion at all levels of decision making process. This resulted in chaotic aid, redundancy, and unfair aid distribution. The lack of collaboration occurred in all levels, both among the affected businesses and agencies that offered aid. Ineffective structure and human resources of existing government agencies failed to link between local businesses and national agencies. This caused complicated government paperwork for businesses seeking assistance and delayed recovery tasks requiring resources.

The lack of collaboration among tour operators and a highly-competitive tourism market caused a significant price reduction of package tours that in turn damaged the whole business community, especially small businesses. In some cases,

tour operators who were not ready to operate provided low quality and unsafe services. These low quality services affected tourists' confidence generally.

Attempts to change land use zoning in hazardous areas—in part an acknowledgement of past failures—were handled poorly by government agencies. As clearly evidenced from Phi Phi islands (within Had Nopparattara-Mu Ko Phi Phi MNP), individuals and businesses who would have lost their development rights under the new zoning plan within and nearby park boundaries rejected the government's proposals.

c) Corruption and Inappropriate Aid. The flow of aid into affected areas was chaotic, and often did not reach those actually in need. Part of the problem was corruption— monies were siphoned off by unscrupulous officials or provided to those not in need. Government agencies that were responsible for tourism recovery emphasized marketing of tourism in general, rather than determining and meeting priority needs across the entire industry. Local, small- to mid-scale businesses especially were left out. Because these businesses form the basis of service delivery to many MNPs, recovery of MNP tourism was delayed well past the onset of the 2005 monsoon season. The waiver of marine park entrance fees as an incentive for tourists' visits was poorly promoted.

d) Confused information. Over-stated media reports regarding tourism resource damage, especially to coral reefs and beaches that are a main attraction, resulted in potential tourists being misinformed and avoiding even those areas that were not damaged. Both domestic and international tour operators and tourists did not have accurate information and understanding of the recovery situation of affected areas; this should have been provided by tourism promotion agencies. This also caused strong negative “halo effects” to areas adjacent to tsunami-affected areas.

e) Negative Psychological Factors. Fear of the ghosts of those who died in the tsunami, and other supernatural concerns had significant impact on the recovery of tourism businesses, both among business operators/employees and potential visitors. The trauma experienced by those who lost family members, were injured, or had substantial property damage was haunting. There was also great concern that more tsunami could strike at any time, a situation worsened by numerous aftershocks in the area. These factors also played out in efforts to promote tourism opportunities as recovery went forward. For the Asian market, especially, promoters misunderstood concerns about ghosts and the supernatural, resulting in failure of the effort. Incidentally, the same campaign worked well in the European and Australian market where such superstitions are not as prevalent.

4.5 Social, Health, and Safety Environment: Tsunami Impacts, Response and Recovery in MNPs

Social, health, and safety environment impacts are those affecting human populations—directly through loss of life, and indirectly due to psychological trauma, disruption of social services, loss of employment, loss of public and private transportation, and individual and family stress. The impacts of the 2004 tsunami on the social, health, and safety environment are presented here, along with their effects on tourism in marine national parks, response and recovery actions and their effectiveness, and constraints to recovery.

4.5.1 Impacts of the 2004 Tsunami on MNP Social, Health, Safety Environments

The tsunami created unprecedented social and psychological impacts on people who experienced the damages and lost. Certainly, these kinds of impacts strongly affected many of the panel members who saw these impacts first-hand and got involved with people in local recovery efforts. Panelists were thus able to identify impacts on social structure, health, and safety with some detail and examples (Table 4-7).

The most traumatic aspect of the tsunami was the heavy loss of life—park rangers, officers, and staff, and private business operators associated with parks and tourism were killed or lost their loved ones and friends. Those who did survive dealt with injuries, disabilities, and separation, not knowing if others important to them had survived. They, as well as local residents and tourists suffered deteriorated mental health, depression and distress following the disaster. Many, particularly local residents, feared the ghosts of those who died would come back to haunt them and that other supernatural forces were at work.

People in affected areas including park rangers, officers, staff, and tourists experienced unsanitary conditions in the aftermath of the event. Shelters were crowded, food and water were contaminated, and contagious diseases were spread by mosquitoes breeding in the standing water that was everywhere. Hazardous waste, such as dead animals, was not appropriately disposed of as well. The public, business operators, and park staff worried about their own safety, always with one eye on the sea, because they feared the possibility of another tsunami. Because of these fears, there was significant emigration out of the area, or changing of jobs and normal ways of life to avoid the sea. Tools of the trade, discussed earlier, were also damaged and contributed to the sense of loss and hopelessness. This also led to unmanageable debt, business closure, unemployment, insecure lives, personal stress, and family and community problems.

The loss of life, high numbers of injuries and disabilities, both physical and psychological, and the large number of orphans created by the tsunami greatly increased demands on community social services, both in parks and particularly in communities adjacent to parks. These significantly changed communities' social and economic structures. Education was also affected because schools were damaged or destroyed and teachers died or were otherwise affected. Children could not find local education providers and, in some cases, this led to overloaded classrooms and insufficient numbers of teachers in unaffected schools nearby disaster areas.

People were disappointed by the government's chaotic and ineffective relief and recovery efforts, creating a deep sense of discouragement. Villagers were desperate for mental, physical, and spiritual support following the disaster. Panelists reported that many families converted from their original beliefs—mainly Buddhism—to Christianity because of donor and aid-provider influence. This may lead to long term changes of local social structures and lifestyles, but it remains to be seen if these new ideas take hold.

4.5.2 Tourism Effects of Tsunami Damages to the Social, Health, Safety Environment

Following identification of tsunami impacts on the social, health and safety environment, panelists estimated the extent to which each type of impact affected marine park tourism. As with other impact categories, rating scores from Delphi Rounds 2 and 3 are presented and simple statistics used to reveal trends and skewness of the panelists' opinions (Table 4-7).

The 11 social, health, and safety impacts described above had differing degrees of impacts on tourism in marine national parks. Delphi panelists rated the degree to which tourism was affected by each of these 11 impacts (Table 4-7). Most significant, in terms of effects on tourism, was that “tourists lack confidence in safety measures, disaster warning networks, and emergency response capacity, strongly influencing their decision to avoid traveling to the Andaman Coast” (mode = 8). The panelists also agreed that “tourists think that affected marine parks and adjacent areas are still not ready for tourism, so they avoid visiting these areas”; this had a high degree of impact (mode = 8). Moreover, the fact that “tour operators and park employees perceive a lack of safe working conditions, contributing to reduced quality of their tourism services” also highly affected park tourism (mode = 8).

However, the panelists did not believe that “insecurity issues in affected areas during the crisis due to Thai robbers and foreign piracies” significantly affected park tourism (mode = 3). This issue was a concern during the first days following the

Table 4-7. Tsunami impacts to marine national park *social, health, and safety environment* and the degree to which these impacts affected tourism.

Delphi Panel-identified Tsunami Impacts on the Social, Health and Safety Environment	Effects on Tourism ¹					
	Round 2			Round 3		
	Mode	Median	IQR	Mode	Median	IQR
Tourists lack confidence in safety measures, disaster warning networks, and emergency response capacity, strongly influencing their decision to avoid traveling to the Andaman Coast.	9	8	3.25	8	8	4
Tourists think that affected marine parks and adjacent areas are still not ready for tourism, so they avoid visiting these areas.	8	8	2	8	8	1.25
Tour operators and park employees perceive a lack of safe working conditions, contributing to reduced quality of their tourism services.	8	8	1.5	8	8	1
Tourists fear the sea, staying over-night on islands, and camping nearby the sea.	8	7	3.25	8	7.5	2.5
General public have psychological problems and depression due to seeing massive death and loss that reduce their willingness to travel or to greet tourists.	8	7.5	2	8	7.5	1
Tourists are concerned about sanitization, food and water contamination and contagious diseases in affected areas.	7	7	2	7	7	1
There is a lack of public health system and functional hospitals.	7	6	3	7	6	2
The unique lifestyle of sea gypsies (Moken tribe) living on Surin Islands marine national park immediately altered due to influx of donations and attention from media.	4	5.5	4.5	6	6	4.25
Tourists fear ghosts and supernatural concern.	7	7	3.25	5	6.5	3
There are changes of community structure in areas adjacent to parks due to massive loss of lives and the swelling number of disabilities.	5	5	3.5	5	5	2
Security issues in affected areas due to Thai robbers and foreign pirates.	3	4	3	3	4	2

¹ Rating scale for tsunami-related tourism effects ranged from 1 (lowest effect) to 10 (highest effect)

disaster due to the chaotic situation. However, the situation was quickly resolved as the military and police took control, ensuring protection of tourists and local residents from robbers and pirates. Another impact was that tourists alternatively

may have picked marine parks located on the mainland or far from the Thai-Myanmar border to avoid the risk.

4.5.3 Response and Recovery Efforts Focused on Social, Health, Safety Environments

Delphi panel experts were next asked to identify social, health, safety-related response and recovery efforts taken in 2005 and to rate their effectiveness with respect to MNP tourism recovery. These are discussed below.

Twelve social, health, safety-related response and recovery efforts taken in 2005 were identified (Table 4-8). Among these actions, contributions of financial aid, shelters and boarding schools for orphans and school children living adjacent to marine park boundaries—carried out by the Ministry of Education and many private foundations—were rated quite effective (mode = 8). The panelists also indicated that replacement of damaged or destroyed schools with new schools organized by government agencies, private sectors, and foundations positively affected park tourism recovery (mode = 8), probably because it allowed families to refocus on their normal work and lives. It is noteworthy that although these two efforts focused outside marine park boundaries, they had created positive consequences to marine park tourism recovery. In addition, restoration of freshwater reservoirs by removal and clean-up of debris undertaken by the Marine Park Division and volunteers were judged to contribute positively to MNP tourism recovery (mode = 7).

In contrast, the panelists felt that construction of the 2004 tsunami victim memorial, organized by Ministry of Natural Resources and Environment, contributed little to marine national park tourism recovery (mode = 4).

4.5.4 Constraints and Barriers to Effective Recovery of Social, Health, Safety Systems

As with other impact categories, bad weather, limited financial resources, disorganized service delivery, and the use of untrained personnel caused delays,

Table 4-8. Response and recovery efforts undertaken in 2005 to mitigate damage to *social, health, and safety environment* in MNPs and the effectiveness of these efforts on tourism recovery.

Delphi Panel-identified Response-Recovery Actions for Social, Health, and Safety Environments	Effectiveness of Response-Recovery Action ¹					
	Round 2			Round 3		
	Mode	Median	IQR	Mode	Median	IQR
Provided financial aid, shelters, boarding schools for orphans and school children – Ministry of Education and many private foundations.	8	7.5	1	8	8	1
Replaced damaged or destroyed schools with new schools – government agencies, private sectors, and foundations.	8	7	1.75	8	7	1.75
Cleaned up debris in freshwater reservoirs – Marine Park Division and volunteers.	7	7	2.25	7	7	2.25
Developed and practiced tsunami warning procedure and evacuation plan in high risk areas – park officers, police, Tourism Authority of Thailand, and volunteers.	7	7	3.75	7	7	2
Cleaned up debris on land and underwater – Marine Park Division and volunteers.	7	7	1	7	7	1
Sent doctors and medical teams to help victims recover psychologically and physically – Ministry of Public Health, medical schools, Red Cross and many foundations (victims included park staff, tourists, and villagers).	7	7	2	7	6	2
Installed new freshwater wells and new tap water systems – Ministry of Natural Resources and Environment.	4	5.5	3.75	6	6	4
Alternative job training provided to victims for victims – government agencies, private sectors, and foundations.	6	7	2	6	6	1
Gave special medals for park officers who worked hard in the affected areas during crisis time in order to show appreciation – Office of the Prime Minister.	3	5	3.75	6	5	3
Relief, including donated food, basic needs, and medicine provided to victims – government agencies, private sectors, and individuals.	7	6	2	5	5	2
Money provided to park officers – Department of Forestry co-op.	5	5	3	5	5	1.75
Built the 2004 tsunami victim memorial – Ministry of Natural Resources and Environment.	4	4.5	3.25	4	4	3

¹ Rating scale for response-recovery action effectiveness ranged from 1 (lowest effect) to 10 (highest effect)

interruptions, and inappropriate aid directed at recovering social aspects of communities, mental and physical health, and a sense of safety. Examples of these are outlined below.

a) Weather Conditions. Especially heavy rain and wind during the 2005 monsoon season made it difficult to deliver needed social service assistance. Recovery workers were not able to complete shelters for many displaced victims and many shelters that were built were done so too quickly and without careful consideration of siting. In some cases, new housing built in the flood plain was damaged by storms and floods just a few months after the tsunami.

b) Lack of Resources. There was a significant lack of rescue personnel, equipment, and trained medical and mental health professionals to address the needs of local populations. Trained psychological therapists were scarce, especially those with experience in post-disaster trauma care. Given the large number of posttraumatic stress disorder (PTSD) victims, this was a major problem. This problem was noted in a number of related studies (Silove and Bryant 2006; Thienkrua et al. 2006; van Griensven et al. 2006).

Relief volunteers with no background in psychology or mental health care unintentionally questioned victims in insensitive ways, opening fresh wounds and causing more damage. Untrained relief volunteers, on the other hand, also suffered from the accumulated stress of their difficult aid experience. This sometimes resulted in tension, fights, deteriorated mental health, and excessive drug and alcohol use. This added greatly to the need for services from psychological therapists (Nattasuda Taephant, instructor in Counseling Psychology Program, Faculty of Psychology, Chulalongkorn University, Bangkok, Thailand, July 28, 2006, personal communication).

c) Fragmentation of Recovery efforts. As with other impact areas, no single government agency was in charge of coordinating social, health, and safety recovery efforts, resulting in systematic problems in distribution of financial aid and donations, and uneven, sporadic, and redundant aid allocation. As a consequence, there was no tangible plan for implementation of recovery efforts to reach needy target groups.

d) Inappropriate Aid. The distribution of relief and emergency response did not cover the whole affected area, due in part to the massive and widespread damage, especially in outlying areas. Relief was concentrated in well-developed coastal communities or tourism areas. There was gender inequality in aid distribution as well. For example, female victims tended to receive less financial support than males, even though they had similar degrees of responsibility for their families. This disparity has been reported elsewhere in the world, notably in the United States following hurricanes (Heinz Center 2000).

Although job retraining was provided by the government for displaced workers, the actual market for those jobs has failed to materialize, leaving many trainees out of work. Inappropriate aid was given to tribal people (Moken sea gypsies,) influencing their cultural traditions and social structure. An example is the construction of permanent houses on land, which may lead to disruption of traditional patterns of natural resource utilization in marine parks. Generally, another complaint was the rapid influx of aid for basic needs but poor longer-term follow-through.

e) Negative Psychological Factors. Many among the general public strongly believed that those who died returned as ghosts. This made mental recovery very difficult. Further, most believed that psychologists and counseling were only for insane people, resulting in underutilization of services in many areas. In other areas, there was a perception that the agenda of some donors providing counseling services,

basic needs, and medical assistance was religious conversion. This led to resentment among some victims.

Another important effect of the disaster was to change local people's attitudes from one of self-sufficiency to dependence. As a result, people accepted aid of all kinds, whether or not they had already gotten what they needed. The result, besides wasting scarce resources, was that some people ended up with much-improved housing, two or more boats, and other redundant aid. Due to this behavior, all assistance agencies had to spend more time to re-check aid allocation, thus further delaying the whole process.

4.6 Continuing Priorities for Recovery of MNPs and Associated Tourism Economy

As noted at the outset of this chapter, the 2004 Indian Ocean tsunami resulted in what is likely the most intensive and extensive disaster response and recovery effort in Thai history. The national government, regional and municipal governments, international donors and NGOs, and the private sector all stepped up to provide a wide array of medical and psychological assistance, food relief, debris removal and reconstruction assistance, business grants and loans, and other individual and community services. Despite this massive effort, there were in retrospect some recovery actions that did not take place or were done less than well. Anticipating this, Delphi panelists were asked to identify the full range of actions needed to recover MNP tourism and their relative priority. In a sense, the list the panelists generated (Table 4-9) represents an ideal set of response and recovery actions for recovering MNP tourism following the disaster.

The Delphi panelists identified a wide range of governmental and private sector recovery actions and prioritized their relative importance (Table 4-9). The actions identified cut across the four dimensions of recovery addressed in this study: natural resources and ecosystems, the built environment, the business community,

Table 4-9. Priority tsunami disaster response and recovery actions needed to recover tourism in Thai marine national parks, and responsible entity.

Ideal Response/Recovery Action	Action Priority³	Responsibility for Action
Create tsunami warning network (and all-hazards) and preparedness system, including a multi-level communication network, evacuation plans, hazard/disaster preparedness education and outreach, and related research.	High (2.85)	Experts in specific fields, Marine Park Division.
Minimize the construction of new buildings in marine parks and use caution in the new development, especially close to shore. A priority for all construction should be to take natural ecosystem concerns and natural hazards into consideration.	High (2.85)	Marine Park Division
Prepare emergency response and disaster mitigation plan for each park; include rescue tools such as boats, emergency communications, emergency food and water supply to be used in parks following a disaster.	High (2.80)	Marine Park Division
Repair or replace damaged reservoirs and repair or install new water treatment plants within marine parks.	High (2.75)	Marine Park Division
Clarify activity zone in park.	High (2.70)	Marine Park Division
Promote and raise awareness of tourism impacts on natural resources among tourists.	High (2.70)	Educators, tour operators, Marine Park Division
Persuade the tourism businesses to emphasize their competitiveness by increasing service quality rather than reducing price.	High (2.70)	TAT ¹
Identify activity zoning plans in each marine park and strictly enforce the plan.	High (2.60)	Marine Park Division, each marine park
Enforce park regulations among tourists and tour operators especially in and around diving sites.	High (2.60)	Tour operators, Marine Park Division
Create continuous tourism promotion campaign in affected areas to promote sustainable recovery.	High (2.60)	TAT ¹
Promote tourism safety measures.	High (2.55)	TAT ¹
Study tourism carrying capacity in each marine park in order to control number of boats and tourists not to exceed capacity of parks and to insure tourism safety.	High (2.45)	Marine Park Division
Inventory natural resource quantity and quality in marine parks to serve as a baseline for monitoring ecosystem recovery.	High (2.40)	Marine Park Division or universities
Provide aid by asking for victims' actual needs. This will increase effectiveness of aid allocation, receiver satisfaction, and will reduce conflict with primitive cultures such as sea gypsies and artisanal fishermen.	High (2.40)	Specific government agency and NGOs

¹TAT = Tourism Authority of Thailand

²DMCR. = Department of Marine and Coastal Resources

³Low (≥ 1.00 but < 1.67), Moderate (≥ 1.67 but < 2.34), High (≥ 2.34)

Table 4-9 (continued). Priority tsunami disaster response and recovery actions needed to recover tourism in Thai marine national parks, and responsible entity.

Ideal Response/Recovery Action	Action Priority³	Responsibility for Action
Build professional capacity for marine park management, including enhanced training and increased numbers.	High (2.35)	Marine Park Division
Establish a one-stop agency that is responsible for receiving requests and concerns from tsunami victims. This is not a short term relief plan but is necessary as long term agenda to continuously reduce stress and discouragement of victims.	High (2.35)	Relevant government agencies
Monitor impacts on natural resources and ecosystems.	Moderate (2.25)	Experts from specific fields
Establish collaborative network to develop knowledge and conduct research needed for enhanced park management. The network should consist of government agencies, universities and educational institutes, and the private sector.	Moderate (2.25)	Educational institutes, Marine Park Division, and DMCR ²
Promote clean beach campaigns to reduce debris in coastal areas.	Moderate (2.25)	Everyone
Using the baseline, provide ongoing monitoring and reporting of natural resource recovery, providing distribution to agencies, tour operators, tourists, divers, and the general public.	Moderate (2.20)	Marine Park Division or universities
Monitor tsunami impacts on social, health, and safety.	Moderate (2.20)	Experts from specific fields
Develop recovery plan for coral reefs, including installation of artificial reefs where appropriate.	Moderate (2.10)	DMCR ²
Encourage communities located near park boundaries to get involved in designing park management plans and conservation projects such as mangrove reforestation, beach cleaning projects and education & outreach projects regarding marine environment and coastal disaster.	Moderate (2.10)	Educational institutes, local governments, NGOs, Marine Park Division, and DMCR ²
Monitor tsunami impacts on business community/environment and find financial sources to recover business environment.	Moderate (2.10)	Specific field experts, Ministry of Commerce, Finance institutes
Explore coastal morphology and seafloor changes to promote navigation safety.	Moderate (1.90)	Hydrographic Department or DMCR ²
Identify new diving destinations to replace damaged diving sites, thus reducing pressure on existing diving sites and allowing damaged diving sites time to recover.	Moderate (1.75)	Education institutes, Marine Park Division, and DMCR ²
Reduce park management cost by leasing bungalows in parks to property management companies.	Low (1.30)	Marine Park Division

¹TAT = Tourism Authority of Thailand

²DMCR. = Department of Marine and Coastal Resources

³Low (≥ 1.00 but < 1.67), Moderate (≥ 1.67 but < 2.34), High (≥ 2.34)

and social structure, health, and safety. Some of these actions have been taken, at least to some degree, in 2005, while others might have been taken if barriers and constraints could have been avoided. Other actions, especially those related to preparedness (e.g., tsunami education and evacuation plans), ideally would have well before the tsunami, thus avoiding significant loss of life.

Based on a simple High (3), Moderate (2), Low (1) priority rating system, 16 of the 27 actions on average ranked in the High priority category (≥ 2.33), and the remaining in the Moderate priority category (≥ 1.67 but < 2.33) (Table 4-9). The actions the panel identified also serve as a guide for future action, both to help recover tourism in marine national parks, and to plan for more hazard-resilient parks in the future. These ideal preparedness and recovery actions are discussed further in Chapter 5, which addresses the implications of Delphi panel findings for MNP hazard vulnerability assessment and mitigation planning.

4.7 Comparative Analysis and Discussion of Delphi Expert Panel Results

The four MNPs used as a basis for this research were selected based on the level and types of damage they sustained. Delphi panelists, however, in responding to questions in each of the three rounds, were instructed to consider impacts and recovery actions collectively in the four parks, rather than for each park separately. This was a conscious decision on the part of the researcher, given the potential complexity of designing a Delphi questionnaire that required separate responses for each park for each category of impacts and recovery actions. Further, the goal of the research was to gain a broader understanding of the range of MNP impacts and recovery actions, not just what happened within a given park. That said, what did happen within each park during and after the 2004 tsunami is considered later in this chapter (Section 4.9). The discussion here, however, addresses all four parks in aggregate, comparing categories of impacts and recovery actions.

The aggregated Delphi findings and results were coded and analyzed with the statistical software packages (S-PLUS and Statistical package for the Social Science

Table 4-10. Results of paired samples t-test of Delphi Round 2 and Round 3.

Compared Values between Round 2 - Round 3	Paired Differences (2-tailed)					t	df	Sig.
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
MODE	.01163	1.12191	.12098	-.22891	.25217	.096	85	.924
MEDIAN	.00581	.54500	.05877	-.11103	.12266	.099	85	.921
MEAN	-.05663	.30353	.03273	-.12171	.00845	-1.730	85	.087
IQR	.59302	.67087	.07234	.44919	.73686	8.198	85	.000
SD	.22186	.20966	.02261	.17691	.26681	9.813	85	.000

Note: d.f. = degree of freedom; $n = 86$; Sig. = Level of Significance

[SPSS]). The moderator applied paired-samples t-test with a 95% confidence interval (level of significance, $P < 0.05$) for two purposes: (1) to indicate consensus or the stability of opinion, i.e., when there is no more change from Round 2 to Round 3 (the t-test tested the null hypothesis that there was no significant difference in the variance of the panelists' responses during the two final rounds using mode, median and mean values); and (2) to identify significant convergence or divergence of opinion from Round 2 to Round 3, i.e., the t-test tested the null hypothesis that there is no significant difference in the variance of Inter-Quartile Range (IQR) and Standard Deviation (SD) values during the two final rounds.

Statistical values of 86 items ($n = 86$) from eight topics were analyzed. The result of the analysis is presented in Table 4-10. The analysis found a significant change in the variance of the panelists' opinions in mode, median, and mean values from Round 2 to Round 3 ($P = .924$, $P = .921$, $P = .087$, respectively). That is, the difference in means of mode and median values from Round 2 to Round 3 was not equal 0, thus significantly rejecting the Null Hypothesis, ($P > .10$, two-tailed). This is because many panelists learned more about the impacts and effectiveness of recovery actions from their colleagues or media during the time between Round 2 and Round 3 and drastically reduced or increased their votes in Round 3. Therefore, this indicated that the Delphi sequences did not reach stability or consensus due to significant changes in opinion from round to round.

Although this study did not reach the stability of opinion which is an ultimate goal for Delphi study, adding more rounds to reach the convergence is not a practical option in this case. Alternatively, the moderator considered IQR and SD value of each item between the two rounds to indicate the degree of convergence and divergence. The t-test analysis significantly revealed the reduction of IQR and SD values as panelists moved from Round 2 to Round 3 ($P < .05$). Thus, the smaller IQR and SD value indicated a significant increase in the level of agreement or convergence between these two final rounds (see Table 4-10 for detail and comparison).

4.7.1 Comparison of Degree of Impact of the Four Impact Categories

In this study, tsunami impacts to MNPs have been identified and analyzed with respect to how they influenced the tourism sector. This is because providing quality tourism experiences to visitors from Thailand and all over the world is one of the most important reasons for park existence. Therefore, it can be assumed that the panelists focused on the tourism sector in the Delphi rating process, and not just tourism activities within the park, but also on the businesses that provide tourism goods and services within/around MNPs (see Figure 4-3).

To determine the degree to which different kinds of tsunami impacts affected tourism in MNPs, mode values for each impact in the four impact categories were aggregated, analyzed, and compared. The analyses show that, according to the panel experts, tsunami impacts on the business environment within and/or outside park boundaries had the greatest impact on marine park tourism (Figure 4-3), with an average score of 7.80. Not far behind in terms of tourism impact was damage sustained by the built environment (facilities, equipment, accommodations, etc.), which received average score at 7.75. Social, health, and safety impacts ranked the third in importance among the four categories of impact, with an average score of 6.64. Interestingly, tsunami impacts on the natural environment—the primary

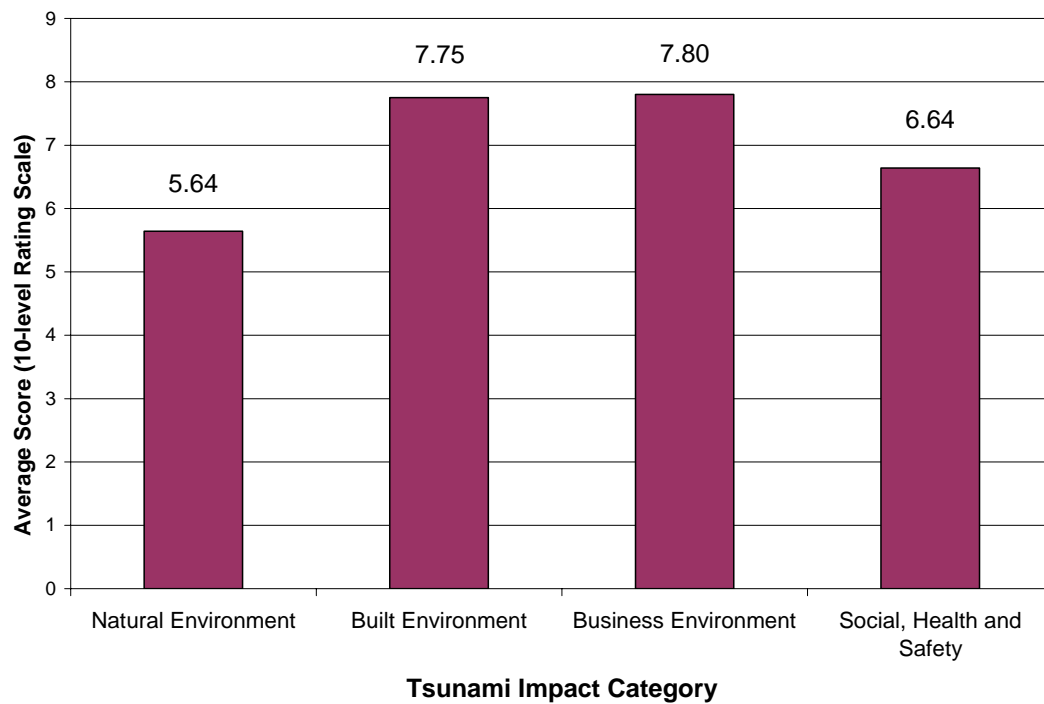


Figure 4-3. Comparison of Delphi panel average mode value of four categories of tsunami impacts on marine park tourism.

attraction park visitors—were considered the least important category affecting park tourism, with an average score of 5.64 (Figure 4-3).

4.7.2 Influence of Delphi Panelists' Professions on Opinions the Four Categories of Tsunami Impacts on Marine Park Tourism

One of the questions of interest in the Delphi process was whether or not the panelists' professions or experience influenced their opinions on the relative importance to tourism of the different kinds of impacts—natural resources, built environment, and so on. To explore this question, impact median values for panelists in each profession category were analyzed and compared with average median value for all panelists (Figure 4-4).

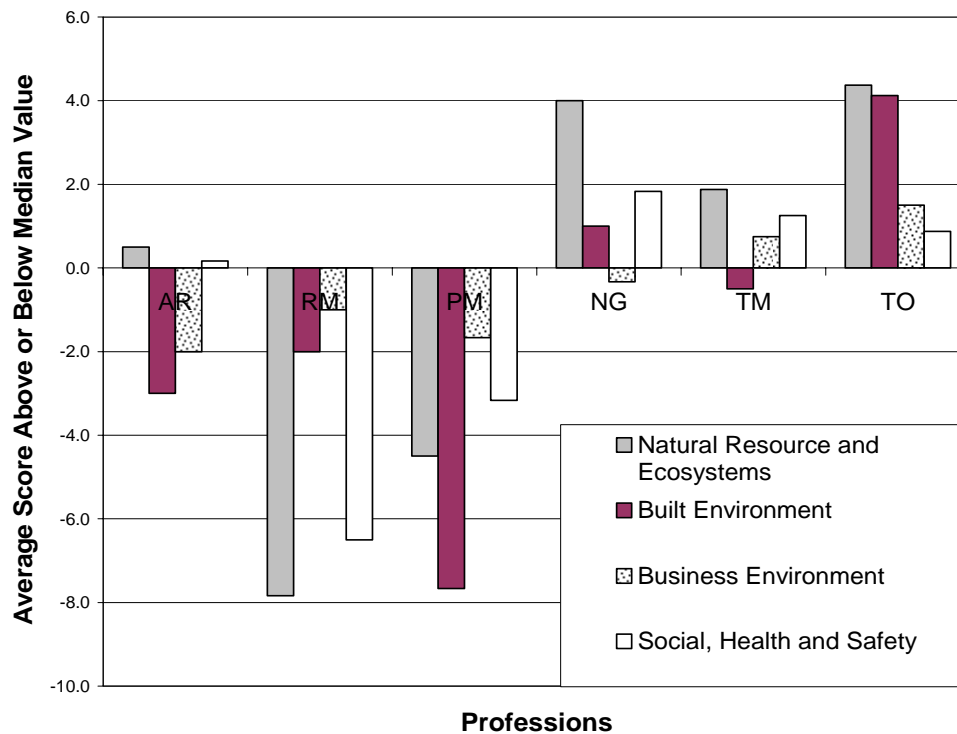


Figure 4-4. Comparison of difference in median value of six professions on four categories of tsunami impacts affecting marine park tourism (AR = Academic Researcher ($\underline{n} = 3$), RM = Resource Manager ($\underline{n} = 3$), PM = Park Manager ($\underline{n} = 3$), NG = Non-Government Organization ($\underline{n} = 3$), TM = Tourism Promoter and Manager ($\underline{n} = 4$), TO = Tour Operator ($\underline{n} = 4$)).

Resource managers (RMs), park managers (PMs), and academic researchers (ARs), on average, attributed less importance to the combined four categories of impacts and their influence on tourism than did the panel as a whole, while tour operators (TOs), non-governmental organizations (NGOs), and tour promoters and managers (TMs) did the opposite. However, panelists from the different professions disagreed as to which tsunami impact category were most and least important to tourism. TOs, NGOs, TMs, and ARs all rated natural resource and ecosystem impacts as being most important, whereas RMs and PMs rated it relatively less important, instead seeing tsunami impacts to businesses as the most important of the four categories. RMs and PMs rated social, health, and safety as less important while on-the-ground ARs, NG, TM, and TO that exposed to affected communities did the

opposite. The impact categories that exhibited the greatest divergence among the six professions were the built environment and the natural environment.

4.7.3 Comparison of Tsunami Impacts and Recovery Effort Effectiveness

Another important question has to do with the effectiveness of actions taken to recover tourism in MNPs in the year following the disaster. To determine the degree to which recovery actions affected tourism in MNPs, mode values for each impact in the four recovery action categories were aggregated, analyzed, and compared to both one another and to the importance of each of the impact categories in Figure 4-5. Built environment recovery actions (average mode=7.73) were deemed the most effective by far in contributing to marine park tourism recover, followed by recovery actions focused on the business environment (average mode=6.75), natural resources and ecosystems (average mode=6.58), and social, health and safety (average mode=6.33). All categories of actions, however, scored well above the midpoint in the 10-level rating scale, suggesting that, in general, Delphi panelists believed that most recovery actions were at least somewhat effective.

Other insights can be gained from a comparison of tsunami impact and recovery action mode values for each category (Figure 4-5). For the business environment and the social health, and safety categories, recovery action effectiveness mode values were somewhat lower for than for tsunami impact importance, suggesting that more effort is needed to match effectiveness with the significance of the impacts. For the built environment, the mode for recovery action effectiveness matched almost exactly the importance of tsunami impacts (mode values of 7.75 and 7.73, respectively). For the natural environment, recovery actions effectiveness exceeded expectations, given the lower importance of tsunami impacts on that category (mode values of 6.58 and 5.64, respectively).

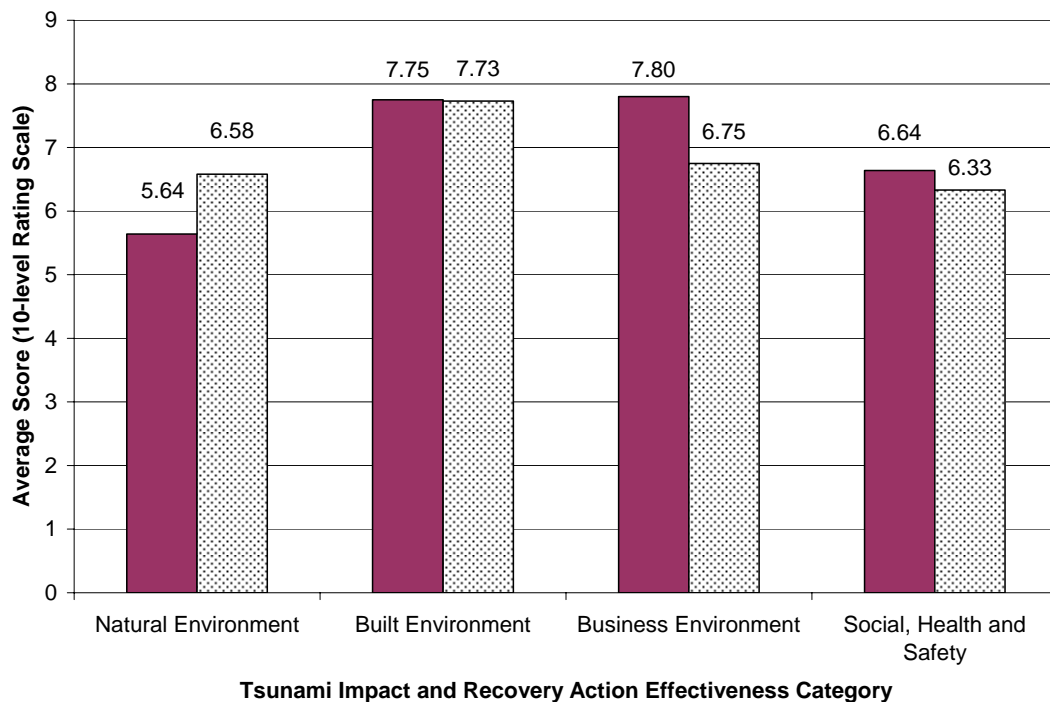


Figure 4-5. Comparison of recovery action effectiveness of each impact category.

In summary, compared to the importance of tsunami impacts, recovery action effectiveness exceeded expectations for the natural environment, was about what would be expected for the built environment, and fell short for the business environment and for social, health, and safety impacts.

4.7.4 Influence of Delphi Panelists' Professions on Opinions of Recovery Action Effectiveness for Marine Park Tourism

As with tsunami impacts (Section 4.7.2), it is important to see whether or not panelists' professions or experience influenced their perceptions about the relative importance of recovery actions. To explore this question, recovery action median values for panelists in each profession category were analyzed and compared with median values of all panelists (Figure 4-6).

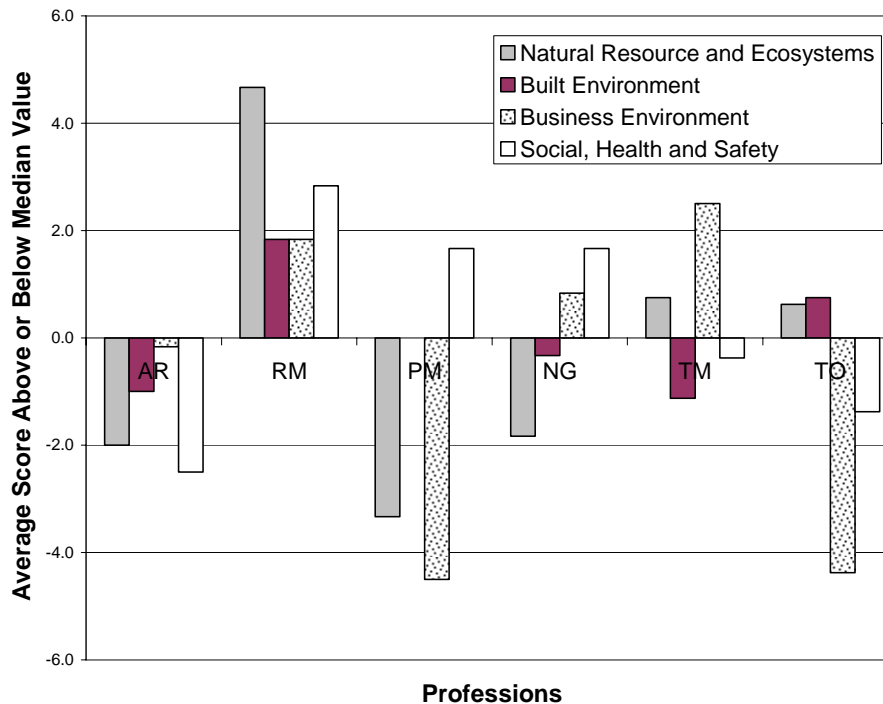


Figure 4-6. Comparison of difference in median value of six professions on recovery action effectiveness (AR = Academic Researcher ($\underline{n} = 3$), RM = Resource Manager ($\underline{n} = 3$), PM = Park Manager ($\underline{n} = 3$), NG = Non-Government Organization ($\underline{n} = 3$), TM = Tourism Promoter and Manager ($\underline{n} = 4$), TO = Tour Operator ($\underline{n} = 4$)).

The analyses show that academic researcher is the profession that rated all four categories of recovery efforts below the median of the whole panel. Resource managers, on the other hand, rated all four categories of recovery efforts higher than the median. Panelists from the other four professions showed mixed results.

To explore this issue further, the effectiveness scores for each recovery action category assigned by members of each profession were analyzed. For natural environment recovery efforts, effectiveness scores assigned by park managers, academic researchers, and NGOs were lower than the median of the whole panel. Resource managers gave this category of efforts the highest degree of effectiveness of all professions; tourism managers and tour operators also rated natural environment recovery actions slightly higher than the median. Interestingly, park managers—the profession that manages natural resources within marine parks—gave

the lowest effectiveness score for this category. This might be explained by their dissatisfaction with the level of accomplishments in this area.

The effectiveness scores of built environment recovery efforts varied little among the six professions. For the business environment, effectiveness ratings were quite different among the six professions, with tour operators and park managers rating recovery efforts much lower than other professions. Tour promoters and managers, on the other hand, rated recovery efforts more highly than the panel median. This may be because this group believed they played an important role in tourism business recovery; in contrast, on-the-ground tour operators felt quite the opposite.

Social, health and safety recovery action effectiveness scores for response and recovery effort given by resource manager, park manager, and NGO were higher than the whole panel's average median. Other three professions, academic researcher, tourism promoter and manager, and tour operator voted lower scores than whole panel's average median. The analyses also show that resource managers gave much higher scores than the panel's average median while academic researchers gave much lower scores than average median.

4.8 Positive Impacts of the 2004 Tsunami on Marine National Park Tourism

The death and destruction wrought by the 2004 tsunami initially made it hard to see any positive outcomes of the event. However, by early 2006 when the Delphi survey was conducted, panelists were quick to identify a number of positive impacts and new opportunities that the tsunami had created for MNPs, surrounding areas, and related tourism operations.

Surprisingly, the tsunami actually improved water quality and beach conditions in some areas, particularly after several months of adjustment. Areas that were poorly flushed by tidal currents received an influx of new water and opened up new channels. Sediments were overturned in shallow areas and some beaches were

renewed with clean, fresh sand as eroded areas accreted in the months following the tsunami.

Reduced number of tourists during the year after the disaster (2005) also helped decrease human pressures on natural resources, pressures that had been increasing continuously for decades. Tour operators, other tourism stakeholders, and general public have come to realize that the environment is sensitive to tourism demands and pressures and needs to be managed carefully to become more sustainable. It remains to be seen if this new attitude persists.

The inconsistent, often-disrupted, and self-serving nature of national and local government-initiated recovery efforts, and those of NGOs, created a degree of cynicism among hard-hit communities, businesses, and MNPs. The positive aspect of this situation was that those affected by the tsunami took more responsibility for their own recovery, thus fostering a feeling of control, independence, and self-satisfaction. At the same time, local people organized and demanded improved assistance and services, holding local and national administrators responsible. Delphi panelists expressed hope that this will lead to more openness and improvement of government and nongovernmental services generally and less focus on which organization gets “credit”.

The tsunami disaster demonstrated how vague land ownership records and use controls led to corruption in land use decisions over the past several decades. Public lands often came under private control. The disaster had the effect of “resetting” the clock on land use and coastal resource utilization. Government sectors re-identified old resource management plans that had not been followed and, in and around MNPs, examined carrying capacity and key new regulations to control overuse of coastal lands.

One of the most important outcomes of the tsunami disaster was the increase in coastal hazard awareness and disaster preparedness. It also made clear to government officials and the general public how human impacts on coastal and marine environments increase their vulnerability to disasters. The disaster was a

huge lesson for policy makers and researchers. This new understanding led to renovation of laws and regulations (both in general and those that related to coastal resources), emergence of new policy ideas for development and tourism, and changes in resource management paradigms.

Despite breakdowns noted earlier, the collaboration and cooperation among government agencies, NGOs, and the private sector that did occur in cleanup and recovery operations was unprecedented and created a lot of good will. One noteworthy example in MNPs were efforts by diverse groups of divers to clean up debris in the marine environment, often debris that was out of sight but harmful to marine life (Figure 4-7). There was also unprecedented cooperation among government agencies, the private sector, academic researchers (especially marine scientists from different institutes), and general public in helping victims and supporting natural resource recovery efforts.

The disaster created opportunities for the country to receive international support, including funding, human resources, and technology. Some agencies received additional budget allocations to help recover natural resources. This allowed agencies to launch projects in special-need areas.

Of all the positive benefits of the tsunami disaster, probably the biggest related to the political instability of the country at the time of the event. The crisis united Thai people to help all the victims regardless of religion, class, or nationality. This in turn created a very positive impression among domestic and international organizations.

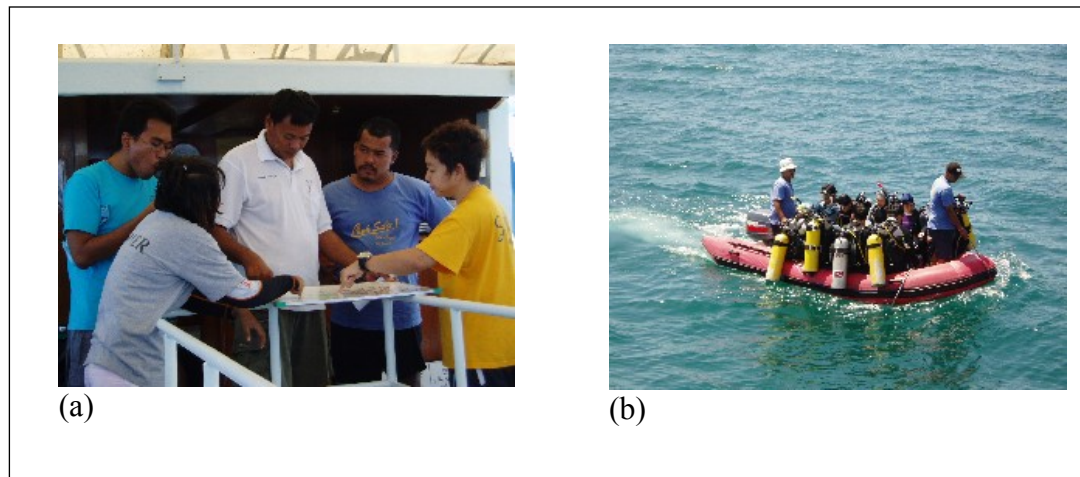


Figure 4-7. (a) and (b) Collaborative work among volunteer divers, tour operator, and marine scientists in monitoring recovery of damaged coral reef near Koh Phai Islands in Had Nopparattara-Mu Ko Phi Phi MNP (Somrudee Meprasert photos).

4.9 Relationship of Delphi Findings to the Four MNP Study Sites

The previous sections presented the findings of the Delphi process aggregated for the four MNP study sites. Their purpose was to provide a broad understanding of impacts and recovery action effectiveness representative of MNPs throughout the region. This section aims to look at relationships between the general findings in Sections 4.1 to 4.8 and each of the four MNP study sites. In addition to the Delphi panel findings, a variety of data sources were drawn upon to examine these relationships: literature review—mostly rapid assessments conducted by government agencies and NGOs; informant interviews conducted by the researcher; and the researcher's field observations. For each of the parks, direct and indirect tsunami impacts and selected recovery actions are discussed. The same classification scheme of impacts and recovery actions are used to discuss each park, namely the natural environment and ecosystems, the built environment, the business community-environment, and social, health and safety environment. The four study sites provide tangible examples of the direct and indirect impacts of the 2004 tsunami on MNPs.

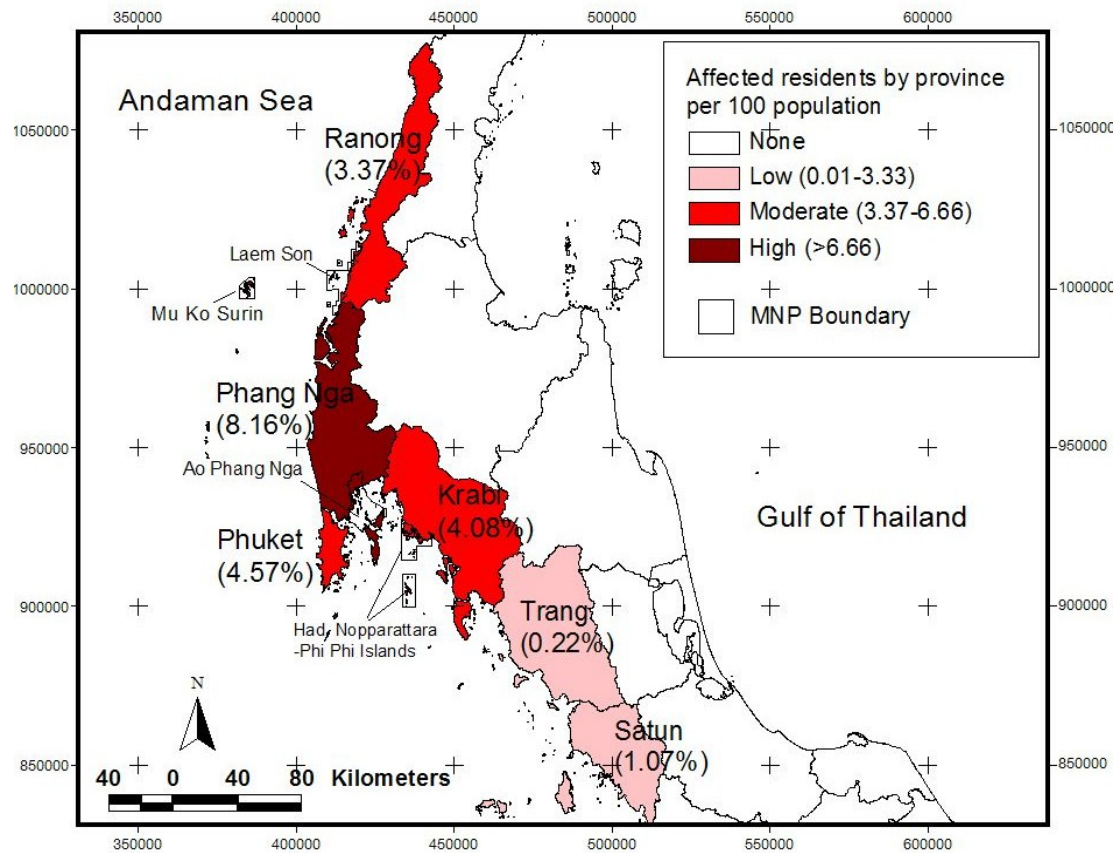


Figure 4-8. Location of the four study sites and tsunami affected residents by province per 100 population (data from Tsunami Relief Center 2005).

They also show how the different types of impacts interacted with others to affect MNP tourism and its recovery.

This section is organized as follows. First, the impacts of the 2004 tsunami on the four MNPs are compared. This is followed by a more in-depth discussion of impacts and recovery actions within each park and the surrounding area from which it draws tourists and/or tourism workers. Ao Phang Nga MNP and Hat Nopparat Thara – Mu Ko Phi Phi MNP, both in the south, are presented first, followed by Mu Ko Surin MNP and Laem Son MNP, the two parks to the north (Figure 4-8). Figure 4-8 also shows the number of Thai people killed in each province, which indirectly relates to the density of local populations and by extension to tourism activities.

4.9.1 Direct Comparison of Tsunami Impacts on the Four MNP Study Sites

As noted in the Methods chapter, the extent of loss of life, injuries, property damage and business and social impacts varied for each of the four MNPs selected for consideration in the Delphi process. This section uses a variety of data to explain these differences in some detail, again using the four standard categories: natural environment and ecosystems, the built environment, the business community-environment, and the social, health and safety environment.

a) Impacts on the natural environment and ecosystems

In this study, the coral reef ecosystem was assumed to be the primary tourism resource for MNPs in the Andaman Sea. Therefore, the degree of coral reef damage in the tsunami-affected parks was used as a key indicator of the degree of natural resource and ecosystem impacts. Degrees of damage were the results of the rapid impact assessment of the tsunami on marine resources done by DMCR (2005). It is noteworthy that due to the recent nature of the tsunami disaster this report was the only reliable information available.

Beginning December 30, 2004—less than one week after the tsunami disaster—the Department of Marine and Coastal Resources organized a team of government, university, and volunteer divers to undertake a rapid impact assessment of coral reef damage on the Andaman coast. This team produced the only study of its kind undertaken in 2005 (DMCR 2005). The team used a checklist and a five-category damage classification scheme ranging from none to extreme to estimate damage (Table 4-11). The diving surveys were extensive, involving more than 120 divers at 174 diving stations. Of these, 137 stations were located within the 11 MNPs on the Andaman coast and 51 within the MNP study sites examined in the Delphi study (Table 4-12) (DMCR 2005).

Table 4-11. Rapid Assessment classification system for estimating the degree of coral reef damage following the 2004 tsunami (DMCR 2005).

Damage category	Percent damage at diving station	Damage Level
None	0%	0
Low	1 – 10%	1
Moderate	11 – 30%	2
High	31 – 50%	3
Extreme	> 50%	4

Table 4-12. Estimated coral reef damage in Andaman coast marine national parks resulting from the December 26, 2004 Indian Ocean tsunami (DMCR 2005) (Bold font-coded parks basis for Delphi study).

Marine National Park Name	Number of Diving Stations**	Average Degree of Coral Reef Damage
1. Ao Phang Nga*	-	None
2. Mu Ko Petra	9	None
3. Hat Nopharat Thara – Mu Ko Phi Phi	19	Low
4. Mu Ko Lanta	10	Low
5. Sirinath	2	Low
6. Tarn Boke Koranee	1	Low
7. Tarutao	24	Low
8. Hat Chao Mai	2	Moderate
9. Mu Ko Similan	38	Moderate
10. Mu Ko Surin	21	Moderate
11. Laem Son	11	High
Average Damage	137	Low (1 – 10%)

* The diving survey had not been done in Ao Phang Nga marine national park based on the assumption that this bay did not receive any impact from the tsunami wave due to its protected geography (located east of Phuket Island and surrounded by many islands).

** Number of diving station refers to number of areas where surveys were conducted in each MNP.

In general, the average degree of coral reef damage in the 11 MNPs on the Andaman coast was low—in the 1-10% damage category (Table 4-12). Of the four MNPs in our study, coral reefs in Ao Phang Nga did not receive any tsunami impact and so was not included in the surveys (no stations surveyed). In the other three MNPs that served as the basis for our study, Hat Nopharat Thara – Mu Ko Phi Phi MNP had low coral reef damage (1 – 10%), Mu Ko Surin MNP had moderate

damage (11 – 30% damage), and Laem Son MNP had high damage (31 – 50% damage). Laem Son’s coral reef damage was the highest among all 11 MNPs examined.

b) Impact on the built environment

Although an official cost estimate of tsunami damage to the built environment of MNPs is not available, the National Park, Wildlife and Plant Conservation Department did estimate the “degree” of damage to park facilities as none, moderate, or high, presenting their assessment at a department meeting in February 2005 (NPWPCD 2005d). The damage assessment process focused on damage to park headquarters, ranger stations, ranger and staff dormitories, boats, vehicles, and other tourism-serving facilities belonging to the department. Based on this classification, the average degree of damage in the 11 MNPs is in the moderate category. Of the four Delphi study sites, Ao Phnag Nga MNP received no damage, while the built environment in the other three study sites—Hat Nopharat Thara – Mu Ko Phi Phi, Mu Ko Surin, and Laem Son MNPs—was rated as highly damaged (Table 4-13).

c) Impact on the business community-environment

There was no specific information regarding damage to the tourism-related business community for any of the four MNPs. However, given the nature of MNP tourism businesses and their location mostly outside or adjacent to MNP boundaries, the best proxy available are province-level data on damaged “tools of the trade” gathered by the Tsunami Relief Center (Tsunami Relief Center 2005). This data set is the aggregate calculation of damage on fishery tools, such as boats, engines, and equipment, livestock lost, area of damaged agricultural lands, and losses within the service sector in each province, which in part includes seasonal tourism services. The rationale for using the data in this study is that in the tsunami-affected area, most local people change jobs seasonally or even hold multiple jobs at one time. For example, local fishermen, when not fishing, often hire out their boats to tourists,

Table 4-13. Degree of the built environment damage in marine national parks with coral reef ecosystems (National Park, Wildlife and Plant Conservation Department 2005d) (Bold font-coded parks basis for Delphi study).

Marine national park name	Degree of the built environment damage
1. Ao Phang Nga	None
2. Mu Ko Petra	None
3. Hat Nopharat Thara – Mu Ko Phi Phi	High
4. Mu Ko Lanta	High
Sirinath	High
6. Tarn Boke Koranee	Moderate
7. Tarutao	Moderate
8. Hat Chao Mai	Moderate
9. Mu Ko Similan	High
10. Mu Ko Surin	High
11. Laem Son	High
Overall average damage	Moderate

Table 4-14. Cost of the damage on tools of the trade in the six affected provinces (Sources: Tsunami Relief Center 2005; NSO 2006).

Province	Cost of damage on tool of the trade (million US\$)	Provincial Gross Domestic Product (GDP) in the year 2004 (million US\$)	Percent damage on tool of the trade compare to provincial GDP	Damage category
1. Phang Nga	178.58	507.02	35.22	High (3)
2. Krabi	71.90	714.69	10.06	Moderate (2)
3. Phuket	107.49	1299.60	8.27	Low (1)
4. Ranong	4.38	289.25	1.51	Low (1)
5. Trang	0.53	1004.34	0.05	Low (1)
6. Satun	3.02	494.85	0.61	Low (1)
Total	365.90	4309.75	8.49	

Note: 1-9% damage = Low; 10-19% damage = Moderate; >20% damage = High

transporting them to diving or snorkeling sites, or taking them on scenic park tours. This provides them with a lucrative additional source of income. The same fishermen and their families also have small plantations and gardens, growing herbs or vegetables for sale to both local people and tourists. These data, then, while not absolute with respect to MNP tourism services, allow for a comparison of relative damage to tourism-related businesses in the region of each park.

To compare tsunami impacts to the business community of the four MNP study sites, Tsunami Relief Center data were classified into three impact categories: low, moderate, and high (Table 4-14). Phang Nga province received a high degree of impact on the business community. Two of the four NMP study sites—Ao Phang Nga MNP and Mu Ko Surin MNP—are served by businesses in this province. The most southerly of the study sites—Hat Nopharat Thara – Mu Ko Phi Phi MNP—is located in the Krabi province that received a moderate degree of impact. Laem Son MNP, located in northernmost Ranong province, received the lowest degree of the business community-environment impact. These data are discussed in more detail for each park later in this chapter. However, one thing that is clear is that the population density of each province correlates well with the level of impacts to tools of the trade (see Table 4-14).

d) Impact on social, health and safety environments

There are no official data on tsunami impacts on the social, health and safety environment of the four MNPs. For this study, then, the number of tsunami-affected residents in each province was used as a proxy for impacts to adjacent parks, as identified by the Tsunami Relief Center (2005). The number of affected residents was classified into three levels: low, moderate, and high (Table 4-15).

Phang Nga Province suffered the greatest number of local resident deaths and otherwise affected individuals, many of whom suffered injuries, lost family members, or were displaced from their homes and communities (Table 4-14). Ao Phang Nga MNP and Mu Ko Surin MNP are located in and served by the local population in this province and by extension, were also highly impacted. The toll was next highest in Krabi Province, where Hat Nopharat Thara – Mu Ko Phi Phi, Krabi MNP is located. However, number of deaths and affected residents in Krabi is relatively moderate compare to its population number. Ranong Province had the next highest number of deaths, but overall had a relatively moderate number of otherwise

Table 4-15. Number of people affected by the tsunami disaster in the six coastal provinces (Sources: Tsunami Relief Center 2005; DOPA 2006).

Province	No. of Death	No. of affected residents	Provincial population (2004)	Percent affected residents compare to provincial population	Damage category
1. Phang Nga	1,238	19,509	239,064	8.16	High (3)
2. Krabi	357	15,812	387,752	4.08	Moderate (2)
3. Phuket	151	13,065	285,901	4.57	Moderate (2)
4. Ranong	156	5,942	176,372	3.37	Moderate (2)
5. Trang	3	1,302	596,087	0.22	Low (1)
6. Satun	6	2,920	273,546	1.07	Low (1)
Total	1,911	58,550	1,958,722	2.99	

Note: 0-3.33% damage = Low; 3.34-6.66% damage = Moderate; >6.66% damage = High

affected residents, leading to an overall moderate degree of social, health, and safety impacts. Phuket Province, on the other hand, had fewer deaths than Ranong, but considerably more affected people. This probably relates to population differences in the two areas (Phuket's is 40 percent greater) and differences in the tsunami striking the two coasts (tsunami inundation was much greater in Ranong). This issue is discussed in more detail later in this chapter.

e) Summary of impacts across the four categories

Tsunami impacts in the four MNP study sites are summarized in Figure 4-9. Among all four impacts, the degree of impact on the social, health and safety is high in all four MNP. Interestingly, the summary also shows that among four study sites Mu Ko Surin MNP in Phang Nga province had the highest overall degree of damage while other three MNPs had the moderate degree of damage. These and other findings are discussed in detail separately for each study site in the following sections.

f) Tsunami impact on MNP visitation

Not surprisingly, the number of visitors to each of the four MNP study sites in the year following the 2004 tsunami declined dramatically compared to the prior year

(Figure 10). However, the amount of decline differed significantly among the four parks, ranging from an 88 percent reduction at Laem Son to just 34 percent at Ao Phang Nga. There are several reasons for these differences, including the relative amount of coral reef damage, differences in other park attractions, park accessibility, and length of park closures following the disaster.

Although all four NMP study sites contain coral reef ecosystems, their extent, quality, and diversity differ significantly, as does the degree of damage experienced during the tsunami. Expectations as to the quality of the reef experience could have played an important role in tourists' and divers' decisions to visit the different parks. Other unique attractions may also have played a role in visitation differences. For example, visitors who came to Ao Phang Nga MNP expected to see the dense mangrove forest and the exotic landscape of the bay; coral reefs are of less importance there. Park accessibility and isolation significantly influenced the visitation numbers in 2005. Mu Ko Surin, for example, required a relatively long boat trip to reach the park, and the fear of future tsunamis no doubt deterred some visitors. Finally, the length of time each park was closed following the disaster varied. Ao Phang Nga MNP, for example, suffered no direct tsunami damage and was closed for just a few days in order to assess possible damage. At the other extreme is Laem Son MNP. Having sustained a great deal of damage to both the natural environment and park facilities, it was closed for a full year. As of March 2006—15 months after the disaster—Laem Son MNP was still in ruins. Park offices and facilities have not yet been reconstructed and, although parts of the park are open to the public, it was not ready to accommodate significant numbers of visitors. The relationship between the degree of damage and numbers of park visitors following the tsunami is discussed park by park in the following sections.

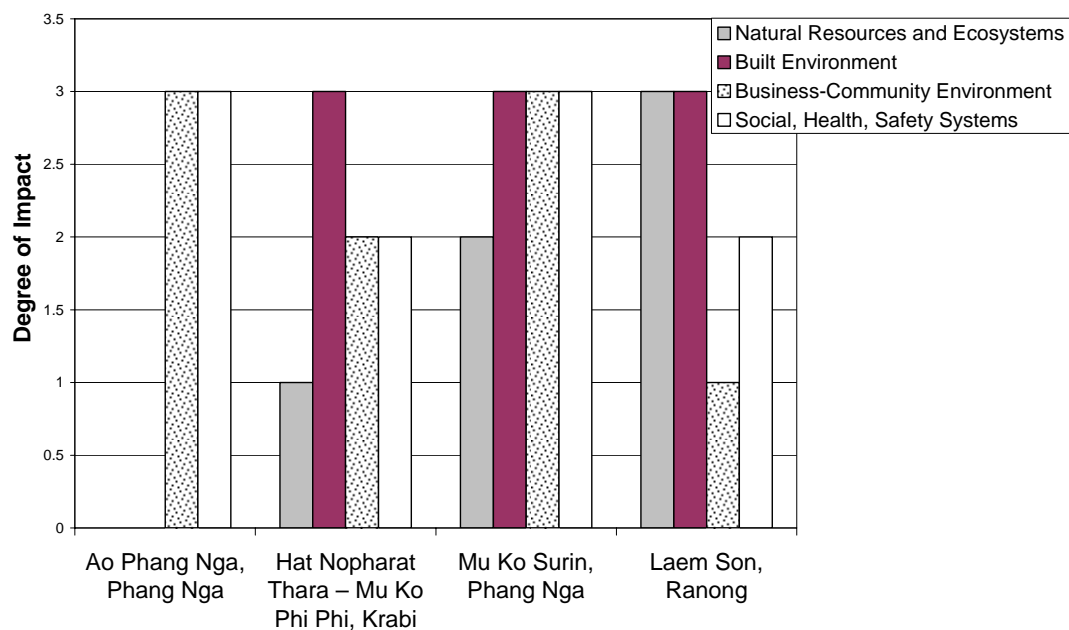


Figure 4-9. Summary of the degree of tsunami impacts in four Andaman coast MNPs. (0 = None, 1 = Low, 2 = Moderate, 3 = High)

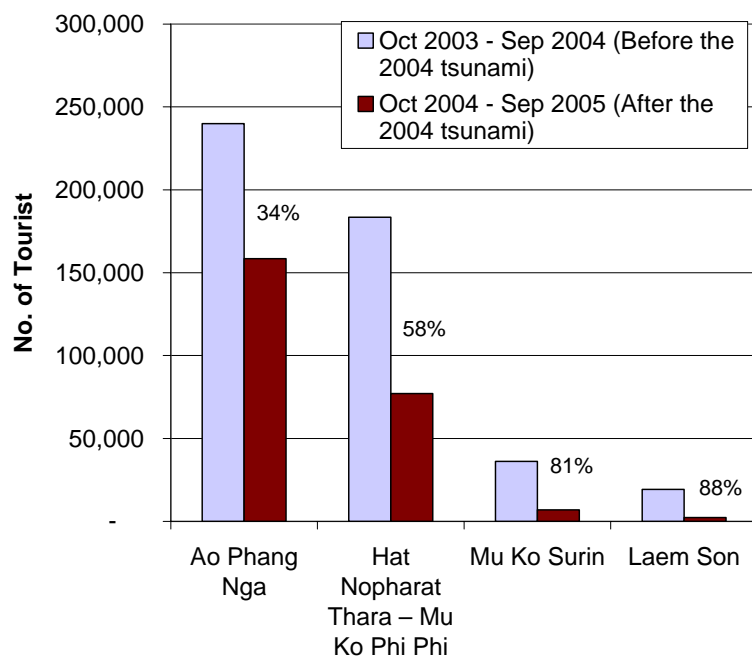


Figure 4-10. Percent reduction of tourist number during the year before and after the 2004 tsunami (Source: NPWPCD 2005b).

4.9.2 Tsunami Impacts and Tourism Recovery in Ao Phang Nga MNP

Tsunami impacts on each of the four MNP study sites are discussed in this and the following three sections. Following a brief introduction to each park, tsunami impacts affecting tourism are discussed using the four impact categories used elsewhere in this report: natural environment and ecosystems, the built environment, the business community, and the social, health and safety environment.

Overview of Ao Phang Nga MNP

Ao Phang Nga MNP lies in the heart of Phang Nga Bay in Phang Nga province. The park shares its marine borders with Phuket province to the southwest and Krabi province to the east. This park covers an area of 400 km² (about 154 square miles) and contains the largest area of old-growth mangrove forest in Thailand. Over 80 percent of the park area is in the Andaman Sea (Figure 4-11 and Figure 4-12).

Ao Phang Nga MNP, discussed in more depth in Section 2.1.2, consists of more than 40 limestone islands. Some of these islands rise 300 meters or more out of the milky brown water of the bay (NPWPCD 2005a). In geological terms, this park is a drowned karstland, with landscapes characterized by sinks, solution valleys, and other features produced by groundwater activity; it commonly develops in limestone (Hamblin and Christiansen 2003).

In addition to these unique geological features, a number of archeological sites are found in this park. Gastropod fossil remains and evidence of prehistoric human inhabitants are found in caves on some of the islands in the park, and include rock paintings and spearheads. Given its tropical location and marine climate, freshwater and marine ecosystems are found side by side in this park, such as moist evergreen forest and mangrove forest. In addition, coral reefs, karst, and sand and mud beaches are among park ecosystems. These habitats support a great abundance of marine life, birds, and other wildlife.

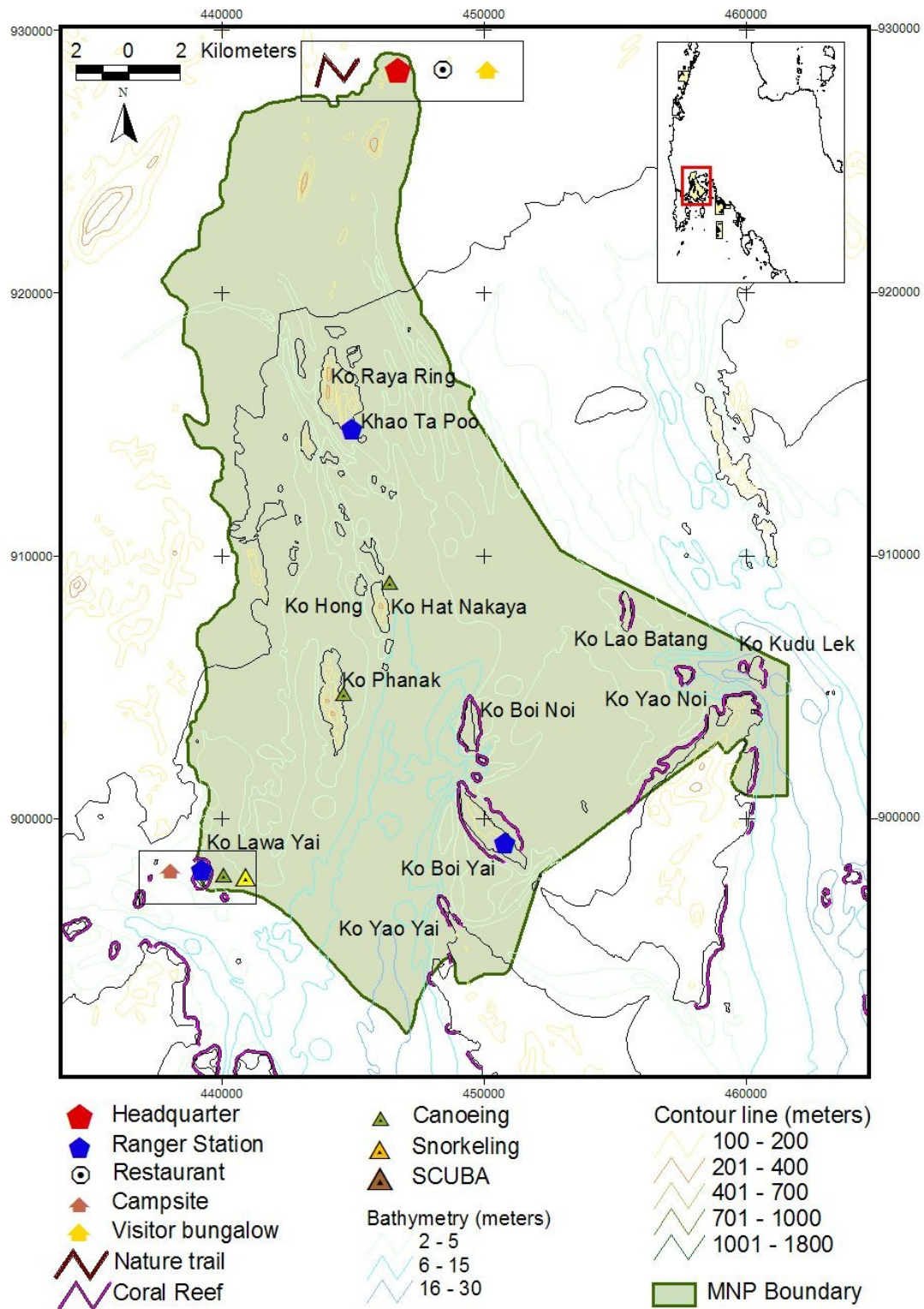


Figure 4-11. Geography, facilities and tourist attractions of Ao Phang Nga MNP.

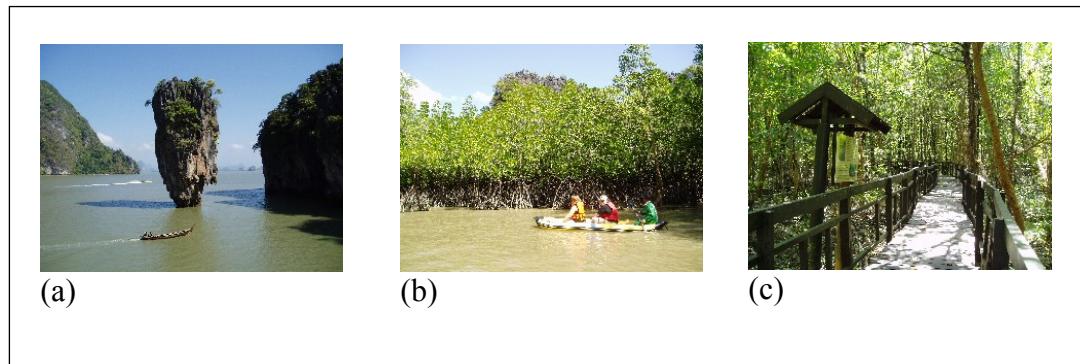


Figure 4-12. Attractions and tourist activities in Ao Phang Nga MNP (a) Khao Ta Poo (James Bond island) (b) Canoeing and kayaking in the dense mangrove forest (c) Nature trail in a mangrove forest near the park headquarters (Somrudee Meprasert photos).

Ao Phang Nga MNP provides a wide range of recreational and educational opportunities. Tourist attractions and activities include historical and cultural sight-seeing, geological touring, canoeing, and kayaking within the inner bay and mangrove forests. Beach camping, diving, and snorkeling can be done near the south border at Lawa Yai Island. This park is accessible year round and frequented even in the monsoon season. Visitors can take a boat from Phuket or one of the piers in Phang Nga Bay. Bungalows and campsites are provided near the park headquarters. Some of the park attractions and tourist activities are illustrated in Figure 4-12.

Ao Phang Nga MNP and the 2004 Tsunami

Its location east of Phuket Island protected Ao Phang Nga MNP from sustaining direct impacts from the tsunami. Phuket and other surrounding islands absorbed the brunt of wave forces from the tsunami. At Ao Phang Nga, there was no huge vertical wall of turbulent fronts; instead, the water level raised up and down like quick tides several times when the tsunami approached the park mainland (Witaya Srinil, manager of Ao Phang Nga Park restaurant, February 3, 2006, personal communication). Although there was no direct wave damage within its boundary, the park was indirectly affected by the severe damage that occurred in adjacent areas

around the park boundary. Based on available literature and the author's field observations, tsunami impacts on the natural environment, the built environment, business, and the social, health and safety environment are discussed below.

a) Impact on natural resources and ecosystems

Because Ao Phang Nga MNP was not struck by the tsunami directly, damage to its unique natural resources and ecosystems were minimal. The few, small coral reefs adjacent to islands within the park were assumed to be undamaged and were not even included in the rapid assessment survey cited earlier (DMCR 2005). The dense mangrove forest and livelihood of people resided near/within the park boundary were mostly intact. Nevertheless, the huge amount debris generated from damage along the shorelines of Phuket, Krabi, and Phang Nga ended up in waters and along shorelines of Ao Phang Nga MNP, presenting continuing cleanup challenges.

b) Impact on the built environment

The National Park, Wildlife and Plant Conservation Department reported no damage to the built environment at Ao Phang Nga MNP (NPWPCD 2005d). Ranger stations located on the three small islands and the park headquarters located on the mainland were unaffected, as were tourist accommodations, camping areas, and interpretive trails and signage. All interruptions to tourism within the park can thus be attributed to indirect impacts of the tsunami, mainly direct and indirect impacts to surrounding areas and the general distress the event caused.

c) Impact on the business community-environment

Ao Phang Nga MNP is located in Phang Nga province where the cost of damage to "tools of the trade" was the highest among all six affected provinces—more than \$178 million (Table 4-14). The majority of the cost was borne on the west coast of the province, particularly the Khao Lak area where luxury hotels and resorts were located; many of these were heavily damaged or completely destroyed. Because the

park draws visitors from these highly damaged areas, park visitation and local tour operator businesses suffered despite no direct damage to the park itself.

d) Impact on social, health and safety

The degree of impact on the social, health and safety environments was high in Phang Nga province. According to a report from Tsunami Relief Center (2005), among all six affected provinces, Phang Nga had the highest number of local people killed and otherwise affected by the tsunami (Table 4-15). The large majority of casualties reported in this province were from the amphoes (counties) along the provincial west coast facing the Andaman Sea.

Ao Phang Nga MNP and the tsunami recovery

Because Ao Phang Nga MNP was not directly affected by the tsunami, it received little attention from general public or park authority on tsunami recovery action. However, at a meeting organized by the National Park, Wildlife and Plant Conservation Department in February 2005 (NPWPCD 2005d), the park authority put forth a plan to use the disaster to improve Ao Phang Nga MNP management. The approach they initiated was to reorganize using multiple-use zoning within park areas. Improvement of the park headquarter area and the rezoning of marine areas were initial goals. Since Ao Phang Nga MNP is surrounded by indigenous fishing communities, re-designing the park and nearby excluded area to accommodate conservation, tourism, and fishing purposes is very sensitive matter. A good deal of opposition has emerged and the success of this process will require compromise and time.

Although no one was lost within the park boundaries, park facilities were unaffected and ready to accommodate tourists. Tourism in 2005 suffered from a negative “halo effect” from damage to the surrounding areas. The number of park visitors decreased by 34 percent between the fiscal year before and after the 2004 tsunami (Figure 4-11). This reduction at Ao Phang Nga MNP, while small compared

to the other parks, was still enough to cause revenue shortages and management problems. However, this was considerably less loss of visitors than in the other parks. Mu Ko Surin MNP, for example, lost 81 percent of its visitors compared to the previous year (Figure 4-10). Incidentally, Mu Ko Surin MNP is also located in hard-hit Phang Nga province.

4.9.3 Tsunami Impacts and Tourism Recovery in Hat Nopharat Thara - Mu Ko Phi Phi MNP

Overview of Ao Phang Nga MNP

Hat Nopharat Thara - Mu Ko Phi Phi MNP is located in Krabi province southeast of Phang Nga province (Figure 4-13). The park covers 388 km² (about 150 square miles) and its marine area covers 84 percent (326 km²) of the whole park area. The park name derives from the two main areas of the park: the mainland and its adjacent waters (Hat Nopharat Thara) and the islands (Mu Ko Phi Phi) located 42 km offshore and south of the mainland. This group of islands gets its name from a native tree “Pi Pi” which is found in abundance there.

The mainland part of the park is comprised of high mountains arranged in the northwest-southeast direction. Most are limestone outcrops with steep cliffs and numerous caves. There are three types of forests found within the park: primary rainforest (found on the high mountains), mangrove forest (found on the lowland near park headquarters), and peat forest (very small strip found near the mainland beach). These diverse forest habitats have an abundance of wildlife including seabirds.

A group of limestone islands dominate this park’s marine landscape. Primary rainforest, sandy beaches, rocky shorelines, steep cliffs and coral reef ecosystems all can be found on these islands. Visitors can access this park on the mainland from

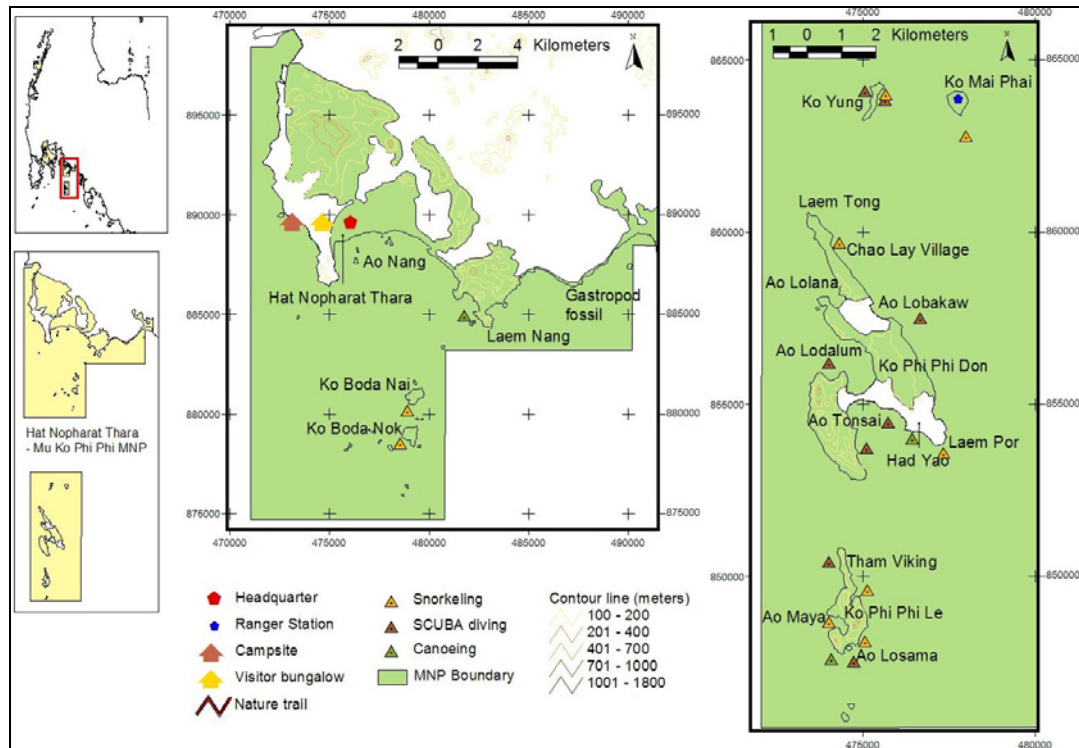


Figure 4-13. Geography, facilities and tourist attractions of Hat Nopharat Thara - Mu Ko Phi Phi MNP.

Krabi province and by boat from Phuket province. Due to the unpredictable storms and strong ocean currents in the monsoon season, most tourism in this park occurs from December to May, and in fact, a large number of visitors were at the park when the tsunami struck on December 26, 2004.

Popular tourist attractions in the park include the coral reefs and beaches of Phi Phi Don and Phi Phi Lay islands—the main attractions for both domestic and international tourists—and the wide sandy mainland beach at Hat Nopharat Thara and the unique natural wonder of gastropod fossils in the Ban Laempho area (Figure 4-13 and Figure 4-14). Snorkeling, SCUBA diving, hiking, rock climbing, canoeing, and geological touring are among the most popular recreational activities in Hat Nopharat Thara - Mu Ko Phi Phi MNP (Figure 4-14). Campsites and bungalows are available as well for overnight stays.

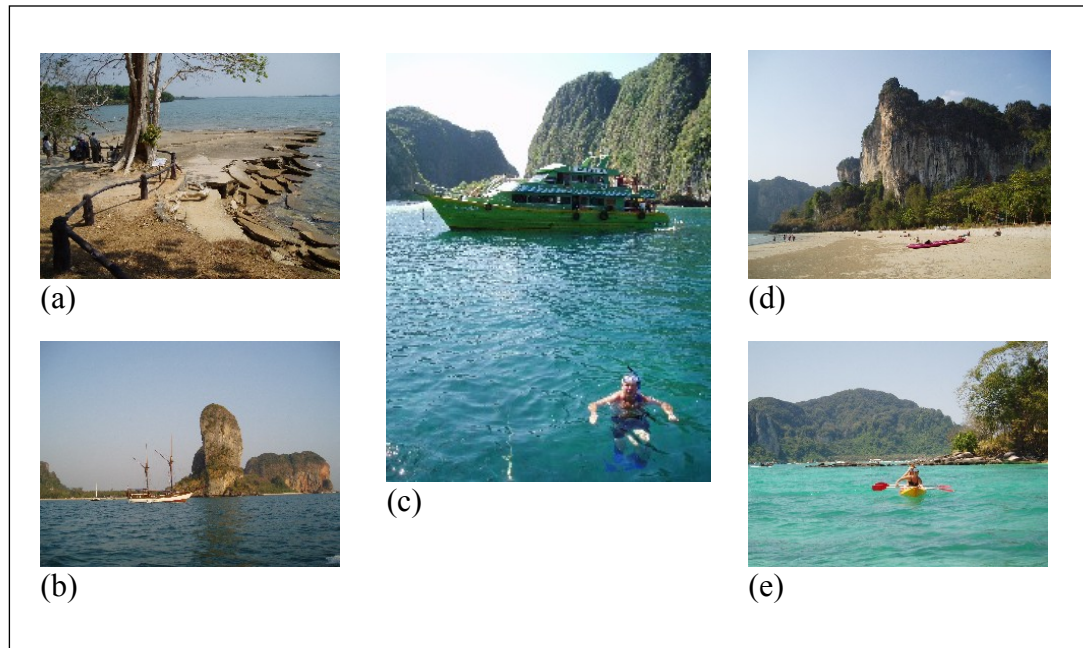


Figure 4-14. Attractions and tourist activities in Hat Nopharat Thara - Mu Ko Phi Phi MNP (a) Gastropod fossil beds on the park mainland (b) Limestone outcrops in Laem Nang area (c) Snorkeling and swimming with fish at Maya Bay, Phi Phi Le Island (d) Beach activities and rock climbing in Ao Nang area (e) Canoeing at Had Yao, Phi Phi Don Island (Somrudee Meprasert photos).

Hat Nopharat Thara - Mu Ko Phi Phi MNP and the 2004 Tsunami

Hat Nopharat Thara - Mu Ko Phi Phi MNP received a moderate degree of damage overall. The majority of damage in park occurred on Phi Phi Don Island where tourists crowd into excluded private areas within and adjacent to the park. Run-up heights were measured at three areas on the island and ranged from 4.6 to 5.4 meters (Figure 4-15). Ao Lolana, located on the north side of the island facing the sea to the northwest, had a 5.3 meter tsunami run-up height, Ao Lodalum 4.6 meters, and Ao Ton Sai, facing the Andaman Sea to the southeast, had the highest run-up height at 5.4 meters. Most of the bays on Phi Phi Don Island had considerably high run-up heights due to the funneling effect of the tsunami wave fronts (MNRE 2005). Run-up height on the park mainland was also high in certain areas, measured at 4.3 meters near south-facing Ao Nang. As a consequence, tsunami impacts were significant.

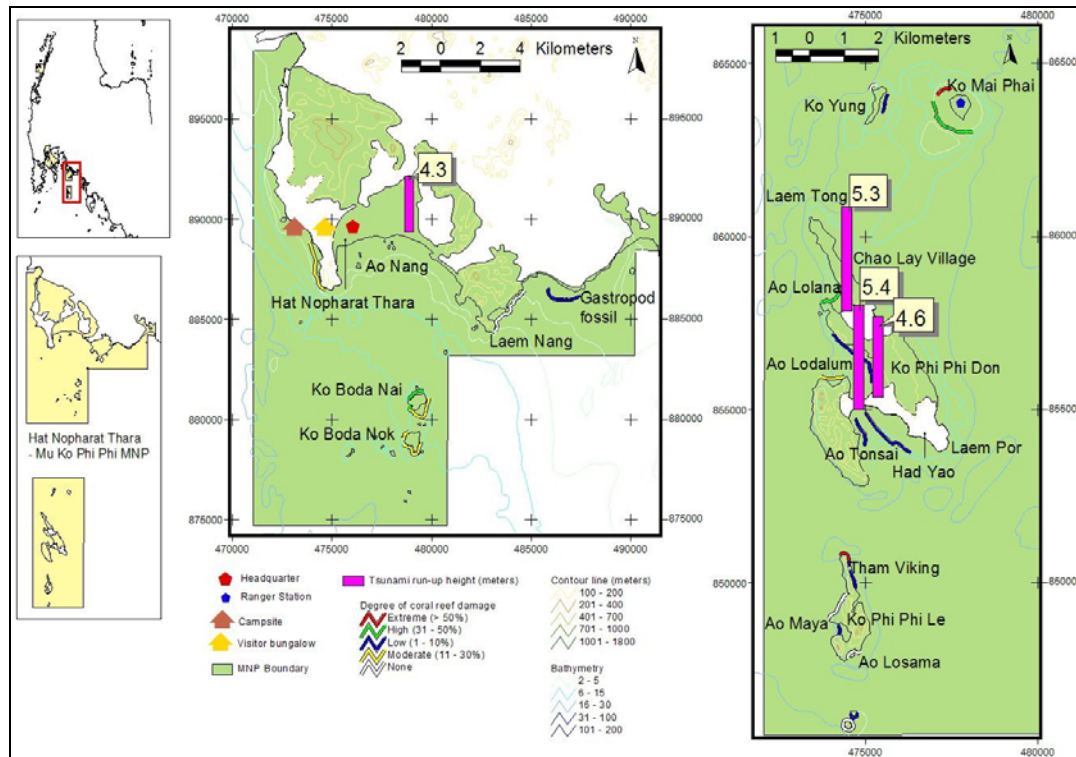


Figure 4-15. Hat Nopharat Thara - Mu Ko Phi Phi MNP and the tsunami damages (DMCR (2005) for coral reef damage data and MNRE (2005) for run-up height data).

a) Impact on the natural environment and ecosystems

Despite significant wave heights, direct impacts to natural resources and ecosystems in Hat Nopharat Thara - Mu Ko Phi Phi MNP were judged to be low, based on the main indicator, coral reef damage. Coral reefs at 19 diving stations were examined and were rated on average to have only 1 – 10% damage. Only a few coral reefs near the north tips of Mai Phai and Phi Phi Le islands were affected to the extreme, i.e., >50 percent damage (DMCR 2005) (Figure 4-15).

Although the direct impact on the natural environment was low, the natural resources and ecosystems in park suffered extensive indirect damage from destruction of much of the built environment—resorts, luxury hotels, and tourism facilities located adjacent to the park. The huge amount of debris created was swept into coastal waters and scattered along beaches everywhere along beaches and beach

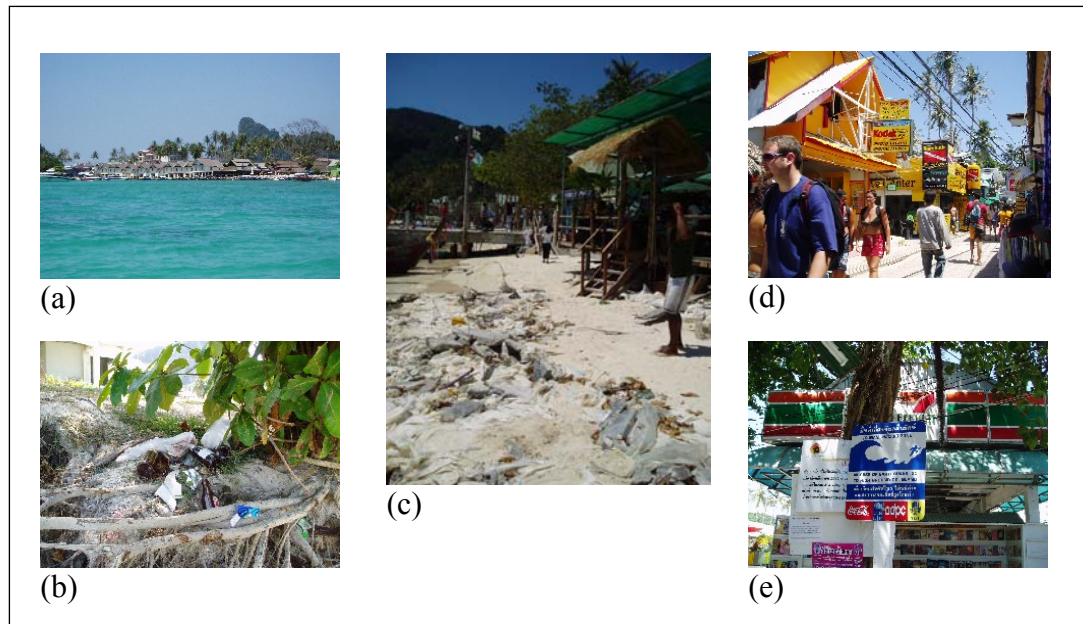


Figure 4-16. This tsunami affected area is located adjacent to Hat Nopharat Thara - Mu Ko Phi Phi MNP boundary on Phi Phi Don Island. (a) Damaged tourist bungalows in the Ao Tonsai area (b) Broken glass and sharp debris on Ao Lodalum beach (c) Sharp-rusty steel and construction materials potentially harm tourists near the pier in Ao Tonsai area (d) Quickly recovered services and shops in Ao Tonsai area (e) Tsunami evacuation sign in Ao Tonsai area (Somrudee Meprasert photos).

forest areas. The bulky and abrasive debris mechanically harmed the fragile staghorn coral (*Acropora sp.*) as well as boulder brain coral (*Colpophyllia natans*). While much of this damage likely occurred as debris-laden tsunami wave fronts ebbed and flowed during and shortly after the event, it continued well after the event.

b) Impact on the built environment

The built environment in this park was rated as highly affected. On the mainland in the Hat Nopharat Thara area, the park headquarters and visitor bungalows were significantly damaged. On Phi Phi islands' upland areas that were excluded from the park or located adjacent to it, dense development too close to the shoreline was severely damaged.

The excluded area on Phi Phi Don Island is a prime example. The excluded area here at one time belonged to local people and was used mainly for coconut plantations, but later sold and intensively developed for tourism. The wide range of tourism facilities built to support the increasing numbers of tourists included a deepwater pier at Ao Ton Sai, small guest houses, convenience stores, and luxury hotels.

This intensively-developed excluded area on the island not only caused problems in controlling park carrying capacity in recent decades, but also generated huge amounts of debris after the tsunami struck. Everything from mattresses, toxic electronic materials, abrasive tin roofs, and broken wood debris from piers, boats and buildings damaged coral reefs beyond that of the forceful tsunami waves alone. This direct tsunami impact on the built environment also led to significant indirect effects on social, health and safety environments, and on the business community, both in a physical and psychological sense.

c) Impact on the business community-environment

Hat Nopharat Thara - Mu Ko Phi Phi MNP is located in Krabi province which sustained a moderate degree of damage to the business community and environment, based on our indicator: cost of damage to “tools of the trade” (Table 4-14). Most of the nearly US\$ 72 million in damage came from the businesses that located near the park on Phi Phi Don Island and thus were mostly tourism-related.

The business community was also indirectly affected by direct losses to the natural, built, and social environments. For example, customer records and other confidential business information was lost when the tour operator office buildings were swept into the sea. Businesses’ reputations for customer safety were degraded because of many tourists died while staying in local accommodations or using resort services, such as diving instruction. Business revenues were also reduced because target customers changed their vacation destinations after seeing first-hand in the media and on the internet how devastated the landscape and facilities were. Local

tour operators, however, recovered a significant degree of their business, as explained below.

d) Impact on social, health and safety

According to provincial data, a total of 1,363 people lost their lives in Krabi province. Just 357 deaths were local people, with the large majority of casualties international tourists who were visiting the Phi Phi islands (UNEP 2005a). The number of otherwise affected residents was considerably higher in this province—15,812 people (Table 4-15).

Although much of the social, health and safety impacts in the region occurred outside of the park boundaries, mainly in excluded areas, the news media significantly overstated how this affected the park itself, initially leading to expectations that park tourism recovery would take a very long time. Park tourism, however, did not decline as much as might be expected. Even though more than a thousand people lost their lives within or near the park, and the park's built environment suffered extensive damage, the park actually had more than 77,000 visitors in fiscal year 2005, a 58% reduction from the previous year (Figure 4-10). Although some of these may have been in the month prior to the December 26, 2004 tsunami, field observations in spring 2005 showed that some of the park's main attractions on Phi Phi Islands remained easily accessed. Day trips could be organized from the park mainland in Krabi province and from a large, undamaged passenger pier on Phuket Island. Due to high competition, the tour operators and boat owners in these two locations recovered quickly enough to engage their staff and their customers.

The park closure announced by the marine park authority also did not affect the park visitation very much because tourists could still visit the area, stay at the few resorts near the park that had little damage, or just visit the park for the day and return to their hotels on the mainland in the evening. The tsunami and its aftermath demonstrated how difficult it was for park authorities to establish and enforce

visitation limits associated with the park's carrying capacity. The opportunity for Hat Nopharat Thara - Mu Ko Phi Phi MNP authorities to do that through a park closure did not really work.

Hat Nopharat Thara - Mu Ko Phi Phi MNP and the tsunami recovery

Hat Nopharat Thara - Mu Ko Phi Phi MNP is a famous international and domestic tourism destination that generates large revenues annually. Hence, a number of relief and recovery actions conducted by several agencies were concentrated in this MNP and its nearby areas.

a) Recovery action on the natural environment and ecosystem impacts

Among the four study sites, this MNP received the highest degree of recovery assistance from concerned divers and the general public. Government agencies, researchers, NGOs, international foundations, and volunteer divers worked together extensively to clean up a huge amount of debris from beaches and the seafloor. Among several recovery projects, the 'Phi Phi tsunami dive camp' was a successful example. Funded by private donations, the project was enlisted more than 4,000 volunteers and 25 local Thai employees. Approximately 280 tons of debris were removed from the water. This project is ongoing, with monthly dive clean ups scheduled (Phongsuwan et al. 2006). In addition, several monitoring efforts on coral reef recovery are being conducted by marine scientists with collaboration from business operators and volunteer divers.

b) Recovery action on the built environment impacts

Buildings and infrastructure in the excluded area near this MNP was rebuilt very quickly and in the very same tsunami-affected sites, despite the risk of future tsunamis and on-going rearrangement of land ownership and regulation. The rebuilding included guesthouses, souvenir shops, and other tourism services. In the MNP, on the other hand, the reconstruction process has been slow. The park

authority and several academic institutions have worked together to design and to rebuild the park headquarter and other facilities. The design of this project was carefully considered, using criteria like hazard safety and harmony with the natural environment of the park. At the time of this research, park reconstruction projects are continuing.

c) Recovery action on the business-community and environment impacts

Impacts of actual recovery actions on the business community in this MNP are not clear. However, the extensive clean-up efforts and studies conducted by several agencies in this MNP have created many jobs for small-scale businesses and the unemployed. Recovery teams hired charter diving boats to bring them to the diving sites. The small long-tail boats that belong to the artisanal fishermen can sail into shallow water, so they too were hired as taxi boats to deliver additional supplies or equipment and carry communications.

d) Recovery action on the social, health and safety impacts

Relief and recovery services within and nearby this MNP were mainly for three categories of victims: tourists, business operators, and artisanal fishermen who sometimes serve as taxi boat for tourists. Among the three groups, tourists were the first group that received relief services, with the injured moved to the mainland for medical and other treatment. Business operators and staff who emigrated from the islands were quickly united with their relatives on the mainland. This left surviving indigenous people and artisanal fishermen to face the devastation.

Due to its island setting, the relief efforts were slow and poorly allocated. Affected individuals had to leave the islands to receive help and donations on the mainland. They were reluctant to leave their places due to the concern over the new land ownership regulations and agency staff trying to eliminate illegal coastal property development. Some of these fishermen lost everything and did not legally

own land they had occupied. Often, they turned to donated boats as shelter, simultaneously using them to ply their trade.

4.9.4 Tsunami Impacts and Tourism Recovery in Mu Ko Surin MNP

Overview of Mu Ko Surin MNP

Mu Ko Surin is an isolated park located in the Andaman Sea. It is located 60 km (36 miles) offshore from the mainland in Phang Nga province. The park shares its north border with the country of Myanmar and its south border with Mu Ko Similan MNP. It covers the area of 135 km² (about 45 square miles) and 76 percent of the park is marine waters. The park has two main islands, Ko Surin Nuea (north island) and Ko Surin Tai (south island), and other three small islands—Ko Satok, Ko Pachumba, and Ko Torinla (Figure 4-17).

For many years before Mu Ko Surin MNP was established, this small group of islands was a refuge for fishing boats during storms. During the Vietnam War era, the park was proposed to be developed as a refugee camp. However, due to its pristine and fragile environment, the Royal Forestry Department opposed the development of the islands and established the park in 1981 to protect this pristine environment (NPWPCD 2005a).

Due to its isolated location from the mainland, limited seasonal freshwater runoff, and the existence of strong, cleansing ocean currents, the waters in the park area are crystal clear. This high visibility and low pollution of the water provides an environment for healthy coral reef ecosystems, including shallow and deep reefs. The park's isolation also results in unspoiled white sandy beaches which have minimal debris from the mainland.

Mu Ko Surin MNP islands also have diverse forest ecosystems. A tropical evergreen forest can be found at high altitudes on the two main islands while beach forest dominates lowland areas. Moreover, due to the high precipitation during monsoon season and the presence of the evergreen forest, small coastal streams are

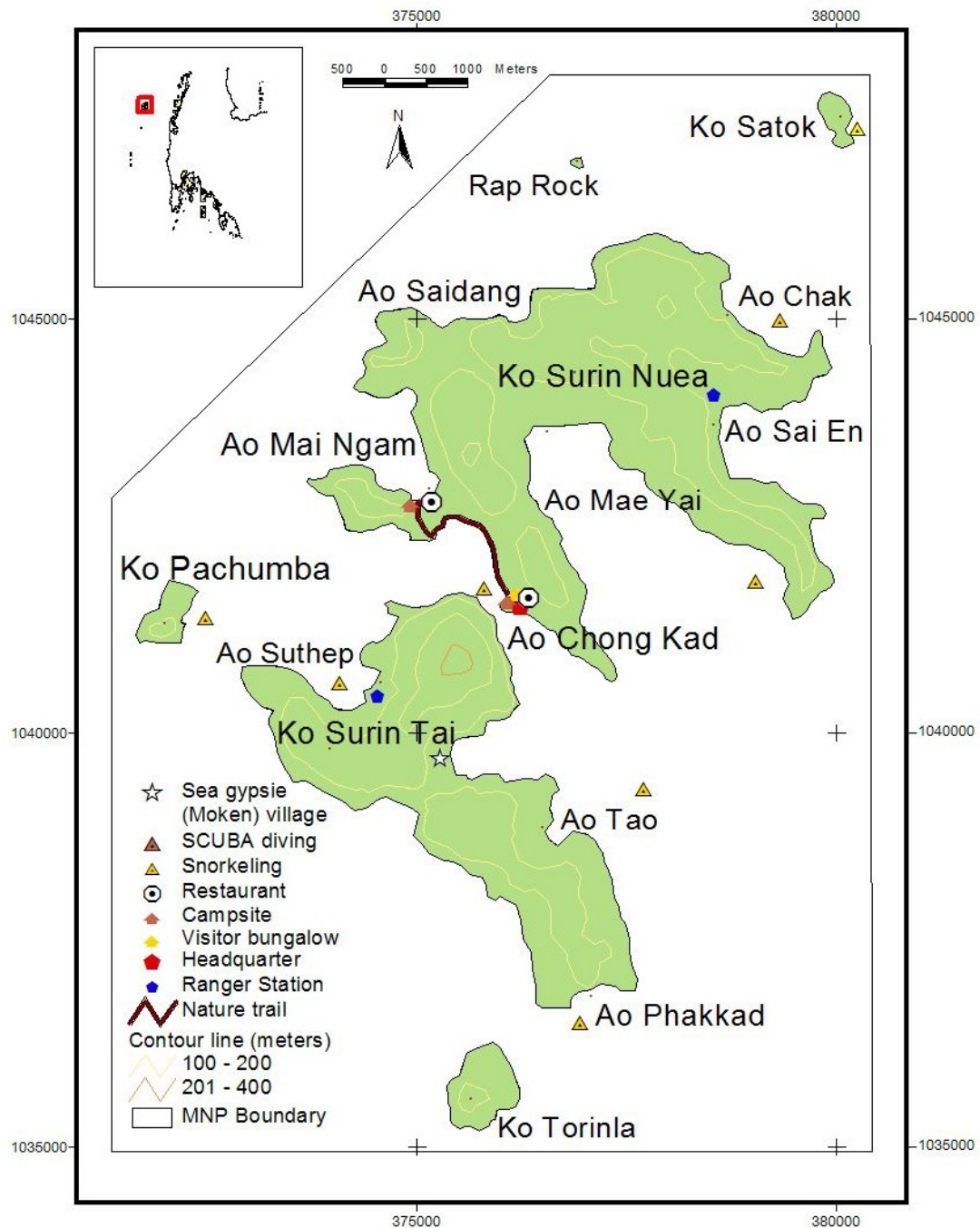


Figure 4-17. Geography, facilities and tourist attractions of Mu Ko Surin MNP.

found with small patches of mangrove forest near the brackish mouths of the streams.

The healthy unspoiled natural environment of Mu Ko Surin provides food and essential habitats for more than 80 species of wildlife (NPWPCD 2005a), including some seabirds and sea turtles rarely found on the mainland. In addition, Mu Ko Surin is the only MNP in the country that hosts small communities of nomadic sea gypsies (Moken tribe) within park boundaries. Sea gypsies travel seasonally around the Indian Ocean between India and Indonesia in small boats. They have their own spoken language understandable among all sea gypsy groups and they live their lives simply with a great respect for the environment.

These unique natural and human resources attract visitors and scientists to the park to research and learn about the island forest ecosystems, its coral reefs, and its marine-nomadic population (Figure 4-18). The park draws more than 20,000 tourists each year. Unspoiled sandy beaches, old growth rainforests, very clear seawater, and healthy coral ecosystems are the main tourist attractions. Moreover, due to its clear coastal waters, Mu Ko Surin MNP is the best park in the country for observing coral reefs and associated communities without the use of SCUBA gear. A basic snorkel, mask, and fins are sufficient. Besides snorkeling and SCUBA diving, activities for park visitors include camping, hiking, swimming, bird watching, nature trail exploration, and the opportunity to explore a unique cultural site and interact with sea gypsies.

Due to the monsoon season and its great distance from the nearest pier in Phang Nga province, the park is normally open only 6 months a year, from December to May. Daily service boats can be hired from Kuraburi in Phang Nga province. Besides the boat ticket, a visitor must buy a park entrance ticket at the mainland office before boarding. Small cabins and campsites are provided at the park and must be reserved in advance. Figure 4-18 illustrates some of the park attractions.

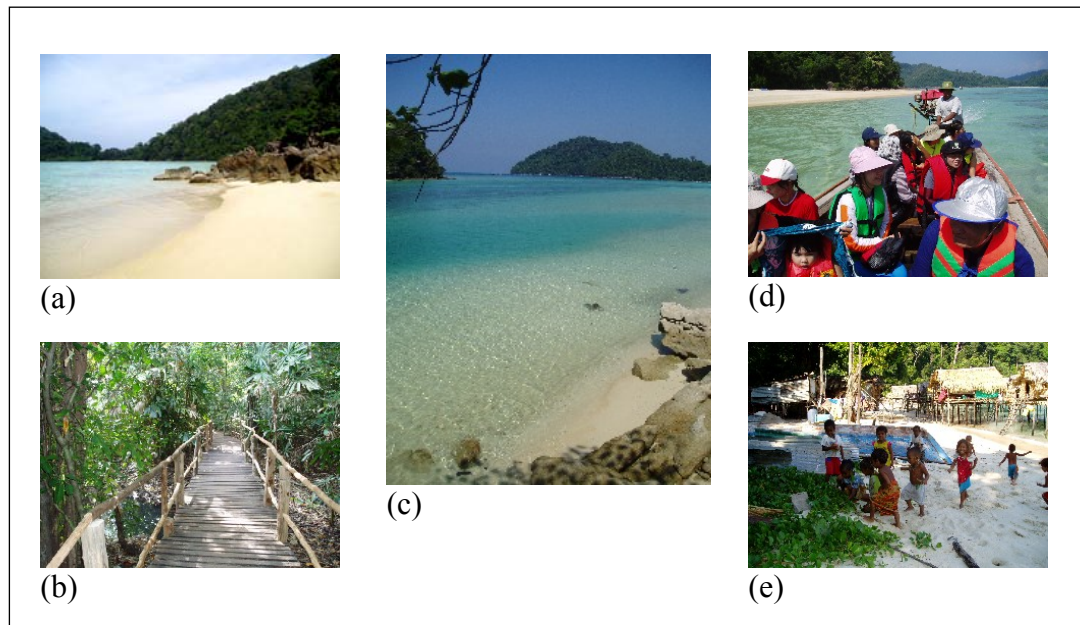


Figure 4-18. Attractions and tourist activities in Mu Ko Surin MNP (a) Pristine sandy beach on Surin Nuea Island; (b) Nature trail in the tropical evergreen forest on Surin Nuea Island; (c) Crystal clear water at Ao Chong Kad located between Surin Muea and Surin Tai islands; (d) Long-tail boat brings visitors to snorkeling sites around the islands arranged daily by the park staff; (e) Sea gypsy village (Moken tribe) on Surin Tai Island (Somrudee Meprasert photos).

Mu Ko Surin MNP and the 2004 Tsunami

Overall, Mu Ko Surin MNP received a high degree of damage. The majority of damage in the park occurred on Surin Nuea Island where the park headquarters and most of the tourism facilities were located. Unfortunately, there were no official data on the run-up heights measured in this park. However, based on interviews with eyewitnesses who were at the park during the tsunami, the author estimated that run-up heights in exposed areas of the park ranged from 1 to 7 meters (Figure 4-19).

Ao Mai Ngam, located on the west side of Surin Nuea Island, had a run-up height approximately between 1 and 2 meters. Eyewitnesses asserted that there was no high turbulent wave front; instead, seawater overflowed the land like a fast, very high tide. The tsunami overflow passed the park's campsite area and traveled through the lowland forest along the nature trail for about 100 meters. Ao Chong

Kad, on the other hand, had a very high tsunami run-up height, approximately 5 to 7 meters. Again, eyewitnesses interviewed noted a high turbulent wave front rapidly approaching the area from two sides, one from the northwest and another from the southeast (see Figure 4-20). The impacts of this tsunami inundation at Mu Ko Surin MNP are discussed below.

a) Impact on the natural environment and ecosystems

The tsunami impact on the natural environment and ecosystems in Mu Ko Surin MNP was estimated to be moderate, with its coral reefs sustaining on average 11-30 percent damage at the 19 survey stations there (DMCR 2005). Coral reefs in the park were also re-examined by the NGO, Coral Cay Conservation, supported by British Embassy, National University of Singapore, and United National Environment Program. The results of this in-depth study agreed with that of DMCR (2005), concluding that tsunami damage to coral reefs, specifically live hard corals, was relatively low and isolated. Overall, mean damage was 18.2% (Coral Cay Conservation 2005). However, the in-depth study also reported that coral reefs in some areas, such as in Ao Mae Yai (see Figure 4-19), had high coral damage that mostly occurred prior to the tsunami. This was seen as evidence of blast fishing that occurred in the park's past. Coral Cay Conservation also concluded that the good water quality and low resource exploitation in this relatively healthy coral reef ecosystem was allowing it to regenerate and recover rapidly.

Regarding other types of ecosystems, the tsunami sand deposit suddenly changed the coastal bathymetry in the Ao Chong Kad area (Figure 4-19), making docking difficult. In other areas, fine white sand on beaches and in shallow waters was replaced by coarse brown sand, severely smothering coral in some shallow reef areas. The seawater overflow and intrusion into shallow soils also caused the death of many rare species of tropical plants and trees along the park's nature trail (Figure 4-20).

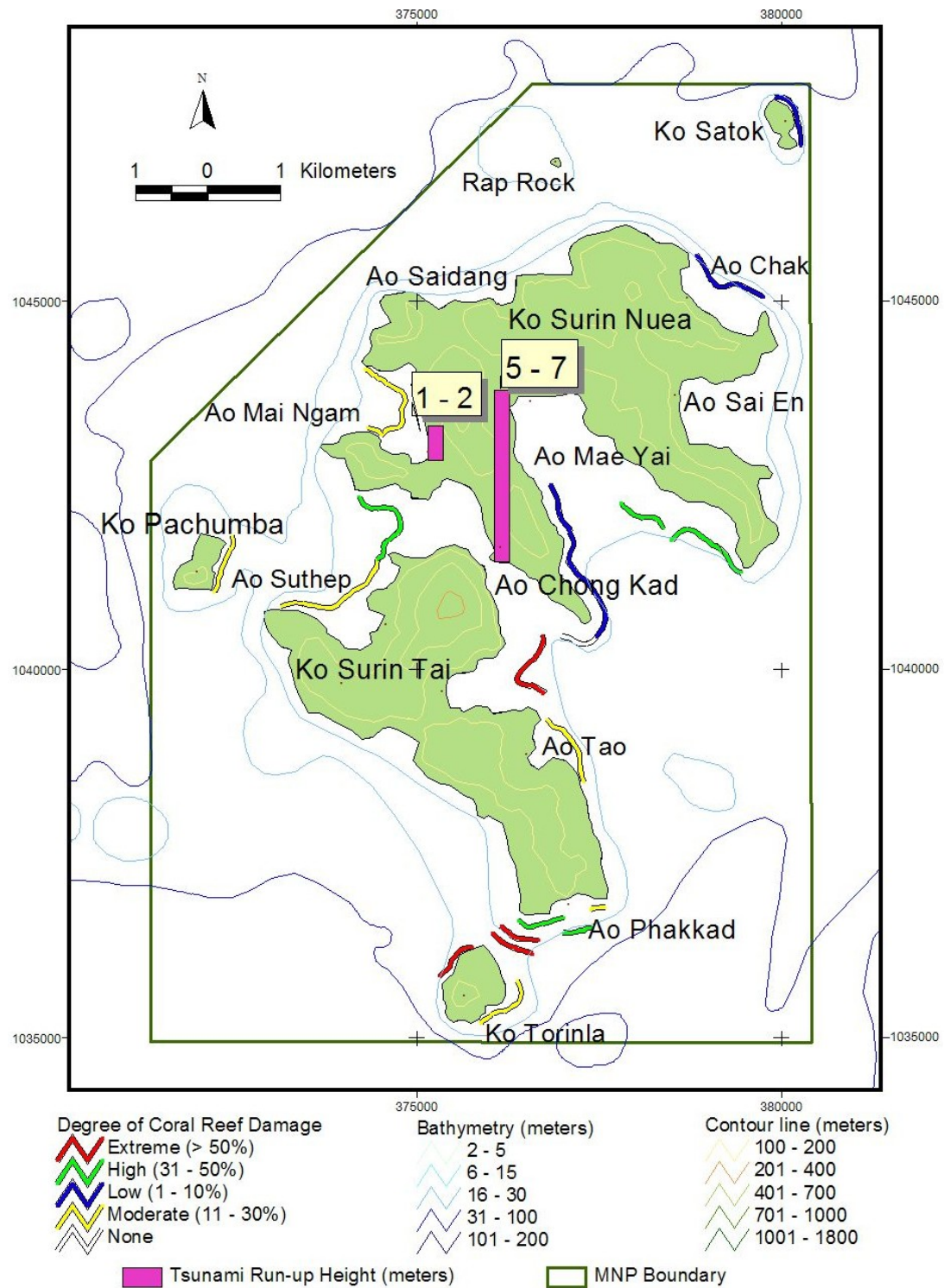


Figure 4-19. Mu Ko Surin MNP and the tsunami damage (Run-up height data are based on the information from eyewitnesses).

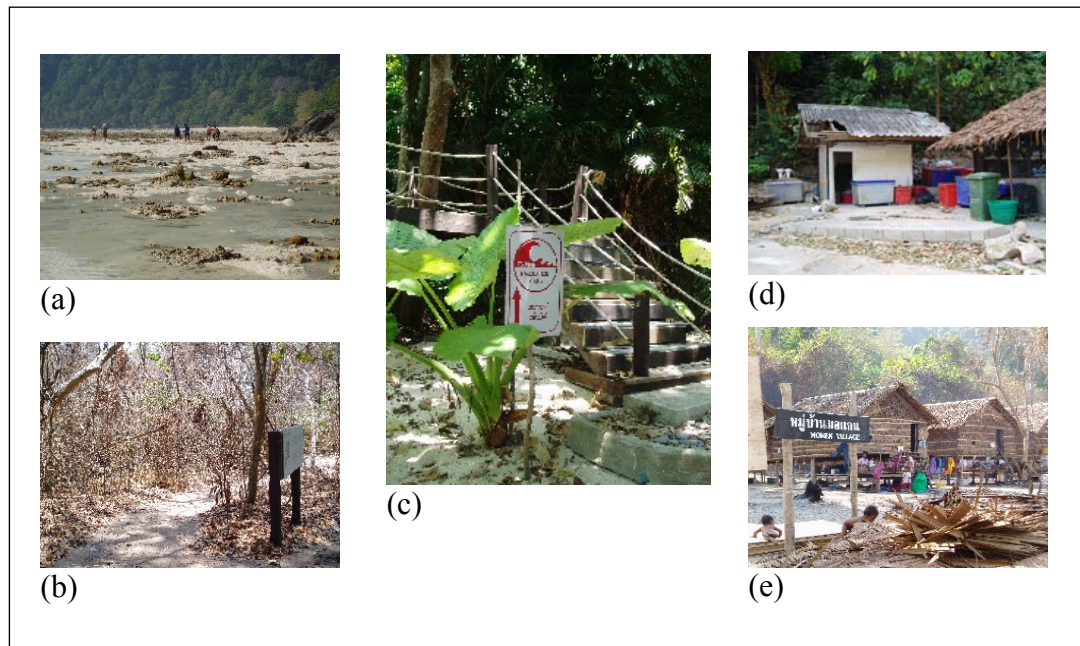


Figure 4-20. Mu Ko Surin MNP--- after the tsunami (a) Coral reefs in the shallow water near Ao Chong Kad on Surin Nuea island were smothered by the tsunami sand deposit; (b) Trees along the nature trail died due to the seawater inundation; (c) Tsunami evacuation signs were installed around the park area; (d) Damaged park facilities and restaurant; (e) Newly constructed houses in the sea gypsy village on Surin Tai Island (Somrudee Meprasert photos).

b) Impact on the built environment

This park sustained a high degree of damage to its built environment. Most of the damage occurred to the park facilities, including the park's headquarters, restaurant, offices, staff dormitory, and campsites. Although the National Park, Wildlife and Plant Conservation Department (NPWPCD 2005d) classified impact on the built environment in Mu Ko Surin MNP as highly affected, damage was considerably lower than that experienced at Hat Nophrat Thara - Mu Ko Phi Phi and Laem Son MNPs. Again, this can be attributed to its isolation from the more developed mainland and the fact that no permanent habitation exists nearby. The park, then, was the only debris source, making clean up go more quickly than in Hat Nophrat Thara - Mu Ko Phi Phi or Laem Son MNPs.

c) Impact on the business community

Most of the tour operators that did business related to Mu Ko Surin MNP had their offices on the mainland in Kura Buri, Phang Nga province. According to the provincial data, the cost of damage to “tools of the trade” in Phang Nga was the highest at more than US\$178 million. The large majority of casualties and built environment damage occurred approximately 90 km (55 miles) to the south of Kura Buri in the Khao Lak area. Kura Buri itself is located further inland on the coastal canal and protected by surrounding islands. As a result, infrastructure, buildings, and businesses located there were not directly damaged by the tsunami waves. However, there was significant indirect impact on the business community.

Tour operators lost their customers when the park authority temporary closed Mu Ko Surin MNP for several months (well into 2005) to assess the park damage. Since the park usually opened for only 6 months a year due to the monsoon season, the park closure left a very narrow window of opportunity for local businesses to recover 2005 revenues. In addition, the impact to social, health and safety environments also indirectly affected the business community. The psychological impact of the disaster, both among tour operators and employees, and especially prospective tourists, caused great concern and fear about tourism safety in significantly affected this isolated park. As a consequence, some tour operations closed altogether or shifted tourists to other attractions outside the affected area.

d) Impact on the social, health and safety environment

Mu Ko Surin MNP is located in Phang Nga province, which was judged to have the highest degree of impact on social, health and safety environments (UNEP 2005a). Approximately 5,990 people lost their lives in Phang Nga province, including 1,238 local people (Table 4-15). The disaster also left at least 19,509 residents dislocated and affected, both physically and mentally (Tsunami Relief Center 2005). Although the majority of casualties were in the Khao Lak area, the park and its main port were negatively influenced by a “halo effect”.

While the tsunami disaster significantly affected the social, health and safety environments of local people, it also caused great concern among potential tourists, as suggested earlier. Fear of dead people floating or decaying in the water, fear of disease outbreak, and fear of future tsunamis led many to believe that tourists in general were avoiding visits to this area.

Within the park, the sea gypsies who resided seasonally on Surin Tai Island gained international attention for how they escaped the tsunami. Their passed-on knowledge about the relationship between earthquake ground-shaking and waves caused them to move quickly to high ground, avoiding casualties. This became a good lesson for the general public. Moreover, the widespread reporting of the story of this tribe of marine nomads led many people to donate basic recovery goods, including modern clothing, house materials, medicine, and so on. Unfortunately, this seems to have the effect of changing their simple lifestyle and their raising material expectations (see Figure 4-20).

Mu Ko Surin MNP and the tsunami recovery

The unique characteristics of MU Ko Surin MNP, particularly its remoteness, made the tsunami recovery in this MNP different from other affected MNPs. Some of the key aspects of recovery are outlined below.

a) Recovery action on the natural environment and ecosystem impacts

In certain other MNPs affected by the tsunami, projects were undertaken to repair broken coral and sea fans, for example at Mu Ko Similan and Hat Noppharat Thara - Mu Ko Phi Phi MNPs. In Mu Ko Surin MNP, although the tsunami wave caused a moderate degree of coral reef damage, the park managers treated the damage as part of natural processes. Except for general clean-up, damage to natural ecosystems was left untouched, effectively making this MNP a control site for natural recovery processes. A thorough damage assessment survey was done by Coral Cay Conservation and other academic institutions in the two months after the tsunami

struck (Coral Cay Conservation 2005; Worachananant 2006). A number of on-going research projects started before the tsunami provided baseline data for monitoring studies (Worachananant et al. 2004; Sudara and Yeemin 2002). Among all four study sites, this MNP has the most complete information for conducting vulnerability assessment and mitigation actions in the future.

b) Recovery action on the built environment impacts

Mu Ko Surin MNP has been slow to rebuild its buildings and infrastructure. Damaged facilities were removed and affected areas cleared and designated as open areas. There is no plan to rebuild in the same area. However, a few basic tourism facilities were repaired including restrooms, some bungalows, and a floating dock. The reconstruction of Moken sea gypsy village was done by humanitarian agencies. The new village site is located in an area that is considerably safer than the previous site.

c) Recovery action on the business-community and environment impacts

Companies that do their business related to the MNP tourism are located in amphoe (county) Kura Buri. Most of them are mid- or small-sized businesses. They had difficulty getting financial aid due to criteria and regulations that were difficult to follow. Park managers also experienced difficulty in recovering their own business, although the park did receive boats from international donors that helped with park upkeep, repair, and management. However, the 81 percent reduced visitation significantly affected the park revenue (Figure 4-10).

d) Recovery action on the social, health and safety impacts

Immediately after the disaster, tourists, most park staff, and the sea gypsies were transported to the mainland. Tourists and park staff were reunited with their families and the sea gypsies were provided temporary shelters in Phang Nga province. Even though they are sea gypsies, some of them were fearful of the sea and reluctant to go

back on the ocean. However, their village was quickly rebuilt and most moved back to Ko Surin Tai (South Island).

After the tsunami, the media and general public paid a lot of attention to the marine nomadic people and many tourists came to visit them. Donations in the form of money and boats flooded in, creating another challenge for the park managers trying to manage this population under MNP regulations.

4.9.5 Tsunami Impacts and Tourism Recovery in Laem Son MNP

Overview of Laem Son MNP

Laem Son MNP is an elongated-shaped park stretching 60 km (36 miles) along the Andaman coast in Ranong and Phang Nga provinces (Figure 4-21). While the majority of the park is in Ranong province, the southern tip of the park is in Phang Nga province. Laem Son MNP covers 315 km² (about 120 square miles) and its marine area makes up 85 percent of the park area. All of the 15 small and large islands in the park are situated nearshore, 1 to 12 km from the mainland. There is no permanent human settlement on these islands.

Seagrass bed, mangrove, beach forest, sandy and rocky shore, coral reef, and open water habitats are found in Laem Son MNP. The park received its name from the native pine tree (*Casuarina equisetifolia* or Australian pine) that dominates the area near park headquarters. The park contains an extensive area of mangrove forest which covers around 14 km² (5.5 square miles) or half of the park's coastal area (MNPD 1999). Due to high amount of freshwater runoff and sediment loading from the mainland and coastal canals, coral reefs are found only in the few areas near Ko Kam Yai Island (Figure 4-21). This is probably a reason why this park is not as popular among divers and tourists compared to nearby Mu Ko Surin MNP.

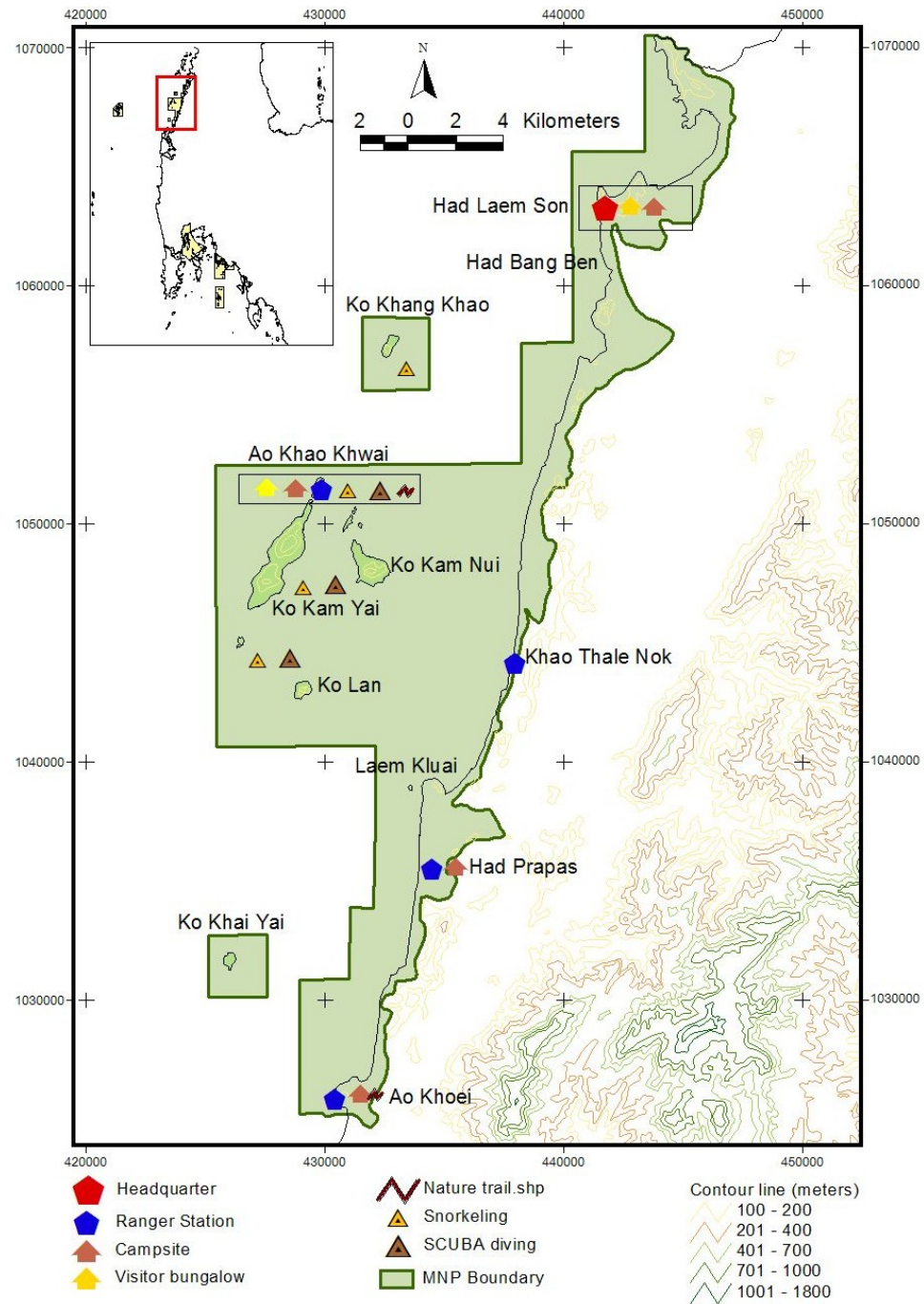


Figure 4-21. Geography, facilities and tourist attractions of Laem Son MNP.

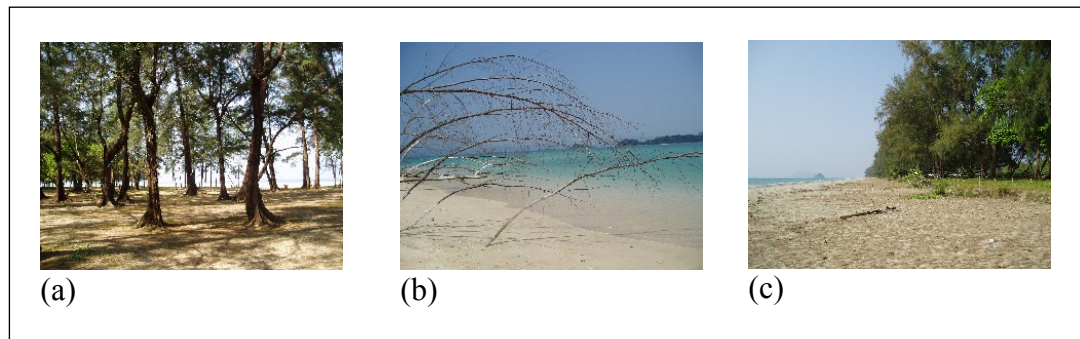


Figure 4-22. Attractions in Laem Son MNP (a) Had Laem Son near the park headquarters; (b) Ao Khao Kwai, north of Ko Kam Yai; (c) Had Prapas (Somrudee Meprasert photos).

Recreational activities in Laem Son MNP are varied, most notably including excellent wildlife watching and birding in most areas of the park. The best time of the year for bird watching is between December to February because of the dry season and bird migration. Recreational activities on the beaches including camping and picnicking can be found in many areas in the park. Snorkeling and SCUBA diving can be done in the coral reefs near Kum Yai Archipelago.

Since there is no permanent habitation on the islands and the park is not well-known among the tourists compared to other MNPs in the Andaman Sea, it still preserves the original unspoiled condition. This park is a destination for visitors looking for a quiet escape with basic accommodations. The park located off inter-province Route 4. Some of the attractions in Laem Son MNP are illustrated in Figures 4-21 and 4-22.

Laem Son MNP and the 2004 Tsunami

Laem Son MNP received a moderate degree of the overall damage. Run-up heights were measured from three areas on the park mainland ranging between 3.9 to 10.1 meters (MNRE 2005) (Figure 4-23). In Had Bang Ben and Had Laem Son areas, the run-up height was the lowest among all three areas, 3.9 meters. At the ranger station in Ban Thale Nok area, however, the run-up height was as high as 9.9 meters. The

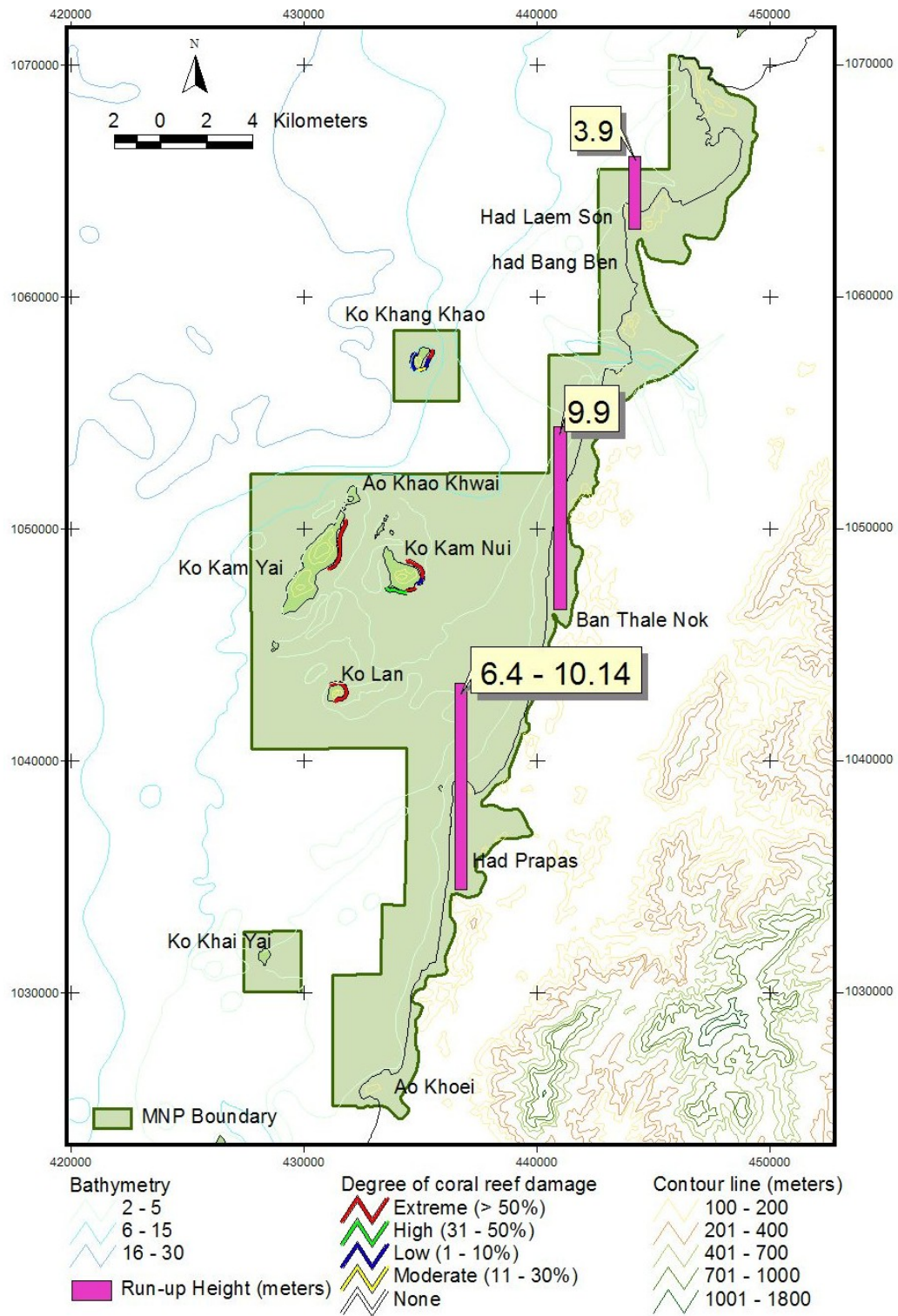


Figure 4-23. Laem Son MNP and the tsunami damages (DMCR (2005) for coral reef damage and MNRE (2005) for run-up height).

highest run-up height in the park was in Had Prapas area which ranged between 6.4 – 10.1 meters. These very high tsunami wave heights and corresponding inundation had significant impacts on the area.

a) Impact on the natural environment and ecosystems

Direct impacts to natural resources and ecosystems in Laem Son MNP were considerably high. Damage on the coral reef ecosystem was classified as highly damaged (31-50% damage) (DMCR 2005), the most of any park along the coast. Most of coral reefs located around the park's islands received high to extreme damage (>50% damage), owing directly to tsunami wave forces and entrained sand that smothered reefs.

The damage on the natural environment and ecosystems were especially high at Ao Khao Khwai (Bull-Horn Bay) in Kam Yai islands (Figure 4-24). Here, the tsunami breached the ancient sand dune that linked the two tiny islands; taking with it the beach forest and scattering huge dead trees and other debris around the islands and its reefs (Figure 4-24).

In addition to the direct damage on the natural environment created by the forceful waves, the natural environment in this park was also vulnerable to abundant fishing gear—cages, nets, hooks—that the tsunami swept from adjacent damaged fishing villages and fishing boats in and around the park. Some of this kind of debris has had ongoing negative impacts, continuously “catching” fish without making use of them. This “ghost-fishing” issue is a particular concern because it contributes to already serious overfishing issues and damages the ecosystem in the long term.

b) Impact on the built environment

The impact on the built environment in Laem Son MNP was high, according to the National Park, Wildlife and Plant Conservation Department (NPWPCD 2005d). The high turbulent tsunami wave fronts forcefully attacked the park headquarters and all three ranger stations in this park, severely damaging or completely destroying them.

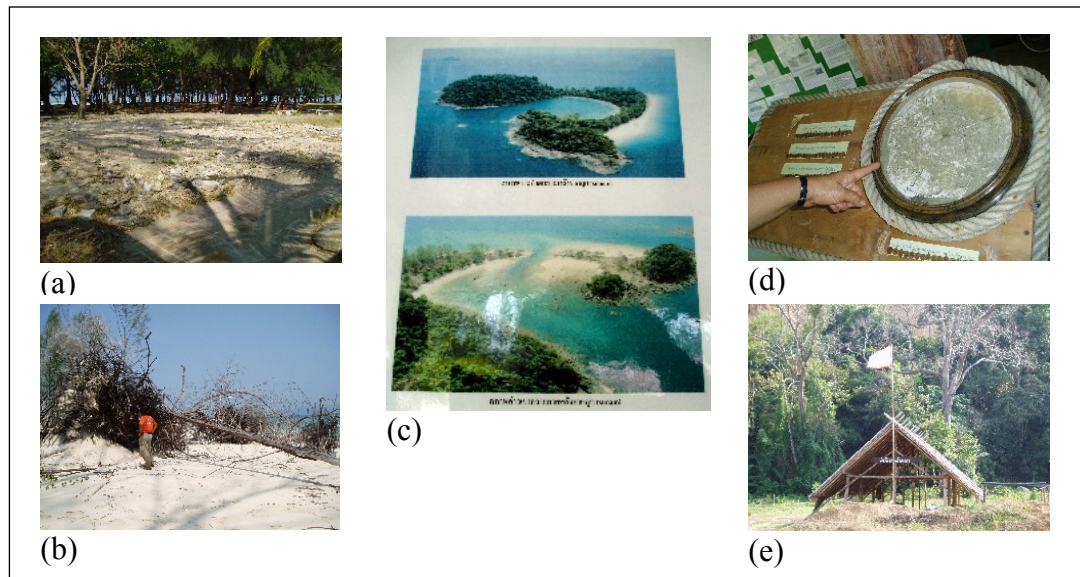


Figure 4-24. Laem Son MNP--- after the tsunami: (a) Flattened park headquarters; (b) Dead trees at Ao Khao Kwai beach, north of Ko Kam Yai; (c) Ao Khao Khwai (Bull Horn Bay) before and after the tsunami. Due to the forceful tsunami, the bay was split into two small islands (photo displayed at the temporary park headquarter); (d) The clock stopped at 11.10 am—the time that the tsunami swept this park; (e) Temporary ranger station at Had Prapas (Somrudee Meprasert photos).

Also destroyed were visitor bungalows and the park's visitor center and interpretive displays. The high energy wave not only destroyed the park but also severely damaged surrounding agricultural lands and coastal fishing villages located near the park.

Fortunately, the area around the park was not highly populated and did not have much tourism development, such as resort hotels. Therefore, debris from damaged buildings and infrastructure was much scattered and not extensive in any one area, especially compared to the mountains of debris at Phi Phi Don Island in Hat Noppharat Thara – Mu Ko Phi Phi MNP. Because the damage mainly occurred to the fishing villages and the local fishing fleet, the debris was mostly fishing gear and boats, whose destruction deprived the local population of their means of livelihood.

c) Impact on the business community-environment

Laem Son MNP is located mostly in Ranong province, which was judged to have sustained a low degree of impact on the business community (Tsunami Relief Center 2005). Fisheries, both small-scale and large-scale commercial ventures, dominate this mostly grass-roots local economy business and simple lifestyle. The commercial fishing fleet here enjoyed the area's fishing-friendly atmosphere and the low cost, over-the-border labor pool from Myanmar just to the north.

The actual cost of damaged “tools of the trade” from combined fishery, agriculture, and service sectors in this province was nearly US\$ 4.4 million (Tsunami Relief Center 2005). Not surprisingly, 97 percent of this damage cost came from the fishery sector, while damage cost from the service sector was approximately US\$21 thousand. The damage cost to the service sector in Ranong province was very little compared to the same type of damage cost in Phang Nga province just to the south. In Phang Nga, 87 percent of overall damage cost on tools of the trade came from service sector that located in Khao Lak area—more than US\$ 155 million (Tsunami Relief Center 2005). This suggests that the degree of impact on tourism businesses in the Laem Son MNP areas was relatively low because not very many tourism businesses existed prior the disaster. As noted earlier, however, some fishing businesses did double duty, also supporting tourism through transportation and tours.

d) Impact on social, health and safety

There were 169 people who lost their lives in Ranong province due to the tsunami. Of these, 156 were local Thais (Tsunami Relief Center 2005; UNEP 2005a). This number reflected that even though it was tourism peak season, this province was not a popular tourist destination compared to Phang Nga, Phuket, and Krabi provinces. Most of affected residents were local fishermen, their families, and fishery-related individuals.

The impact on the social, health and safety environments in the Laem Son MNP area included three park officials who died when the tsunami swept through

the park. Each of them lost his or her life at the three different ranger stations: Ao Khao Khwai, Had Prapas, and Ao Khoei (Figure 4-23). This tragedy negatively affected the mental health of all the park officials and significantly discouraged their spirits. Thus, while provincial data suggested this category of impacts was low, it was the most important impact to the park community itself (Figure 4-24).

Laem Son MNP and the tsunami recovery

Among all four study sites, Laem Son MNP is the least popular tourist destination and most tsunami-impacted MNP studied. These impacts are detailed below.

a) Recovery action on the natural environment and ecosystem impacts

Laem Son MNP did not receive much attention with respect to its damaged natural ecosystems. This is partly because of its small coral reef area and its overfished condition due to numerous fishing communities along the adjacent coastlines of Ranong and Phang Nga provinces. After the disaster, awareness of the natural ecosystem as natural protective feature has increased. Local school children and the general public who participated in the debris clean-up and mangrove reforestation projects have a better sense of the environment. ‘Ghost fishing’ by lost fishing gear is a continuing, long-term problem. However, it is out-of-sight and underwater, it has gotten no official attention.

b) Recovery action on the built environment impacts

Debris and destroyed buildings were removed a few months after the tsunami and buildings and facilities that received minor damage were repaired. However, no permanent buildings were reconstructed at Laem Son MNP. This was partly due to its low priority with respect to tourism revenue generation. The park headquarters and ranger stations on the mainland were moved into temporary shelters. The completely-destroyed ranger station at Ao Khao Kwai (Bull-horn Bay) on Ko Kom islands was left deserted. Without the ranger station on the islands and its significant

location near Myanmar border, the Royal Thai Navy helps patrol the park marine areas. As of March 2006, the park was partially closed, with only a few staff operating in limited areas.

c) Recovery action on the business-community and environment impacts

The artisanal fishing sector was an important business-community that unofficially supported this park's tourism sector. Prior to the 2004 tsunami, visitors who wanted to visit the park's islands had to contact the park staff. The park staff then contacted fishermen who were not engaged in daily fishing activities. Hence, it is expected that the small fishing boats donated will not only help fishermen recover their livelihood, but will also indirectly help park tourism recovery.

d) Recovery action on the social, health and safety impacts

The impact on the social, health and safety in and around Laem Son MNP was widespread. The most affected fisherman villages were located near the park ranger stations in three areas: Had Bang Ben, Khao Thale Nok, and Had Prapas (see Figure 4-21). In order to deliver relief, the park collaboratively worked with volunteer and NGOs by allowing relief crews to camp in or near the park. As of March 2005, the livelihoods in affected areas have slowly recovered. Several projects to revive artisanal fishing communities and to develop job opportunities nearby the park conducted by NGOs are continuing (Save Andaman Network 2005).

Chapter 5

IMPLICATIONS FOR HAZARD PREPAREDNESS AND MITIGATION IN MARINE PARKS

This study has documented the impacts, effects on tourism, and response and recovery activities in selected marine national parks on the Andaman Coast, Thailand associated with the 2004 Indian Ocean tsunami. Although it is valuable to do this kind of retrospective analysis, its principal usefulness is in looking forward. How can these findings be used to prepare for and mitigate potential damages from future hazard events—not just tsunamis, but also tropical storms and other hazards? This section focuses on this question.

First, based in part on the results of this study and in part on existing methodologies, a five-step planning model is proposed for assessing hazard risk and vulnerability, and for identifying preparedness and mitigation actions. Planning activities and tasks under each step are also suggested. This model is then used as a framework for discussing the implications of the study findings for increasing the resiliency of marine parks to tsunami and other natural hazards. These implications are presented in four principal contexts: planning process design and start-up; hazard identification and risk assessment; hazard vulnerability assessment; and identifying preparedness and mitigation goals and actions. It is asserted that application of this model using lessons learned from the 2004 tsunami will lead to more hazard-resilient marine parks. An example of how the model might be applied to a hypothetical Andaman coast park—Sudara Marine National Park—is included as Appendix N.

5.1 Planning Model for Increasing Park Resiliency to Natural Hazards

There are a number of risk and vulnerability assessment models in the literature addressing natural hazards like tsunamis (Heinz Center 2000; NOAA, Coastal Services Center 1999; FEMA 1997; OAS 1991; Wood et al. 2002). One in particular, developed by the NOAA Coastal Services Center (1999), is particularly relevant to

marine parks. Developed to assess vulnerability of local communities to coastal hazards in the United States, it has also been adapted to earthquake and tsunami hazards affecting ports and harbors in the U.S. Pacific Northwest (Wood 2002).

The NOAA planning model determines vulnerability using both single- and multi-hazard approaches, depending on user objectives and available resources, such as hazard and socioeconomic data. The assessment tool is used to identify potential hazards, define risk areas, map areas and resources that may be affected, and identify and prioritize hazard preparedness and mitigation actions. The model requires multidisciplinary stakeholder involvement where stakeholders are equal partners in the process.

An adaptation of the NOAA planning model for use in marine parks in Thailand (and elsewhere) is discussed next and summarized in Figure 5-1. The model is then used as a basis for examining the implications of study results for MNP hazard preparedness planning and mitigation.

5.1.1 Planning Process Design and Start-up (Step 1)

To begin this step and the process overall, project advocates meeting with marine park staff and other potential stakeholders to outline the proposed planning effort, identify concerns, and recruit leadership. A core planning group is organized, consisting of park staff, local or university-based professionals, and key local leaders from public and private entities that depend on the park as a tourism resource. This group assumes responsibility for process coordination, public meetings facilitation, financial assistance procurement, and GIS development (if appropriate). Technical and stakeholder advisory groups are recruited the national agencies, local universities, consulting firms, and elsewhere as appropriate. Based on information gathered at initial park and community meetings, project goals are developed and areas where site-specific vulnerability analyses should be focused are identified.

<p>Step 1. Design and Start Planning Process</p> <ul style="list-style-type: none"> • Organize core planning team • Identify core planning area (MNP) and key peripheral areas • Identify and recruit stakeholders and technical advisors • Hold a “getting started” community workshop to identify issues and goals
<p>Step 2. Identify and Assess Hazards, and Develop Scenarios</p> <ul style="list-style-type: none"> • Identify priority hazards to be addressed in planning process • Inventory and collect available hazards data • Hold technical workshop to identify hazard scenarios: frequency, range, worst-case
<p>Step 3. Assess Marine Park Vulnerability</p> <ul style="list-style-type: none"> • Develop preliminary vulnerability assessment using scenarios/associated hazards <ul style="list-style-type: none"> ○ Built environment ○ Social environment ○ Business community ○ Natural resources and ecosystems • Present preliminary assessment to stakeholders/technical experts • Hold interactive stakeholder-technical expert vulnerability assessment workshop
<p>Step 4. Develop Mitigation Options</p> <ul style="list-style-type: none"> • Identify and compile potential mitigation actions • Hold mitigation workshop to develop mitigation strategies and options <ul style="list-style-type: none"> ○ Existing or planned mitigation ○ Short-term mitigation that might be completed in five years ○ Long-term mitigation that could be undertaken over longer time • Evaluate mitigation options: public and private costs, political feasibility, potential effectiveness of the measure in reducing loss of life, property damage, social impacts, and natural resource and environmental damage.
<p>Step 5. Prepare Mitigation Action Plan</p> <ul style="list-style-type: none"> • Stakeholders and the project planning team develop a mitigation action plan • Identify necessary implementation actions, responsible parties, public and/or private costs and sources, and potential plan obstacles • Establish monitoring process to review progress, consequences, and barriers

Figure 5-1. Planning model for increasing marine park resiliency to natural hazards (adapted from NOAA 1999; Wood 2002)

5.1.2 Assessing Hazards and Developing Scenarios (Step 2)

Following an initial data search and map development, a one-day technical workshop is held to develop credible planning scenarios and examine the various hazards associated with each. For purposes of this project, hazards are defined as natural events that may pose risks to human life and property, but refer only to the physical attributes of the event, such as inundation potential, in the case of tsunamis. Through a series of presentations followed by facilitated discussion, workshop participants decide upon frequency, worst-case magnitude, most likely source area, and severity of associated hazards for each viable planning scenario. Additional sources for data are also solicited.

5.1.3. Assessing Marine Park Vulnerability (Step 3)

Vulnerability assessment, defined in this process as a qualitative or quantitative examination of the exposure of some component of society or the environment (Heinz Center 2000), is a key step in the process. Initially, a preliminary assessment is prepared for presentation to participants—descriptions of hazards, how those hazards interface with marine park built environment (e.g., infrastructure, critical facilities), social environment (e.g., local and visitor populations, social services) the business environment and resources (e.g. tour operators, charter boats), and natural resources and ecosystems (e.g., beaches, mangrove forest, coral reefs). Secondary hazards, such as hazardous material sites, and other important marine park-related resources are also considered. Resources are broadly defined in a functional and subjective context as any beneficial built, social, economic, or environmental element of the marine park.

A vulnerability assessment two-day workshop is the principal data-gathering effort at this stage. Participants include the core planning team, local stakeholders from all relevant sectors, and technical advisors. In an interactive setting using meeting room exercises and field visits to key sites, marine park stakeholders and technical participants share their knowledge and opinions with one another in a facilitated process. The result of this interactive process is set of vulnerability issues

founded on the best available science and tempered with local values, perceptions, and priorities.

5.1.4 Developing Mitigation Options (Step 4)

Mitigation is defined simply as sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects (FEMA 1997). In a one-day workshop, participants from the previous workshop reconvene to develop mitigation action and strategy options for the primary marine park vulnerability issues.

Mitigation options are organized into three categories: (1) existing or planned mitigation, (2) short-term mitigation that might be undertaken and/or completed in the next five to ten years, and (3) long-term mitigation that could be undertaken and/or completed over longer time frames—10 to 50 years. Additional factors to consider in subsequent evaluation of mitigation options include public and private costs, political feasibility, and the potential effectiveness of the measure in reducing loss of life, property damage, social impacts, and natural resource and environmental damage.

5.1.5 Preparing the Mitigation Action Plan (Step 5)

Based on information developed in previous workshops, stakeholders and the project planning team develop a mitigation action plan for increasing marine park resiliency to tsunamis and other priority hazards, with an emphasis on complementary strategies that benefit multiple users within the marine park. For each mitigation strategy, necessary implementation actions, responsible parties, public and/or private costs and sources, and potential plan obstacles are identified. Once actions are implemented, the marine park establishes a monitoring process to review progress, consequences of adopted plans, and barriers to carrying out actions.

5.2. Study Implications for Process Design and Start-up

The diversity of stakeholders in marine national parks and associated tourism endeavors became clear in the aftermath of the 2004 tsunami. To develop a useful

hazard preparedness and mitigation plan, it will be essential to involve all of those affected by the tsunami—local tribal inhabitants in the case of Mu Ko Surin, local park managers, national and provincial officials, tourism operators and resorts that channel tourists to parks, and others. It will also be necessary to bring all of these into the planning process, so adequate time needs to be set aside to enlist all of these individuals and groups in the vision of building more resiliency into parks and associated tourism enterprises.

5.3 Study Implications for Hazard Identification and Analysis

The 2004 tsunami generated a series of hazards, from powerful waves with great run-up height that killed people and destroyed buildings in its path to massive amounts of debris from damaged and destroyed structures. Wave backwash not only sucked floating people out to the sea but it also damaged structures and caused severe coastal erosion. Huge amounts of debris, contaminated environment, and psychological trauma after the water receded are some of the associated hazards generated by tsunami. Study findings suggest that hazard identification and prioritization will be complex and different depending on park and nearby development and population characteristics.

Tropical storms, another significant hazard in the region, make landfall on the Malay peninsular more often than earthquakes and tsunami, but generate a lesser magnitude of loss and damage. So, the frequency and magnitude of hazards must be taken into account when identifying potential hazards. The results also suggest that each marine park may experience the different degree of damage to the same hazard depending on its natural features (e.g., geography, geology, and ecology) and societal conditions (e.g., local population density and distribution, numbers of tourists, extent of human-made environment). Physical evidence and personal accounts also revealed the unpredictability of the run-up height and inundation distance. The height and distance even on the same beach may be very different (e.g. run-up height in the same area in Laem Son MNP). This implies the need to develop models for tsunami

inundation and run-up that include information on sources, local bathymetry, natural barriers, topography of the beach, and so on. All of these should be incorporated in determining risk areas. In addition, due to the uncertainty in magnitude, the hazard identification and analysis process should consider the worst-case scenarios.

Other types of natural hazards that are prevalent in the tropical zone include tropical storms and typhoons. The threats would come from wind damage and strong currents; however, there would be more warning and more time to be prepared. The other type of hazards is human-made hazard. The Andaman Coast is located near the commercially important maritime route, the Strait of Malacca. So, damage from an accidental oil spill is possible.

5.4 Study Implications for Vulnerability Assessment

Perhaps the most important implication of this study is the utility of its basic analytical framework—examining direct and indirect impacts and recovery efforts in four key categories: natural resources and ecosystems, built environment, business community, and social environment. Another related implication is that any human-made environment (within or nearby the MNPs) holds a threat of secondary or indirect hazards, especially for natural, economic and social elements of MNPs, in addition to the primary hazard. A MNP located near dense coastal development tends to experience a higher degree of natural environment damage than an isolated MNP. Pointed or sharp debris not only delays rescue and relief efforts but may also reduce social safety that hinders marine park tourism recovery. Damage to critical facilities in the MNP may interrupt the park operation, search, rescue and response in times of tsunami impact. So, the facilities that make a MNP workable should be relocated in low risk areas. Only water-dependent facilities such as docks or boat moorings should be allowed in the high risk area.

Different groups that visit or stay in MNPs cause different degrees of park and community vulnerability. A park with diverse groups of visitors, especially vulnerable populations such as children, elderly and pregnant women, will be highly dependent

on assistance when disasters occur. This also varies by season. Hence, this dynamic nature of the park community should be considered when assessing vulnerability. The findings also imply that the small local businesses are more vulnerable to the direct and indirect impact of the hazard than the big out-of-area businesses. Closure of these vulnerable companies may create a high degree of impact on local employment and community well-being.

Damage to fishing communities may not be high-value losses compared to the popular, highly developed tourism areas, but their loss is a high cost in the long term. For example, damaged and lost fishing gear swept into the ocean continues to catch fish, creating increased pressure on already limited fishery resource. Moreover, seawater contaminated coastal lands may not produce enough food and income for local families. Hence, a significant threat to grass root communities, resources, traditional cultural practices, and local employment may increase the threat to MNPs. Associated impacts, such as increasing poverty, declining optimism, and natural resources scarcity outside marine parks could lead to more illegal poaching within park boundaries. Consequently, vulnerable communities outside the park could contribute to marine park vulnerability. Vulnerability assessment should thus be conducted using a holistic approach that incorporates both natural and societal conditions within and nearby a given park.

5.5 Study Implications for Hazard Preparedness and Mitigation Action

The most useful part of this study with respect to hazard preparedness and mitigation are the list of ideal, prioritized actions identified by the Delphi panel (Table 4-9). They represent a reality-based, expert assessment of things that should or might have been done in advance, in response to, or to help recover from the 2004 tsunami. Other valuable products of this study are the constraints and barriers to recovery that the panel identified. Armed with these, preparedness and mitigation planners can seek ways to overcome these impediments.

Another conclusion from this study is that the response and recovery process is chaotic, due to failures of communication, transportation, and power networks. Fragmentation of government agencies which are responsible for providing aid also adds problem to the already chaotic situation. This suggests that in times of disaster, a reliable 'host agency' that serves as 'one-stop service' to link between victims and aid is crucially needed. When the rescue/relief mission is over, this 'host agency' may shift its goal to operate for long-term recovery.

The widespread and severe effects of a disaster can paralyze local authorities responsible for providing services. Consequently, assistance may need to come from areas outside of the region and may take a long time to arrive. This means that the park communities in remote settings must be self-sustaining for a period of time before help arrives from outside. Emergency survival elements including dried food, potable water, and basic medicine available in the park may make a difference between life and death. In general area, out-of-area aid providers should support local authorities and organizations in providing services. This would increase aid allocation effectiveness, reduce redundancy and strengthen local capacity to deal with disasters. Asking victims for actual needs may also reduce conflict with traditional cultures such as artisanal fishermen.

It may not seem a priority to install a warning network immediately after the tsunami disaster, given its rarity. However, the Delphi panelists in this study recommended the development of warning network, preparedness system, evacuation plan, education and outreach, and tourism safety enforcement as one of its highest priority actions to recover tourism. This infers that regaining a sense of safety in the region is very important, not only for tourists but also for increasing confidence of local communities and marine park staffs. This sounds reasonable, especially for hazards like tsunamis that provide little warning time.

All forms of hazard awareness education should be provided to school children, community groups, the general public, and visitors. Exhibition and interpretative signs within the marine parks and a brief talk given by tour operator

could be examples of the informal education. It is noteworthy that although this study focuses on marine park tourism recovery, the panelists raised concerns about the recovery of schools in communities nearby MNPs. This implies that the revitalization of the livelihood nearby MNPs indirectly recover park tourism. The re-establishment of school systems not only allows adults to go back to their routine work, but it also signifies hope for the future.

The media can either improve or worsen the situation in disaster-affected areas. The picture of severely-affected areas broadcast worldwide increased aid and donations but at the same time constantly reopened fresh wounds of local survivors. Visitors may avoid coming to an area they believe is devastated even when the areas have already recovered. Unaffected MNP may also experience a 'halo effect' from surrounded areas. Hence, MNPs not designated in risk areas may have to be prepared for negative economic impacts after the disaster.

Finally, despite the economic and political pressure to recover park tourism quickly, park authorities and development officials should incorporate lessons learned from the recent disaster to minimize any new construction in the high risk area. This may reduce future damage and loss.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

“Building a culture of prevention is not easy. While the costs of prevention have to be paid in the present, the benefits lie in distant future. Moreover, the benefits are not tangible; they are the disasters that did not happen.”

Kofi Annan (quoted in *Tropical Coasts*, 12(1). July 2005)

Conclusion

The general theme of this study is the impacts of natural hazards on tropical marine national parks and how these impacts might be lessened through preparedness planning and more effective disaster response and recovery efforts. The unprecedented impacts of the 2004 Indian Ocean tsunami has raised concern among marine park and hazard mitigation professionals about the impact of major coastal hazards to natural resources in marine parks and nearby areas. The main reason for this concern is the linkage of the parks to coastal community well-being and associated natural ecosystem services, especially in rural areas where many such parks are located. This interwoven relationship was examined for marine national parks along Thailand’s Andaman coast, following the 2004 tsunami.

Four principal issues were examined here: the impacts of the tsunami on marine parks and how they affect the tourism sector of the economy; the recovery efforts undertaken and their effectiveness; a retrospective assessment of actions that might have improved preparedness and made recovery efforts more effective; and how the vulnerability of marine parks to natural disasters might be reduced in the future. The comprehensive framework used for this investigation accounts for typically-addressed disaster impacts, including life loss, injuries, and property damage, as well as sometimes hidden impacts and costs, such as business interruption/loss and damage to natural resources, such as coral reefs. This broad framework is particularly

important for assets like marine parks, which depend heavily on natural resources and small businesses that support tourism. Conclusions drawn from this study are detailed below.

Tsunami Impacts on MNPs and their Effects on Tourism

Marine parks and the tourism enterprises they support are highly vulnerable to natural hazards, as tragically illustrated by the tsunami that struck Thailand's Andaman coast on December 26, 2004. The 16 MNPs along this coast were strongly affected by the tsunami, based on expert opinions rendered in this study, site assessments of four representative parks, and specific indicators of impact, including destroyed or damaged "tools of the trade", numbers of "affected" local population, and property damage estimates. Another indirect indicator of these impacts was the 49 percent decrease in visitation from FY 2004 to FY 2005 experienced by the MNPs examined here (NPWPCD 2005b).

Direct and indirect tsunami impacts to the *business community and environment* were judged to have the most significant effects on tourism (rated 7.80 on a 10-level scale), according to the expert panel assembled for this study. This was followed closely by the direct impacts of tsunami waves on the *built environment* and associated infrastructure (7.75/10). These built environment impacts were especially important for the chain-reaction of indirect damage and loss they caused within the other impact categories. For example, the debris from damaged buildings, infrastructure, and vehicles that was swept into the sea damaged coral reef and other coastal ecosystems, degraded water quality, and contaminated onshore drinking water supplies. Debris on beaches threatened safety of visitors. Similarly, direct damage to park facilities made parks nonfunctional, leading to extended park closures and loss of revenue to both parks and associated businesses. *Social, health and safety* impacts (6.64/10) and impacts to *natural resources and ecosystems* (5.64/10) were of lesser importance to the tourism sector. The latter finding was somewhat surprising, given the importance of the natural environment as a marine park attraction.

Recovery Effectiveness for MNP Tourism

The effectiveness of recovery actions on the four tsunami/tourism impact categories examined in this study varied. Actions taken to *rebuild infrastructure and park-serving facilities* inside and outside park boundaries were judged most effective at helping to get park tourism back on its feet (7.73/10). One is tempted to associate this finding with the very visible, morale-boosting nature of reconstruction activities. Recovery action effectiveness with respect to tourism did not vary greatly for the other three categories, with business environment recovery actions rated at 6.75/10, natural resource/ecosystem recovery actions 6.58/10, and social, health and safety-related actions 6.33/10. Again, it is important to note that recovery action effectiveness in all four categories rated well above the mid-level.

Despite its relatively positive assessment of recovery effectiveness, the Delphi panel identified numerous barriers and constraints to tourism recovery, many of which cut across the four categories. Some constraints were natural, like the onset of a particularly harsh monsoon season just a few months after the tsunami, or the isolation and extent of destruction of the northern-most MNP at Laem Son. Another is related to understandable trauma and fear, as well as superstitions, which led to many skilled workers leaving the area. Still others might have been avoided or at least minimized. These include uneven and sometimes redundant aid distribution; limited financial and human resources, particularly the lack of skilled aid personnel; fragmentation of relief efforts among competing agencies and NGOs; undue focus on who gets credit among aid-providers; bureaucratic delays and paperwork; and outright favoritism and corruption.

Hindsight and Foresight: Improving Preparedness, Response, and Recovery

In hindsight, it is clear that some of the devastating impacts of the 2004 Indian Ocean tsunami might have been avoided if knowledge of the risk had been more widespread and taken seriously, if coastal construction practices had been sensitive to hazards, and if the public and visitors more aware of the hazard and what to do when a tsunami

approaches. Given the rarity of such events and money to be made in the tourism business, it is probably unrealistic to have expected this. This experience has the potential to change that, but even that is uncertain, given reconstruction in some at-risk areas.

The Delphi panel addressed these issues by identifying and prioritizing 27 preparedness, response, and recovery actions (Table 4-9). Based on a simple High (3), Moderate (2), Low (1) priority rating system, 16 of the 27 actions on average ranked in the High priority category (≥ 2.33), and the remaining in the Moderate priority category (≥ 1.67 but < 2.33). Not surprisingly, most of the actions identified are well-documented, effective hazard preparedness and mitigation strategies. However, implementing them will be expensive and presents a number of challenges. For example, the two actions that tied for top priority at 2.85 involved costly and complicated advance planning. One was to develop a tsunami warning and preparedness system, including ocean sensors, integrated warning communication systems, evacuation plans for low-lying coastal areas, including appropriate signage, and ongoing education and public awareness. Such a system, based on the latest technology, is expensive and will require new, more effective emergency management institutions and communication protocols, periodic testing, evaluation, and maintenance. The second top-ranked action was to develop, implement and enforce of a coastal construction setback law that takes hazards and sensitive resources into consideration. Such systems have been employed elsewhere, but are difficult to implement and enforce and subject to loopholes and abuse. Ranked third was the development of emergency response and preparedness plans for individual marine parks. The guidelines prepared in this study should be a useful resource in this park planning process (see Recommendations below). Other desirable preparedness and recovery actions identified by the panel cover a broad sweep of park operations, ranging from the water system improvement to clarified marine zoning to better regulation of visitor-serving businesses. Some of these relate to hazards, but many are

simply improvements in park management that the tsunami demonstrated were needed.

Direct and Indirect Impacts Affect Parks Differently

Three of the four parks examined here had significant direct tsunami impacts. Laem Son and Mu Ko Surin MNPs facilities and natural attractions were severely damaged, resulting in a more than 80 percent reduction in visitors for FY 2005. Ao Phang Nga MNP, on the other hand, did not sustain any direct tsunami impacts, yet visits also declined more than one-third there, suggesting a negative “halo effect” from damage in the surrounding area and in other parks. On the other hand, Mu Ko Surin MNP is an example of a park that benefited from its low intensity development and high degree of remoteness. Although its facilities were heavily damaged, little construction or man-made debris was found on its beaches and seafloor surrounding the islands. In contrast, at Hat Nopharat Thara – Mu Ko Phi Phi MNP, which has extensive private development in park “excluded areas” and in areas adjacent to the park, direct wave impacts were high, as were indirect debris-related damage on land and in the water. These kinds of differences suggest that MNP hazard vulnerability assessments need to examine potential impacts from sources both inside and outside park boundaries.

Delphi Process Proves Useful for Examining Disaster Impacts and Recovery

This study is the first evaluation of natural hazard impacts and recovery actions for marine parks in Thailand. It also pioneers the use of the Delphi approach in coastal hazard studies. The major strengths of this method are its iterative, consensus-building approach with controlled feedback and the anonymity of the expert panel, which allows members to re-evaluate their opinions. In this particular case, the anonymity fostered collaboration among panel members who were drawn from very different “schools of thought”; this was unusual in this researcher’s experience. The Delphi approach also overcame the geographic dispersion of panel members, providing for

participation of individuals at local, regional and national levels, as well as different sectors.

Recommendations

Conduct natural hazard risk and vulnerability assessments, and prepare and implement mitigation plans for individual MNPs in Thailand.

Using the five-step planning guide included in Chapter 5 and recommendations of the Delphi panel on ideal preparedness and recovery strategies, individual MNPs should develop hazard mitigation plans, accounting for the range of hazards that could affect the park, including tsunamis. This recommendation is built upon the belief that marine parks with mitigation and preparedness in place will be more resilient to hazards in the future, resulting in fewer deaths and injuries, less damage to property, and businesses, and less trauma for local people and visitors. Well-prepared parks also will have the potential to be self-sustaining following a disaster, and to more rapidly recover.

Develop and implement tsunami (and other) hazard awareness and response education programs for school children, community groups, the general public and visitors.

Increased awareness of and respect for natural hazards will undoubtedly save lives in future disasters, be it a typhoon or tsunami. Despite the controversy over the installation of an expensive warning technology, an outreach and education program on hazard reduction must be launched now, especially in hazard-prone areas. The context for hazard risk reduction—what to do or what not to do before and during a disaster—should be included in all levels of educational system.

There are many adaptable examples of curricula and informal education and awareness programs to draw upon. For example, in some parts of the United States and Canada, particularly on the west coast, laws mandate tsunami education and drills in schools, and tsunami hazard and evacuation route signs have been installed at hundreds of locations along vulnerable coastlines, particularly parks. Tour operators in

MNPs should be mandated to brief visitors on tsunami hazards and appropriate response actions. A national master plan for hazard education is needed, drawing on the skills of educators and of hazard professionals.

Hazard reduction efforts in MNPs need to be approached from a holistic perspective.

The findings presented here suggest the need for a more holistic approach in reducing vulnerability of marine parks to natural hazards. Multidisciplinary and multisectoral collaboration to assess various dimensions of park vulnerability is vital. Park authorities, local government and NGO institutions, and researchers should work together to set the research agenda and supply relevant data to hazard mitigation planners. The cost of research, warning systems, and preventive planning for hazard mitigation is high, particularly in foregoing tourism revenues in the private sector. It will require realistic trade-offs of short-term economic gains today with somewhat vague, but critical benefits in the future. Given economic and political pressures that have already exerted themselves on the Andaman coast, the road to hazard risk reduction is full of challenges.

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APPENDICES

Appendix A Description of the Delphi expert panel

1. Gender and Age

The composition of the group of 20 panel members ($n = 20$) included 12 males (60%) and 8 females (40%). The panelists' ages range between 25 to 59 years old. Fifty percent of them are 31-45 years old. From the remaining 50%, 45% are 46-60 years old, and only one (5%) ages between 18-30 years old (as shown in Figure A-1).

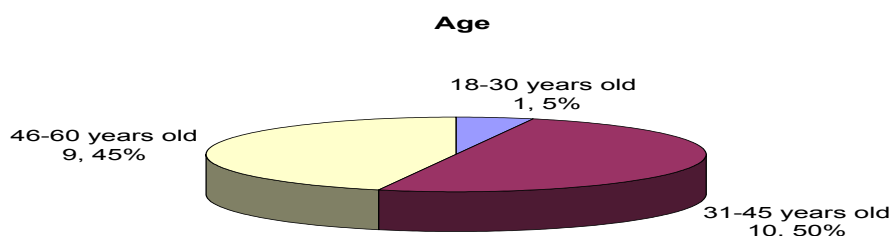


Figure A-1 Ages of the Delphi panelists (number of panelists, percentage of panelists)

2. Educational Background

With regard to educational background, 60% ($n = 12$) of the Delphi panelists possessed master's-level degrees. From the remaining 40%, 20% ($n = 4$) received doctoral degrees, 15% ($n = 3$) earned bachelor's degrees, and only one (5%) received high school diploma (as shown in Figure A-2).

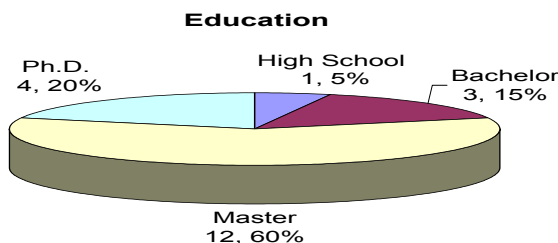


Figure A-2 Educational background of the Delphi panelists (number of panelists, percentage of panelists)

3. Area of expertise

With regard to area of expertise, the composition of the group of 20 panel members comprised six professions including three academic researchers (15%), three resource managers (15%), three park managers (15%), three volunteers from Non-Government Organization (NGOs) (15%), four tourism managers (20%), and four tour operators (20%). The details are presented in Figure A-3.

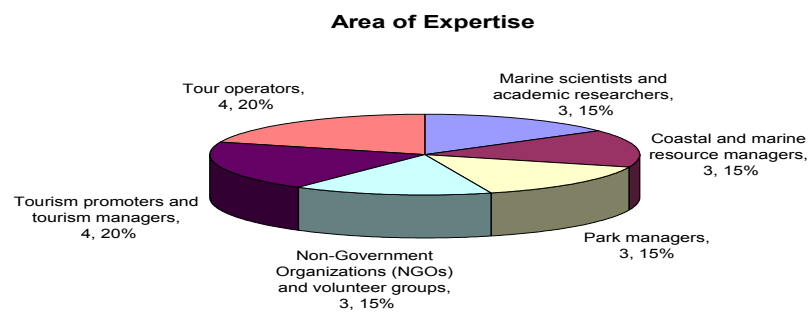


Figure A-3 Area of expertise of the Delphi panelists (number of panelists, percentage of panelists)

4. Work experience period

With reference to work experience, 50% of panelists ($\underline{n} = 10$) worked in their field of expertise for 0-5 years. From the remaining 50%, 20% ($\underline{n} = 4$) worked for 6-10 years, 15% ($\underline{n} = 3$) worked for 11-15 years, and 15% ($\underline{n} = 3$) worked for more than 16 years. (See details in Figure A-4).

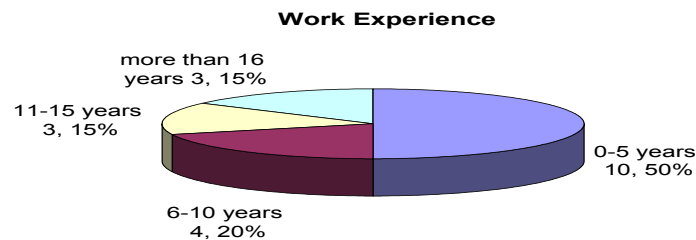


Figure A-4 Work experience period of the Delphi panelists (number of panelists, percentage of panelists)

5. Knowledge regarding study sites

With reference to the panelists' knowledge in four study sites, 17 of the 20 panelists (85%) were familiar with Hat Nopharat Thara/Mu Ko Phi Phi MNP. Fourteen of 20 panelists (70%) were knowledgeable in Mu Ko Surin MNP. Ten of 20 panelists (50%) were well-informed about Ao Phang Nga MNP. Seven panelists (35%) were familiar with Laem Son MNP (as presented in Figure A-5).

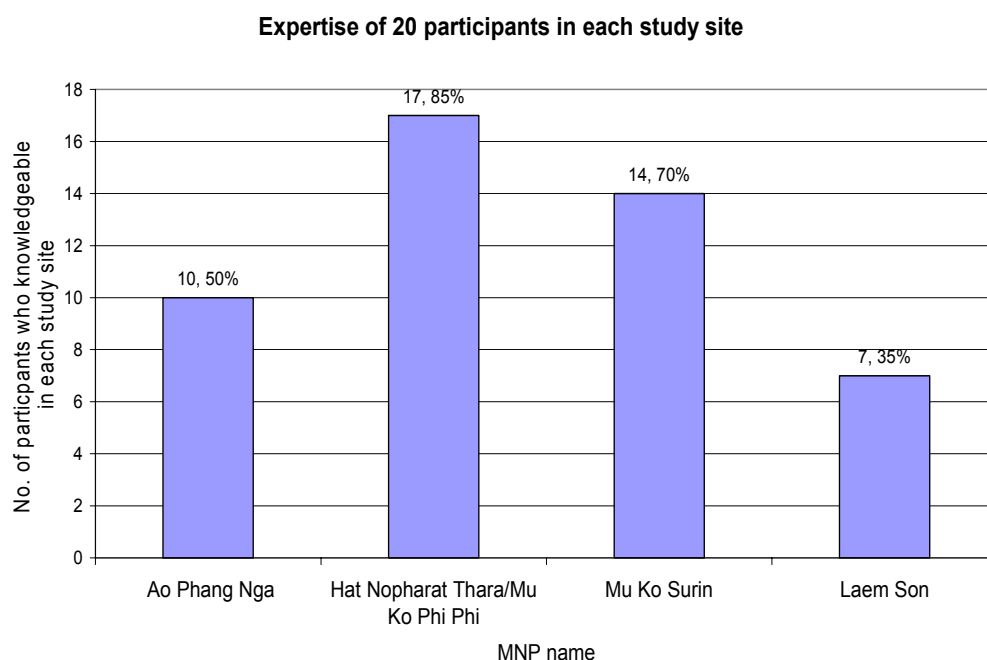


Figure A-5 Delphi panelists' expertise in each study site (number of panelists, percentage of panelists)

Appendix B Invitation email for moderator to recruit nominees for the Delphi survey (English version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

<Date>

Dear <name>,

My name is Somrudee Meprasert. I am a doctoral student in the Geography Program at Oregon State University, USA. I am conducting a study of the impacts of 2004 Indian Ocean Tsunami on coastal and marine tourism and recovery responses in affected marine national parks, Thailand. The primary goal of this research is to document the impact of the December 26, 2004 Indian Ocean tsunami on tourism in marine national parks in Thailand, including how these impacts are being addressed in the year following the disaster (2005) to recover this tourism sector. Additionally, a secondary goal is to develop a risk and vulnerability assessment technique for marine parks to evaluate their degree of risk and vulnerability and to promote more resilient marine parks which led to more rapid and effective recovery. The research will make a variety of contributions and benefits to our understanding of linkage of natural-coastal hazards and tourism in tropical marine national parks.

The study will use the Delphi method to develop a consensus among 20 experts with direct knowledge and/or experience of the impacts of the tsunami and subsequent recovery efforts. An important first step in conducting this study is the identification of a group of experts for the Delphi panel. It would be greatly appreciated if you would help identify at least 10 individuals that you consider highly knowledgeable about the impacts of the 2004 tsunami on tourism in marine national parks and subsequent recovery efforts. They may be from any occupational status, such as marine national park planners and managers, tourism officers, academic researchers, tour operators, environmental groups, media, or from the lay public. They need not be physically located in the tsunami affected areas, but must be knowledgeable about the impacts of this disaster and have potential capabilities in answering the questions regarding impacts of the disaster on marine national parks.

I would like to invite you to take part in the first step of this study—the nomination of potential Delphi Panel experts. Only you and five other individuals have received this invitation, so your voluntary participation is important to the success of the study. If you can assist, please sign and return the attached consent. If you cannot assist, please let me know as soon as possible. Also, the names of people you have nominated will be kept strictly confidential.

The following ***criteria*** are provided as guidelines for your consideration in identifying potential expert panel members. Please include yourself, if appropriate. Include names and available contact information for each person (address, phone, email).

- Expert panel nominees should have working experience in at least one of the selected study sites (below) before and/or after the 2004 tsunami, including, but not limited to, MNP management (local and national), conducting research in MNPs, operating tours in MNPs,

being a SCUBA diver, etc. The four selected study sites, all in the Andaman Sea, Thailand, are:

1. Ao Phang Nga
 2. Hat Nopharat Thara – Mu Ko Phi Phi
 3. Mu Ko Surin, and
 4. Laem Son.
- Expert panel nominees should have working experience regarding tourism planning and/or operation in natural settings.
 - Expert panel nominees should have visited *at least one* of affected marine national parks in the Andaman Sea after the disaster.
 - If expert panel nominees *do not* meet at least one of the above criteria, they should be highly knowledgeable persons who have been intimately involved in coordinating recovery efforts in tourism and marine national parks.

From the list of 60 nominees (nominated by you and five other nominators), 20 knowledgeable persons most frequently identified will be selected for the panel and asked if they are willing to participate. Those who have been nominated by at least three people will be firstly chosen. Remaining panel members will be selected from those who are nominated twice, and then just once.

A form for listing the names and contact information of recommended participants is attached as Word document with this email. Alternatively, for your convenience, you may simply reply to this email as to your contact information and availability by phone and I can take your nominations that way.

Your kind participation is voluntary and you may refuse to participate this study for any reason. Your individual responses will be kept confidential. Your anonymity is assured while this study is being conducted. If you do not want to participate and do not wish to be contacted further, please simply return the uncompleted nomination list as “Blank Reply Email”. Your name will be taken off from list of participants. There are no foreseeable risks to you as a participant in this project; nor are there any direct benefits. However, your participation is extremely valued.

If possible, please reply this email before <Date>. Thank you very much for your valuable time and assistance.

If you have any questions or comments about this study, please do not hesitate to contact me at 02-579-9645, or you can write to me at the email addresses (somdeem@yahoo.com or mepraserts@geo.orst.edu). Please also feel free contact my advisor, Dr. James Good, if you have any questions at the email address good@coas.oregonstate.edu.

Again, I greatly appreciate and thank you for your kind assistance.

Sincerely,

Somrudee Meprasert
Candidate, PhD Geography Program
Department of Geosciences, College of Sciences
Oregon State University

Please list the names and contact information of each Expert Panel nominee.

Name	Affiliation	Basis of Nomination & Nature of Expertise	Contact Information
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Appendix C Invitation email for moderator to recruit nominees for the Delphi survey (Thai version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

(วันที่)

เรียน <ชื่อ>

ดิฉันชื่อ สมฤดี มีประเสริฐ เป็นนักศึกษาระดับปริญญาเอก ในสาขาภูมิศาสตร์ ของมหาวิทยาลัยแห่งรัฐโอเรกอน (Oregon State University) ประเทศสหรัฐอเมริกา ดิฉันกำลังศึกษาผลกระทบของคลื่นสึนามิที่ต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเล จุดประสงค์หลักประการแรกของการวิจัยนี้คือ เพื่อบันทึกผลกระทบของคลื่นสึนามิที่มีต่อระบบการจัดการการท่องเที่ยวในเขตอุทยานทางทะเล และบันทึกแนวทางการฟื้นฟูผลกระทบในระยะเวลาหนึ่งปีที่ผ่านมา จุดประสงค์หลักประการที่สองคือ เพื่อพัฒนาเทคนิคการประเมินผลกระทบจากภัยธรรมชาติที่มีต่ออุทยานแห่งชาติทางทะเล ผลการศึกษาจากงานวิจัยนี้จะช่วยเพิ่มความเข้าใจในผลกระทบของภัยธรรมชาติที่มีต่อการท่องเที่ยว โดยเฉพาะการท่องเที่ยวในเขตอุทยานทางทะเล และนำไปสู่การฟื้นฟูผลกระทบที่รวดเร็วและมีประสิทธิภาพในอนาคต

งานวิจัยนี้เก็บรวบรวมความคิดเห็นจากผู้เชี่ยวชาญอย่างเป็นระบบด้วยเทคนิคเดลฟิ (Delphi) ดังนั้นดิฉันจึงขอเชิญท่านเข้าร่วมในการวิจัยครั้งนี้เนื่องจากท่านเป็นผู้มีความเข้าใจในผลกระทบของภัยธรรมชาติที่เกิดขึ้น นอกจากนี้ดิฉันยังเชื่อว่าท่านสามารถแนะนำรายชื่อผู้มีความเข้าใจถึงผลกระทบของคลื่นสึนามิที่มีต่ออุทยานทางทะเลอีกจำนวน ๑๐ ท่าน เพื่อเข้าร่วมในการวิจัยครั้งนี้ ท่านสามารถแนะนำบุคคลจากสาขาอาชีพใดก็ได้ที่เกี่ยวข้องกับการจัดการท่องเที่ยวในเขตอุทยานทางทะเล เช่น เจ้าหน้าที่อุทยาน เจ้าหน้าที่ส่งเสริมการท่องเที่ยว นักวิจัย เจ้าของกิจการนำเที่ยวในเขตอุทยาน นักอนุรักษ์สิ่งแวดล้อม สื่อมวลชน หรือ บุคคลทั่วไป ที่ท่านคาดว่าบุคคลเหล่านี้มีความสามารถในการตอบปัญหาเกี่ยวกับผลกระทบของคลื่นสึนามิที่มีต่ออุทยานแห่งชาติทางทะเล

ดิฉันขอเสนอคุณสมบัติต่อไปนี้ เพื่อความสะดวกของท่านในการพิจารณานำเสนอรายชื่อ

๑. เป็นผู้ที่มีประสบการณ์การทำงานในเขตอุทยาน ๔ แห่งต่อไปนี้ ในช่วงก่อนและภายหลังเหตุการณ์คลื่นสึนามิ ทั้งนี้ประสบการณ์การทำงานรวมถึง(แต่ไม่จำกัด)กิจกรรมต่อไปนี้ การวิจัยในเขตอุทยาน การประกอบธุรกิจนำเที่ยว และการดำเนินเพื่อนันทนาการ

- อุทยานแห่งชาติอ่าวพังงา
- อุทยานแห่งชาติหาดนพรัตน์ธารา และหมู่เกาะพีพี
- อุทยานแห่งชาติหมู่เกาะสุรินทร์
- อุทยานแห่งชาติแหลมสน

๒. เป็นผู้ที่มีประสบการณ์การทำงานเกี่ยวกับการวางแผนการท่องเที่ยวในสภาพธรรมชาติ
๓. เป็นผู้ที่ได้เดินทางไปยังอุทยานทางทะเลภายหลังเหตุการณ์คลื่นสึนามิ และพบเห็นสภาพความเสียหายในเขตอุทยาน
๔. หากท่านไม่แน่ใจในคุณสมบัติดังกล่าวข้างต้นของผู้ที่ท่านจะเสนอชื่อ ท่านสามารถเสนอชื่อบุคคลท่านอื่นๆ ได้โดยท่านเชื่อว่าบุคคลนั้นๆ ได้มีส่วนเกี่ยวข้องในการฟื้นฟูสภาพธรรมชาติในเขตอุทยานทางทะเลภายหลังเหตุการณ์คลื่นสึนามิ

ดิฉันจะทำการรวบรวมรายชื่อที่นำเสนอจากผู้เชี่ยวชาญเช่นท่านทั้งสิ้นจำนวน ๖ ท่าน (รวมรายชื่อทั้งสิ้น ๖๐ ท่าน) จากนั้นดิฉันจะทำการรวบรวม คัดเลือก และทาบทามผู้เชี่ยวชาญจากจำนวน ๖๐ ท่านให้ได้ประมาณ ๒๐ ท่าน โดยอาศัยหลักการคัดเลือกเฉพาะในการวิจัย

ดิฉันได้แนบบแบบตารางการนำเสนอชื่อมาพร้อมกับจดหมายฉบับนี้ ขอความกรุณาท่านกรอกรายชื่อและส่งกลับมายังดิฉันที่ mepraserts@geo.orst.edu หรือ somdeem@yahoo.com หรือ เพื่อความสะดวกของท่านกรุณาส่งอีเมลล์บอกเวลาที่ท่านสะดวกเพื่อให้ดิฉันติดต่อกลับทางโทรศัพท์

ความร่วมมือจากท่านมีความสำคัญเป็นอย่างยิ่งต่องานวิจัยชิ้นนี้ มีเพียง ๖ ท่านในประเทศไทยเท่านั้นที่ดิฉันเรียนเชิญเข้าร่วมในการวิจัยระยะเริ่มแรกนี้ ดิฉันขอรับรองว่าการนำเสนอชื่อของท่านจะถูกเก็บเป็นความลับตามหลักจริยธรรมการวิจัย หากท่านมีข้อสงสัยหรือข้อใจเกี่ยวกับการวิจัยชิ้นนี้กรุณาส่งอีเมลล์ถึงดิฉันได้ที่ mepraserts@geo.orst.edu หรือ somdeem@yahoo.com หรือทางโทรศัพท์ที่ (๐๒) ๕๑๕-๕๖๔๕ ท่านสามารถฝากข้อความของท่านได้ที่หมายเลขโทรศัพท์ดังกล่าว และดิฉันสัญญาว่าจะติดต่อกลับโดยเร็วที่สุด

ดิฉันเชื่อว่าผลจากงานวิจัยชิ้นนี้นอกจากจะมีประโยชน์เป็นอย่างยิ่งต่อประเทศไทยอันเป็นที่รักของเราแล้ว จะยังสามารถช่วยลดความสูญเสียของชีวิตและทรัพย์สินอันเนื่องมาจากภัยธรรมชาติได้ในอนาคต ดิฉันขอขอบพระคุณล่วงหน้าในความร่วมมือของท่าน

ขอแสดงความเคารพเป็นอย่างสูง

นางสาว สมฤดี มีประเสริฐ

กรุณารอกรายชื่อผู้ที่ท่านเห็นสมควรลงในตารางนี้ หากท่านไม่ทราบชื่อนามสกุลเต็ม ท่านสามารถกรอกเพียงตำแหน่ง หรือ หน่วยงานที่ท่านเหล่านั้นสังกัด

ชื่อ	หน่วยงาน	เบอร์โทรศัพท์	เบอร์โทรศัพท์ หรือ สถานที่ติดต่อ
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Appendix D Questionnaire Round I for the Delphi survey (English version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

<date>

Dear ...<name>.....,

You have been nominated by a distinguished colleague to serve on a panel of 20 experts on the impacts of the 2004 Indian Ocean tsunami on marine national parks in Thailand and recovery efforts over the past year. Because of your expertise in this area, you are invited to participate in a doctoral research project I am conducting as part of my work at Oregon State University. The study examines the impacts of the 2004 tsunami on tourism in marine national parks and recovery efforts since the event. This study will be the first impact assessment study of the 2004 tsunami and its influences on tourism sector in MNPs in Thailand or elsewhere. As such, it will make a variety of contributions and benefits to our understanding of linkage of natural-coastal hazards and tourism in tropical MNPs.

This study will use the Delphi technique to bring about a consensus of opinions among expert panel members. As a Delphi expert panelist, you are asked to participate in three (3) rounds of questioning in which you will be asked to respond and evaluate answers using established survey methods. Your kind participation is voluntary and you may refuse to answer any question(s) for any reason. Your individual responses will be kept confidential. Your anonymity is assured while this study is being conducted. Only aggregated group results will be reported.

If you do not want to participate and do not wish to be contacted further, please simply return the uncompleted survey in the enclosed envelope. Your questionnaire will be destroyed and your name will be taken off from list of participants. There are no foreseeable risks to you as a participant in this project; nor are there any direct benefits. However, your participation is extremely valued. You will also receive a copy of the final results and their interpretation. It is my hope that you will agree to be an expert in the study throughout the entire three-round process.

Please complete and return the round I questionnaire by <Date>. Please accept my sincere appreciation for considering this request. I would be grateful for your expert assistance and cooperation in this study. If you have any questions or comments about this study, please do not hesitate to contact me at 02-579-9645, or you can write to me at the email addresses (somdeem@yahoo.com or mepraserts@geo.orst.edu). Please also feel free contact my advisor, Dr. James Good, if you have any questions at the email address good@coas.oregonstate.edu.

Sincerely Yours,

Somrudee Meprasert

INTRODUCTION

Goal of this Study

As evidenced by the Magnitude 9.0 Sumatra Earthquake and the following Indian Ocean tsunami on December 26th, 2004, earthquakes and tsunamis are powerful forces that cause significant loss of life and property. Impacts of the disaster significantly raised public awareness among Thais and people around the worldwide about the vulnerability of natural and human environments to natural disasters. These impacts also create a demand, especially among concerned Thais, for more information about how natural disaster impacts affect the tourism sector—a major contributor to national GDP—and how best to foster recovery.

Therefore, *the primary goal of this research is to document the impact of the December 26, 2004 Indian Ocean tsunami on tourism in marine national parks in Thailand, including how these impacts are being addressed in the year following the disaster (2005) to recover this key resource for the tourism sector.* In addition, the study resulted in a risk and vulnerability assessment technique for marine parks to evaluate their degree of risk and vulnerability and to promote more resilient marine parks which led to more rapid and effective recovery.

Types and Categories of Impacts

In this study, we are examining the *direct* and *indirect* impacts of the December 26, 2004 tsunami on marine national parks and how recovery is proceeding. *Direct impacts* are defined here as the primary physical damages and losses associated with the tsunami wave striking the coast—the strong wave forces, inland flooding, and swift incoming and outgoing currents that kill people and wildlife, erode beaches, uproot vegetation, destroy or damage buildings and transportation infrastructure, damage business equipment and records, and so on. *Indirect impacts* are defined here as those that related to, but follow the primary event in time and space, such as debris removal, oil and gas leaking, sewage discharge, ongoing contamination of water supplies, loss of tourist clientele, and psychological trauma, fear, and depression. Some secondary impacts may actually be positive ones, witness the outpouring of financial and food aid, community rebuilding efforts, as so on. In this questionnaire, these direct and indirect impacts are further divided into four categories: natural resources and ecosystems, built environment; business community; and social, health, and safety. Each is described below.

- *Natural resource and ecosystem* impacts may be direct or indirect. Direct physical damages to marine and terrestrial ecosystems, associated habitats, and plant and animal communities are caused by the tsunami. Impacts to natural resources and ecosystems may also be indirect, including impacts associated with debris cleanup and disposal, spilled fuel, sewage, industrial waste, and leakage of household toxic chemicals.
- The *built environment* is defined here as the human-constructed environment—transportation infrastructure, utility and power infrastructure, residential buildings, commercial buildings, governmental service related private facilities, public and private education facilities, interior equipment and property, and transportation stock.
- The *business community* is defined here as all aspects of a business that are not part of the built environment—the customer base, reputation, trained employees, and digital records. These are primarily indirect impacts, but often linked to the direct impacts on the built environment described above. Some, however, may be independent of direct physical impacts, instead arising from “halo effects” associated with damage to the surrounding environment, perceptions of potential customers, and psychological trauma.
- *Social, health, and safety* impacts are those affecting human populations—directly through loss of life, and indirectly due to psychological trauma, disruption of social services, loss of employment, loss of public and private transportation, and individual and family stress.

ROUND I QUESTIONNAIRE

This questionnaire has four sections. Each section focuses on one of the four kinds of disaster impacts defined in the introduction: *natural resource and ecosystem* impacts; *built environment* impacts; *business community* impacts; and *social, health, and safety* impacts. For each of these, a set of similar questions are asked about (1) impacts of the tsunami, (2) how tourism in marine national parks was affected by these impacts; (3) governmental and private responses and recovery actions taken in 2005; (4) constraints to recovery efforts, and (5) other response or recovery actions that would have been (or still could be) valuable as marine national parks try to recover the tourism economy. Refer to the Introductory definitions as often as necessary to clarify responses. In making responses, please note which park or parks you are referring to:

- ☐ Ao Phang Nga
- ☐ Hat Nopharat Thara/Mu Ko Phi Phi,
- ☐ Mu Ko Surin,
- ☐ Laem Son

Also, please complete all sections. Thank you in advance for your kind assistance.

Section I: Natural Resources and Ecosystems

1. Tsunami Impacts. Please several of the most significant tsunami impacts on **natural resources and ecosystems** within marine park boundaries and related areas. Here, *natural resource and ecosystem* impacts may include direct physical damages to marine and terrestrial ecosystems, associated habitats, and plant and animal communities; impacts to natural resources and ecosystems may also be indirect, such as the secondary impacts associated with debris cleanup and disposal, spilled fuel, sewage, industrial waste, and leakage of household toxic chemicals.

Examples: Coral damaged by wave force, spread of debris, and sediment deposition
 Recreational beaches eroded and sand deposited inland on vegetation
 Eroded beaches and changed of beach morphology
 Seawater intrusion in potable water sources
 Debris removed and placed in sensitive habitats

- a).....
- b).....
- c).....
- d).....
- e).....

2. How These Impacts Affected Tourism. Indicate how tsunami impacts to the **natural resources and ecosystems** described in the last question affected tourism in marine national parks.

Examples: Destroyed diving sites
 Eroded beaches
 Lack of potable water due to seawater intrusion

- a).....
- b).....
- c).....
- d).....
- e).....

3. Recovery Actions Taken. Please describe the most important governmental or private response and/or recovery actions taken in 2005 to help recover **natural resources and ecosystems** as related to marine national park tourism.

Examples:

Activities	Organization(s)	Outcome or Impact
Debris clearance (on the beach and underwater)	Volunteer divers and local schools	Initial impact significant; new sources being discovered
New constructions of tourism facility	National Park Authority	Created potential to support tourists
National tourism promotion campaign	Tourism Authority of Thailand	Uncertain...tourism recovery slow

Your Responses:

Activities	Organization(s)	Outcome/Impact/Comments

4. Constraints to Recovery. Please describe all significant *constraints* that you or your organization have experienced or have heard about that have limited or undermined **natural resources and ecosystems** recovery efforts.

Examples: Lack of cooperation between tour operators
 Fragmentation of national management structure/responsibilities
 Promised funding yet to materialize
 Redundancy in recovery assignments and activities

- a).....
- b).....
- c).....
- d).....
- e).....

Section II. The Built Environment

1. Tsunami Impacts. Please describe several of the most significant tsunami impacts on the **Built Environment** within and outside marine national park boundaries. Here, the *built environment* is defined as the human-constructed environment—transportation infrastructure, utility and power infrastructure, residential buildings, commercial buildings, governmental service related private facilities, public and private education facilities, interior equipment and property, and transportation stock.

Examples: Pier or dock for tour boats destroyed or damaged
 Park headquarters and concessions damaged
 Visitor lodging destroyed
 Power generators and transmission lines destroyed

- a).....
- b).....
- c).....
- d).....
- e).....

2. How These Impacts Affected Tourism. Indicate how tsunami impacts to the **Built Environment** described in the last question affected tourism in marine national parks?

Examples: Capacity to support overnight visitors eliminated
 Destroyed SCUBA-support building, so no capacity to support key visitor group

- a).....
- b).....
- c).....
- d).....
- e).....

3. Recovery Actions Taken. Please describe the most important governmental or private response and/or recovery actions taken in 2005 to help recover the **Built Environment** as it relates to marine national park tourism.

Examples:

Activities	Organization(s)	Outcome or Impact
Construction of new visitor center	National Park Authority	Created potential to support tourists
New dock and moorages	National Park Authority	Allows boaters to come to park for overnight or temporary use

Your Responses:

Activities	Organization(s)	Outcome/Impact/Comments

4. Constraints to Recovery. Please describe all significant *constraints* that you or your organization have experienced or have heard about that have limited or undermined **Built Environment** recovery efforts.

Examples:

Lack of cooperation between tour operators
 Fragmentation of national management structure/responsibilities
 Promised funding yet to materialize
 Redundancy in recovery assignments and activities

- a).....
 b).....
 c).....
 d).....
 e).....

Section III. The Business Community/Environment

1. Tsunami Impacts. Please describe several of the most significant tsunami impacts on the marine national park **Business Community/Environment**, both within and outside park boundaries. Here, the *business community* is defined as all aspects of a business that are not part of the human-built environment—the customer base, reputation, trained employees, and digital records. These are primarily indirect impacts, but often linked to the direct impacts on the built environment

Examples:

Boats used to transport tourists destroyed
 Business records destroyed
 Customer base interrupted

- a).....
 b).....
 c).....
 d).....
 e).....

2. How These Impacts Affected Tourism. Indicate how tsunami impacts to the **Business Community/Environment** described in the last section affected tourism in marine national parks?

Examples: Employees lost to tsunami difficult to replace
 Destroyed dock facilities make transport of tourists impossible
 Tourism business advertising cooperative broken down

- a).....
 b).....
 c).....
 d).....
 e).....

3. Recovery Actions Taken. Please describe the most important governmental or private response and/or recovery actions taken in 2005 to help recover the **Business Community/ Environment** as it relates to marine national park tourism.

Examples:

Activities	Organization(s)	Outcome or Impact
Construction of new visitor center	National Park Authority	Created potential to support tourists
Computers and business software purchased for businesses	National Park Authority	Allows reconstruction of tourist records, tax records, and new payroll records

Your Responses:

Activities	Organization(s)	Outcome/Impact/Comments

4. Constraints to Recovery. Please describe all significant *constraints* that you or your organization have experienced or have heard about that have limited or undermined **Business Community/Environment** recovery efforts.

Examples: Lack of cooperation between tour operators
 Fragmentation of national management structure/responsibilities
 Promised funding yet to materialize
 Redundancy in recovery assignments and activities

- a).....
 b).....
 c).....
 d).....
 e).....
-

Section IV. Social, Health and Safety Environment

1. Tsunami Impacts. Please describe several of the most significant **Social, health, and safety-related** tsunami impacts within marine park boundaries and related areas. Here, *social, health, and safety* impacts are those affecting human populations—directly through loss of life, and indirectly due to psychological trauma, disruption of social services, loss of employment, loss of public and private transportation, and individual and family stress.

Examples: Park rangers or family members killed by tsunami
 Traumatized staff due to the loss of other lives
 Anxiety regarding self or staff safety
 Fear of water and coastal area

- a).....
 b).....
 c).....
 d).....
 e).....

2. How These Impacts Affected Tourism. Indicate how tsunami impacts to the **Social, Health, and Safety Environment** described in the last section affected tourism in marine national parks?

Examples: Family members of park employees lost/living suffer debilitating trauma
 Spilled fuel contaminates local water supplies
 Prospective tourists afraid to visit affected parks due to tsunami-related deaths

- a).....
 b).....
 c).....
 d).....
 e).....

3. Recovery Actions Taken. Please describe the most important governmental or private response and/or recovery actions taken in 2005 to help recover the **Social, Health, and Safety Environment** as it relates to marine national park tourism.

Examples:

Activities	Organization(s)	Outcome or Impact
Mental health counseling for park employees	Local service agency	Helped employees refocus on rebuilding their lives and livelihoods
Pollution clean-up	National Park Authority	Water made potable

Your Responses:

Activities	Organization(s)	Outcome/Impact/Comments

4. Constraints to Recovery. Please describe all significant *constraints* that you or your organization have experienced or have heard about that have limited or undermined **Social, Health, and Safety Environment** recovery efforts.

Examples: Lack of cooperation between tour operators
 Fragmentation of national management structure/responsibilities
 Promised funding yet to materialize
 Redundancy in recovery assignments and activities

- a).....
 b).....
 c).....
 d).....
 e).....

Section V. Additional Recovery Actions Needed

Please describe (and rate/rank) the additional (or improved) governmental or private recovery actions that should have been taken in the past, or should be taken in the future with to recover tourism in marine national parks.

Please consider actions in all four following aspects:

- Natural resource and ecosystem
- Built environment
- Business community
- Social, health, and safety.

Examples:

Comprehensive, park-specific plans for recovery are lacking & still needed
 Tsunami education, awareness and evacuation planning

Needed Recovery Action	By Whom?	Priority*	Rank**

* Rate Priority as High, Moderate, Low

** Put in Rank order after completing list and priority ratings

Appendix E Questionnaire Round I for the Delphi survey (Thai version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

<วันที่>

เรียน ...<ชื่อ>.....

ท่านได้รับจดหมายฉบับนี้เนื่องจากท่านได้รับความเชื่อถือเป็นผู้ที่มีความรู้ความเข้าใจ และมีประสบการณ์ในการฟื้นฟูผลกระทบจากคลื่นสึนามิในช่วงระยะเวลาหนึ่งปีที่ผ่านมา ดิฉันขอเรียนเชิญท่านเข้าร่วมเป็นส่วนหนึ่งในงานวิจัยระดับปริญญาเอกของดิฉัน โดยจุดประสงค์หลักประการแรกของการวิจัยนี้คือ เพื่อบันทึกผลกระทบของคลื่นสึนามิที่มีต่อระบบการจัดการการท่องเที่ยวในเขตอุทยานทางทะเล และบันทึกแนวทางการฟื้นฟูผลกระทบในระยะเวลาหนึ่งปีที่ผ่านมา จุดประสงค์หลักประการที่สองคือ เพื่อพัฒนาเทคนิคการประเมินผลกระทบจากภัยธรรมชาติที่มีต่ออุทยานแห่งชาติทางทะเล ผลการศึกษาจากงานวิจัยนี้จะช่วยเพิ่มความเข้าใจในผลกระทบของภัยธรรมชาติที่มีต่อการท่องเที่ยว โดยเฉพาะการท่องเที่ยวในเขตอุทยานทางทะเล และนำไปสู่การฟื้นฟูผลกระทบที่รวดเร็วและมีประสิทธิภาพในอนาคต

งานวิจัยนี้เก็บรวบรวมความคิดเห็นจากผู้เชี่ยวชาญเช่นท่านด้วยเทคนิคเดลฟาย (Delphi) โดยเทคนิคนี้ประกอบด้วยการตอบแบบสอบถามที่ต่อเนื่องกันจำนวน ๓ ชุด การตัดสินใจเข้าร่วมในงานวิจัยนี้เป็นไปด้วยความสมัครใจจากท่าน คำตอบจากทุกชุดคำถามจะถูกเก็บเป็นความลับ มีเพียงผลวิเคราะห์ทางสถิติเท่านั้นที่จะถูกนำไปเผยแพร่ในการรายงาน

หากท่านมีข้อสงสัยหรือข้อข้องใจเกี่ยวกับการวิจัยชิ้นนี้ กรุณาส่งอีเมลถึงดิฉันได้ที่ mepraserts@geo.orst.edu หรือ somdeem@yahoo.com หรือทางโทรศัพท์ที่ (๐๒) ๕๑๕-๕๖๕๕ ท่านสามารถฝากข้อความของท่านได้ที่หมายเลขโทรศัพท์ดังกล่าว และดิฉันสัญญาว่าจะติดต่อกลับโดยเร็วที่สุด

ความร่วมมือจากท่านมีความสำคัญเป็นอย่างยิ่งต่อการวิจัยครั้งนี้ ดิฉันเชื่อว่าผลจากการศึกษานี้นอกจากจะมีประโยชน์เป็นอย่างยิ่งต่อประเทศไทยอันเป็นที่รักของเราแล้ว จะยังสามารถช่วยลดความสูญเสียของชีวิตและทรัพย์สินอันเนื่องมาจากภัยธรรมชาติในประเทศต่างๆทั่วโลกได้ในอนาคต ดิฉันจึงขอขอบพระคุณล่วงหน้าในความร่วมมือของท่าน

ขอแสดงความเคารพเป็นอย่างสูง

นางสาว สมฤดี มีประเสริฐ

Round I questionnaire (Thai Version)

บทนำ

จุดมุ่งหมายของการศึกษา

เหตุการณ์แผ่นดินไหวและพิบัติภัยคลื่นสึนามิซึ่งเกิดขึ้นในมหาสมุทรอินเดีย เมื่อวันที่ 26 ธันวาคม พ.ศ. 2549 เป็นประจักษ์พยานถึงพลังของภัยธรรมชาติซึ่งสามารถก่อให้เกิดความเสียหายแก่ชีวิตและทรัพย์สินมูลค่ามหาศาล ผลกระทบที่รุนแรงและกว้างขวางของภัยพิบัติครั้งนี้ได้กระตุ้นเตือนชาวไทยและผู้คนทั่วโลกถึงความเสี่ยงของภัยธรรมชาติที่มีต่อมนุษย์และสภาพแวดล้อม ในประเทศไทยของเรา ความรุนแรงของเหตุการณ์ครั้งนี้ได้ก่อให้เกิดความต้องการองค์ความรู้เกี่ยวกับผลกระทบของภัยธรรมชาติ และองค์ความรู้ที่ใช้ในการฟื้นฟูผลกระทบที่มีต่อการท่องเที่ยว ซึ่งเป็นส่วนสำคัญในการสร้างรายได้ให้แก่ประเทศ

อันเนื่องจากหลักการและเหตุผลดังกล่าวเป้าหมายที่สำคัญของการวิจัยนี้ คือการศึกษาผลกระทบของพิบัติภัยคลื่นสึนามิที่มีต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเล รวมทั้งกระบวนการฟื้นฟูผลกระทบของการท่องเที่ยวในช่วงระยะหนึ่งปีแรกภายหลังเหตุการณ์ (2548) ผลจากการศึกษาเบื้องต้นนี้จะถูกนำไปใช้ในการกำหนดแนวทางการประเมินความเสี่ยงภัย (Vulnerability Assessment Technique) ของอุทยานแห่งชาติทางทะเลต่อภัยธรรมชาติ โดยแนวทางการประเมินผลกระทบนี้สามารถนำมาใช้ได้ทั้งก่อนเหตุการณ์ภัยธรรมชาติเพื่อกำหนดมาตรการการเตรียมพร้อม และภายหลังพิบัติภัยธรรมชาติเพื่อส่งเสริมการฟื้นฟูผลกระทบที่รวดเร็วและมีประสิทธิภาพ

ประเภทของผลกระทบจากสึนามิ

ในการวิจัยครั้งนี้ คิดค้นจะทำการสำรวจผลกระทบโดยตรง และทางอ้อม ของพิบัติภัยคลื่นสึนามิที่มีต่ออุทยานแห่งชาติทางทะเล และกระบวนการฟื้นฟูผลกระทบ เพื่อความเข้าใจที่ตรงกันของผู้เข้าร่วมงานวิจัย จึงมีความจำเป็นต้องกำหนดนิยามจำเพาะของคำสำคัญต่างๆ ดังนี้

ผลกระทบทางตรง (Direct Impact) หมายถึง ความเสียหายทางกายภาพเบื้องต้น ซึ่งเกิดขึ้นในทันทีขณะที่สึนามิกระทบชายฝั่ง ความรุนแรงของคลื่น น้ำท่วมอย่างรุนแรง และฉับพลัน แรงผลักดัน แรงดูดกลับของน้ำ คลื่นชีวิตมนุษย์และสัตว์ป่า ทำให้เกิดการพังทลายของชายฝั่ง ถอนรากพืชพรรณชายฝั่ง ทำลายอาคารบ้านเรือน และสิ่งสาธารณูปโภค ทำลายธุรกิจ และอื่นๆอีกมากมาย

ผลกระทบทางอ้อม (Indirect Impact) หมายถึง ผลกระทบอันเนื่องมาจากสึนามิแต่เกิดขึ้นตามมาจากเหตุการณ์สึนามิ เช่น ขยะจากซากปรักหักพัง การรั่วไหลของน้ำมันหรือสารพิษ เนื่องจากรถยนต์ หรือถังบรรจุก๊าซเกิดความเสียหาย น้ำเค็มน้ำใช้เกิดการปนเปื้อน การสูญเสียความเชื่อถือของนักท่องเที่ยว และผลกระทบด้านจิตใจและสุขภาพจิตอันเนื่องมาจากความสูญเสีย นอกจากนี้ผลกระทบประเภทนี้ยังหมายถึง ผลกระทบที่แผ่ขยายจากพื้นที่ประสบภัยพิบัติ ไปสู่พื้นที่นอกเขตภัยพิบัติ เช่น โรงแรมและท่าเรือโดยสารถูกทำลาย ทำให้ไม่มีนักท่องเที่ยวมาเที่ยว และทำให้เศรษฐกิจโดยรวมของเมืองได้รับผลกระทบ แต่อย่างไรก็ตามผลกระทบทางอ้อมนี้อาจส่งผลได้ เช่น ความช่วยเหลือทั้งด้านการเงิน เพื่อการศึกษาวิจัย หรือการสร้างสิ่งสาธารณูปโภคใหม่เพื่อการฟื้นฟูสภาพความเป็นอยู่

ในแบบสอบถามนี้ ผลกระทบทั้งสองประเภทนี้จะถูกแบ่งออกเป็น 4 ด้าน ได้แก่

1. ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ (Natural resource and ecosystem)

ตัวอย่างของผลกระทบประเภทนี้ คือ ความเสียหายโดยตรงทางกายภาพที่มีต่อระบบนิเวศชายฝั่ง สัตว์ป่า และสัตว์ทะเล เช่นแนวปะการังพังเสียหาย การพังทลายชายฝั่ง และผลกระทบทางอ้อมที่เกี่ยวข้องกับซากความเสียหาย หรือน้ำมันและสารพิษที่รั่วไหลลงสู่ทะเล และระบบนิเวศชายฝั่ง

2. ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น (Built environment)

ผลกระทบประเภทนี้หมายถึงความเสียหายที่เกิดขึ้นกับสิ่งแวดล้อมที่มนุษย์สร้างขึ้นได้แก่ ระบบขนส่ง ถนน ระบบสาธารณูปโภค ไฟฟ้า โทรศัพท์ บ้านเรือนที่อยู่อาศัย อาคารพาณิชย์ อาคารของทางราชการ โรงเรียน สถานศึกษา

3. ด้านธุรกิจ (Business community)

ผลกระทบทางด้านธุรกิจ หมายถึงระบบธุรกิจมีไข้เพียงอาคาร หรือสิ่งก่อสร้าง ในพื้นที่ได้รวมถึงชื่อเสียงของกิจการ กลุ่มลูกค้าเป้าหมาย เจ้าหน้าที่และบุคลากร ผลกระทบประเภทนี้มักเป็นผลกระทบทางอ้อม ซึ่งเป็นผลพวงมาจากความเสียหายโดยตรงทางกายภาพต่อสิ่งแวดล้อม นอกจากนี้ระบบธุรกิจการค้า โดยเฉพาะธุรกิจการท่องเที่ยวยังเป็นระบบที่ละเอียดอ่อน ง่ายต่อการได้รับผลกระทบที่แผ่ขยายมาจากส่วนอื่นๆ (Halo effect) เช่น ความเสียหายต่อสภาพแวดล้อมโดยทั่วไป ความกังวลต่อความปลอดภัยของนักท่องเที่ยว และความเจ็บปวดทางจิตใจจากความสูญเสีย ปัจจัยลบเหล่านี้มีผลอย่างมากต่อการตัดสินใจไม่กลับมาเยือนบริเวณภัยพิบัติของนักท่องเที่ยว

4. ด้านสังคม สุขภาพ และความปลอดภัย (Social, health, and safety)

ผลกระทบด้านสังคมคือผลกระทบที่มีต่อกลุ่มประชากร เช่น การสูญเสียชีวิต และบุคคลอันเป็นที่รัก การตกงาน การสูญเสียเครื่องมือ หรือแหล่งทำมาหากิน ความเครียดของครอบครัวอันเนื่องมาจากความสูญเสีย และความขาดแคลน ซึ่งอาจนำไปสู่ปัญหาครอบครัวในระยะยาว

แบบสอบถาม รอบที่ 1

แบบสอบถามชุดนี้มีทั้งสิ้น 10 หน้า แบ่งออกเป็น 5 ส่วน โดย 4 ส่วนแรกเน้นที่แต่ละประเภทของผลกระทบ คือ

ส่วนที่ 1 ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ (Natural resource and ecosystem)

ส่วนที่ 2 ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น (Built environment)

ส่วนที่ 3 ด้านธุรกิจ (Business community)

ส่วนที่ 4 ด้านสังคม สุขภาพ และความปลอดภัย (Social, health, and safety)

และ **ส่วนที่ 5** ข้อเสนอแนะเพิ่มเติม เพื่อฟื้นฟูสภาพการท่องเที่ยวในเขตอุทยานอย่างยั่งยืน ภายหลังภัยธรรมชาติ

ใน 4 ส่วนแรกนี้ ประกอบด้วย 5 ชุดคำถาม ที่เกี่ยวกับหัวข้อต่อไปนี้ คือ

- 1) ผลกระทบของสึนามิ
- 2) ผลกระทบเหล่านี้ส่งผลอย่างไรต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเล
- 3) การตอบสนองให้การช่วยเหลือ และฟื้นฟูผลกระทบโดยภาครัฐและเอกชนในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)
- 4) อุปสรรค และ/หรือ ข้อขัดแย้งในการให้ความช่วยเหลือ และฟื้นฟู

เพื่อความเข้าใจที่ชัดเจน และตรงกันระหว่างผู้เข้าร่วมงานวิจัย ก่อนตอบคำถาม ขอความกรุณาท่านพิจารณานิยาม หรือความหมายของผลกระทบประเภทต่างๆ ดังที่กล่าวไว้ในบทนำ ในการตอบแบบสอบถามนี้ ขอความกรุณาท่าน ระบุอุทยานแห่งชาติทางทะเลที่ท่านกล่าวถึงในช่องข้างล่างนี้ โดยท่านสามารถเลือก **ระบุถึงอุทยานได้มากกว่า 1 แห่ง ตามแต่ประสบการณ์ และความเชี่ยวชาญของท่าน**

- ☐ อุทยานแห่งชาติ อ่าวพังงา จ.พังงา
- ☐ อุทยานแห่งชาติ หาดนพรัตน์ธารา และหมู่เกาะพีพี จ.กระบี่
- ☐ อุทยานแห่งชาติ หมู่เกาะสุรินทร์ จ.พังงา
- ☐ อุทยานแห่งชาติ แลรมสน จ.ระนอง
- ☐ สภาพโดยรวมของทุกอุทยานฯ

การตอบแบบสอบถามชุดนี้ใช้เวลาประมาณ 30 นาที และเพื่อความสมบูรณ์ของข้อมูล ขอความกรุณาท่านตอบทุกคำถาม ในทุกส่วนของชุดคำถาม ดิฉันขอขอบพระคุณท่านเป็นอย่างสูงสำหรับเวลาอันมีค่าของท่าน

ส่วนที่ 1 ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ (Natural resource and ecosystem)

1.1 ผลกระทบของสึนามิ

กรุณากรอกผลกระทบของสึนามิที่มีต่อ**ทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ** ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง โดยผลกระทบเหล่านี้รวมถึงผลกระทบทางกายภาพโดยตรงและโดยอ้อม

ตัวอย่างคำตอบ

ปะการังหักพัง

ชายหาดพังทลาย

น้ำกิน น้ำใช้ปนเปื้อนน้ำทะเล

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1.2 ผลกระทบที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรุณาอธิบายว่าผลกระทบของสึนามิที่มีต่อ**ทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ** ที่ท่านระบุในคำตอบข้อที่ 1 นี้ ส่งผลต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเลอย่างไร

ตัวอย่างคำตอบ

ปะการังถูกทำลาย เสียหาย ทำให้แหล่งดำน้ำเสียหาย ลดความสวยงาม

ชายหาดพังทลาย ลดความสวยงามของหาด

น้ำกิน น้ำใช้ปนเปื้อนน้ำทะเล ทำให้ขาดแคลนน้ำใช้ และดื่มภายในอุทยานฯ

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1.3 กิจกรรมการฟื้นฟูผลกระทบ

กรุณาระบุกิจกรรมการตอบสนอง หรือกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยว ที่เกี่ยวข้องกับการฟื้นฟู**ทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ** ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

ตัวอย่างคำตอบ

กิจกรรม	หน่วยงาน	ผลของงาน หรือประสิทธิผล
การเก็บขยะทั้งบนบก และในน้ำ	นักดำน้ำอาสาสมัคร และนักเรียนจากโรงเรียนในท้องถิ่น	ประสบความสำเร็จอย่างสูง แต่ยังมิชยะที่หลงเหลืออยู่อีกมาก
การสร้างสิ่งก่อสร้างใหม่ ทดแทนสิ่งที่เสียหาย เพื่อรองรับนักท่องเที่ยว	กรมอุทยานฯ	สร้างศักยภาพในการรองรับนักท่องเที่ยว
การเร่งนโยบายส่งเสริมการท่องเที่ยว	การท่องเที่ยวแห่งประเทศไทย	ยังไม่แน่นอน การท่องเที่ยวยังฟื้นช้ามาก

คำตอบของท่าน.....

กิจกรรม	หน่วยงาน	ผลของงาน หรือประสิทธิผล

1.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กรุณาอธิบายอุปสรรค หรือข้อขัดขวาง ซึ่งก่อให้เกิดข้อจำกัด และ/หรือความล่าช้า ในกระบวนการฟื้นฟูผลกระทบด้าน **ทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ** ที่ตัวท่าน หรือหน่วยงานของท่านประสบ ได้ยิน หรือรับรู้ ในช่วงเวลาหนึ่งปีที่ผ่านมา

ตัวอย่างคำตอบ

ไม่ได้รับเงินทุนช่วยเหลือตามที่สัญญาไว้

ความซ้ำซ้อนของการมอบหมายงาน และกิจกรรมการช่วยเหลือ

ขาดความร่วมมือกันระหว่างหน่วยงานรัฐ

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ส่วนที่ 2 ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น (Built environment)

2.1 ผลกระทบของสึนามิ

กรุณาบอกผลกระทบของสึนามิที่มีต่อ **สิ่งแวดล้อมที่มนุษย์สร้างขึ้น** ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง โดยผลกระทบเหล่านี้รวมถึงผลกระทบทางกายภาพโดยตรงและโดยอ้อม และความเสียหายที่เกิดขึ้นกับสิ่งแวดล้อมที่มนุษย์สร้างขึ้น ได้แก่ ระบบขนส่ง ถนน ระบบสาธารณูปโภค ไฟฟ้า โทรศัพท์ บ้านเรือนที่อยู่อาศัย อาคารพาณิชย์ อาคารของทางราชการ โรงเรียน สถานศึกษา เป็นต้น

ตัวอย่างคำตอบ

ทำเทียบเรือสำหรับเรือนำนักท่องเที่ยวถูกทำลาย เสียหาย

อาคารที่พักนักท่องเที่ยวเสียหาย

อาคารที่ทำการอุทยานฯ ถูกทำลาย

เครื่องปั้นไฟเสียหาย

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2.2 ผลกระทบที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรุณาอธิบายว่าผลกระทบของสึนามิที่มีต่อ **สิ่งแวดล้อมที่มนุษย์สร้างขึ้น** ที่ท่านระบุในคำตอบข้อที่ 1 นี้ ส่งผลต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเลอย่างไร

ตัวอย่างคำตอบ

อุทยานฯ ขาดสิ่งอำนวยความสะดวกเพื่อรองรับนักท่องเที่ยว

อุปกรณ์เพื่อสนับสนุนการดำน้ำลึก (SCUBA) ถูกทำลาย ทำให้สูญเสียนักท่องเที่ยวกลุ่มเป้าหมาย

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2.3 กิจกรรมการฟื้นฟูผลกระทบ

กรุณาระบุกิจกรรมการตอบสนอง หรือกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยว ที่เกี่ยวข้องกับการฟื้นฟู **สิ่งแวดล้อมที่มนุษย์สร้างขึ้น** ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

ตัวอย่างคำตอบ

กิจกรรม	หน่วยงาน	ผลของงาน หรือประสิทธิผล
การสร้างสิ่งก่อสร้างใหม่ ทดแทนสิ่งที่เสียหาย เพื่อรองรับนักท่องเที่ยว	กรมอุทยานฯ	สร้างศักยภาพในการรองรับนักท่องเที่ยว
ทำเที่ยวเรือใหม่	กรมอุทยานฯ	ทำให้นักท่องเที่ยวเดินทางสู่อุทยาน ได้สะดวก

คำตอบของท่าน.....

กิจกรรม	หน่วยงาน	ผลของงาน หรือประสิทธิผล

2.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กรุณาอธิบายอุปสรรค หรือข้อขัดขวาง ซึ่งก่อให้เกิดข้อจำกัด และ/หรือความล่าช้า ในกระบวนการฟื้นฟูผลกระทบด้าน **สิ่งแวดล้อมที่มนุษย์สร้างขึ้น** ที่ตัวท่านหรือหน่วยงานของท่านประสบ ได้ยิน หรือรับรู้ ในช่วงเวลาหนึ่งปีที่ผ่านมา

ตัวอย่างคำตอบ

ไม่ได้รับเงินทุนช่วยเหลือตามที่สัญญาไว้

ความซ้ำซ้อนของการมอบหมายงาน และกิจกรรมการช่วยเหลือ

ขาดความร่วมมือกันระหว่างหน่วยงานรัฐ

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ส่วนที่ 3 ด้านธุรกิจ (Business community)

3.1 ผลกระทบของสึนามิ

กรุณาบอกผลกระทบของสึนามิที่มีต่อ **ธุรกิจ** ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง ในที่นี้ผลกระทบทางด้านธุรกิจ หมายรวมทั้ง **ระบบธุรกิจ** มิใช่เพียงอาคาร หรือสิ่งก่อสร้าง ในที่นี้ได้รวมถึงชื่อเสียงของกิจการ กลุ่มลูกค้าเป้าหมาย เจ้าหน้าที่และบุคลากร ผลกระทบประเภทนี้มักเป็นผลกระทบทางอ้อม ซึ่งเป็นผลพวงมาจากความเสียหายโดยตรงทางกายภาพต่อสิ่งแวดล้อม

ตัวอย่างคำตอบ

เรือขนส่งนักท่องเที่ยวเสียหาย

ข้อมูลและบันทึกทางธุรกิจถูกทำลาย

กลุ่มนักท่องเที่ยวเป้าหมายเสียชีวิต หรือถูกรบกวน

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3.2 ผลกระทบที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรุณาอธิบายว่าผลกระทบของสึนามิที่มีต่อ**ธุรกิจ**ที่ท่านระบุในคำตอบข้อที่ 1 นี้ ส่งผลต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเลอย่างไร

ตัวอย่างคำตอบ

ถูกช้าง หรือเจ้าของกิจการเสียชีวิต

เรือขนส่งนักท่องเที่ยวเสียหาย ทำให้นักท่องเที่ยวเดินทางไปอุทยานฯ ไม่ได้

ระบบกลุ่มกิจการที่เกี่ยวข้องกับการท่องเที่ยว เสียหายขาดทุน ไม่สามารถดำเนินการต่อไปได้

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3.3 กิจกรรมการฟื้นฟูผลกระทบ

กรุณาระบุกิจกรรมการตอบสนอง หรือกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยว ที่เกี่ยวข้องเนื่องกับการฟื้นฟู**ธุรกิจ** ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

ตัวอย่างคำตอบ

กิจกรรม	หน่วยงาน	ผลของงาน หรือประสิทธิผล
การสร้างสิ่งก่อสร้างใหม่ ทดแทนสิ่งที่เสียหาย เพื่อรองรับนักท่องเที่ยว	กรมอุทยานฯ	สร้างศักยภาพในการรองรับนักท่องเที่ยว
การจัดหาคอมพิวเตอร์และระบบการจัดเก็บข้อมูลใหม่	กรมอุทยานฯ	ทำให้มีการจัดเก็บข้อมูลนักท่องเที่ยวใหม่ และมีประสิทธิภาพ

คำตอบของท่าน.....

กิจกรรม	หน่วยงาน	ผลของงาน หรือประสิทธิผล

3.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กรุณาอธิบายอุปสรรค หรือข้อขัดขวาง ซึ่งก่อให้เกิดข้อจำกัด และ/หรือความล่าช้า ในกระบวนการฟื้นฟูผลกระทบด้าน**ธุรกิจ** ที่ตัวท่าน หรือหน่วยงานของท่าน ประสบ ได้ยิน หรือรับรู้ ในช่วงเวลาหนึ่งปีที่ผ่านมา

ตัวอย่างคำตอบ

ขาดความร่วมมือกันระหว่างบริษัทนำเที่ยว

ความซ้ำซ้อนของการมอบหมายงาน และกิจกรรมการช่วยเหลือ

ขาดความร่วมมือกันระหว่างหน่วยงานรัฐ

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ส่วนที่ 4 ด้านสังคม สุขภาพ และความปลอดภัย (Social, health, and safety)

4.1 ผลกระทบของสึนามิ

กรุณากรอกผลกระทบของสึนามิที่มีต่อ **สังคม สุขภาพ และความปลอดภัย** ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง ในที่นี้ผลกระทบทางด้าน **สังคม สุขภาพ และความปลอดภัย** คือผลกระทบที่มีต่อกลุ่มประชากร ทั้งสุขภาพกายและใจ เช่น การสูญเสียชีวิต และบุคคลอันเป็นที่รัก ความพิการเนื่องความบาดเจ็บจากแรงกระแทกของสึนามิ การตกงาน การสูญเสียเครื่องมือหรือแหล่งทำมาหากิน ความเครียดของครอบครัวอันเนื่องมาจากความสูญเสีย และความขาดแคลน ซึ่งอาจนำไปสู่ปัญหาครอบครัว และ โครงสร้างชุมชนในระยะยาว

ตัวอย่างคำตอบ

เจ้าหน้าที่อุทยาน หรือสมาชิกในครอบครัวเสียชีวิต
ความเจ็บปวดทางใจ อันเนื่องมาจากพบเห็นผู้อื่นเสียชีวิต
ความวิตกกังวลในความปลอดภัยของตนเอง และลูกน้องในการทำงาน
ความกลัวทะเล หรือกลัวสิ่งเหนือธรรมชาติ

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4.2 ผลกระทบที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรุณาอธิบายว่าผลกระทบของสึนามิที่มีต่อ **สังคม สุขภาพ และความปลอดภัย** ที่ท่านระบุในคำตอบข้อที่ 1 นี้ ส่งผลต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเลอย่างไร

ตัวอย่างคำตอบ

ครอบครัวของเจ้าหน้าที่อุทยานที่เสียชีวิตขาดผู้นำครอบครัว ขาดความมั่นคงในชีวิต
น้ำมัน และสารพิษที่รั่วไหลออกมาจากถังบรรจุ ปนเปื้อนแหล่งน้ำใช้
นักท่องเที่ยวหลีกเลี่ยงการเดินทางมาเที่ยว เนื่องจากกลัววิญญูณคนตาย

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4.3 กิจกรรมการฟื้นฟูผลกระทบ

กรุณาระบุกิจกรรมการตอบสนอง หรือกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยว ที่เกี่ยวข้องกับการฟื้นฟู **สังคม สุขภาพ และความปลอดภัย** ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

ตัวอย่างคำตอบ

กิจกรรม	หน่วยงาน	ผลของงาน หรือประสิทธิผล
การให้ความช่วยเหลือด้านจิตเวช แก่เจ้าหน้าที่อุทยาน	กรมสุขภาพจิต และกรมอุทยานฯ	ช่วยฟื้นฟูสภาพจิตใจของเจ้าหน้าที่
การทำความสะอาดขยะ ซาก และน้ำที่รั่วไหล	กรมอุทยานฯ	ทำให้แหล่งน้ำใช้การได้อีกครั้ง

คำตอบของท่าน.....

กิจกรรม	หน่วยงาน	ผลของงาน หรือประสิทธิผล

Appendix F Questionnaire Round II for the Delphi survey (English version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

<date>

Dear ...<name>.....,

Thank you very much for completing and returning the Round I questionnaire regarding the impacts of the 2004 tsunami on tourism in marine parks and the subsequent recovery efforts. I have compiled all 23 responses and summarized them in a questionnaire format designed to further refine the results in Round II. The twenty-three panel members who responded to the questionnaire work in 6 different fields of expertise including:

- Park managers
- Coastal and marine resource managers
- Marine scientists and academic researchers
- Non-Government Organizations (NGOs) and volunteer groups
- Tourism promoters and tourism managers
- Tour operators

As you embark on this part of the process, you will be asked to consider the following questions:

- How significant is each one of the impacts listed?
- How have each of these impacts affected the tourism sector in marine national parks?
- How successful are the response-recovery efforts, i.e., are goals being achieved?
- What priority should be given to each of the recovery actions listed?

Your opinions will be most helpful in improving future post-disaster recovery efforts. As I mentioned in my previous letter, your kind participation is voluntary and your individual responses will be kept confidential. Your anonymity is assured while this study is being conducted. Only aggregated group results will be reported.

Please complete and return this Round II questionnaire as soon as you can, and before <Date> at the latest. Please accept my sincere appreciation for your kind cooperation and assistance. If you have any questions or comments about this study, please do not hesitate to contact me. My telephone number is 02-579-9645, or you can write to me at the email addresses (somdeem@yahoo.com or mepraserts@geo.orst.edu).

Sincerely Yours,

Somrudee Meprasert

****Please start here****

Your Identification Number

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Round II Questionnaire

This questionnaire consists of six sections. The first four sections focus on the four categories of tsunami impacts, including aggregated assessments of effects on marine tourism, disaster responses and their effectiveness, and obstacles to response and recovery. Section five addresses additional response actions that are needed; section six focuses on the positive outcomes of the disaster.

- Section 1:** Natural resources and ecosystems
Section 2: Built environment
Section 3: Business community
Section 4: Social, health, and safety
Section 5: Additional recommendations for disaster recovery and ways to achieve more sustainable, disaster-resilient tourism in marine parks
Section 6: Positive impacts of the 2004 tsunami and additional recommendations

For Round II of this Delphi study, please use the following protocol, drawing on your own experience:

For Sections 1 through 4:

1. Review the Round I aggregated list of tsunami impacts for each category, adding to them if necessary.
2. Considering these impacts, use the 10-point scale to assess the extent to which each impact affected marine park tourism.
3. Considering the tsunami response and recovery actions identified in Round I, use the 10-point scale to assess the effectiveness of each in recovering marine park tourism.
4. Review and add to the list of constraints to response and recovery

For Section 5:

1. Assign a priority (high, moderate, or low) to each of the additional response/recovery actions identified by Round I participants.

For Section 6:

1. Describe any positive impacts that the tsunami and its impacts have had (or might have) on marine park tourism.

SECTION 1: NATURAL RESOURCES AND ECOSYSTEMS

Examples of these impacts would include direct physical and biological damages on coastal ecosystem, wildlife, and marine animals. It would also include coral reef damage and coastal erosion. Examples of indirect impacts would be damages that are related to debris, oil spill, and leakage of toxic substances into coastal water and coastal ecosystem.

1.1 Impacts of the 2004 tsunami on natural resources and ecosystems that occurred within and/or nearby marine park boundaries

Please review and/or provide additional comments on responses from Round I questionnaire

1. Changes in offshore/nearshore bathymetry due to sand entrainment by tsunami waves.
2. Loss of marine fish and other marine animals due to direct physical damage and transport inland.
3. Changes in behavior of some marine fish and animals due to physical damage to habitats.
4. Tsunami changed underwater depths and habitat conditions adversely impact regular diving destinations.
5. Severely eroded beaches affect coastal wildlife habitat, including nesting areas for sea turtles, mangrove bird nesting and fish nurseries, and beach forests.
6. White, clean sandy beaches covered by black, dirty-looking sediment and debris in some areas.
7. Seagrass beds and mangroves uprooted up and/or smothered by sand and sediment in some areas.
8. Coral reef communities directly damaged by the force of tsunami waves and entrained sediment, resulting in broken, upended, or smothered corals and other animals and plants.
9. Creation, transport, and deposition of huge amounts of tsunami-generated debris (building remnants, vehicles, trees and other abrasive materials) exacerbate direct physical damage to both marine and coastal resources and ecosystems.
10. Seawater intrusion into surface and underground freshwater supplies makes them unpotable for human and stock consumption, kills trees and vegetation, particularly beach forests and peat swamp forests, and reduces agricultural capacity of coastal lands.
11.
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1.2 How these natural resource and ecosystem impacts affected the tourism sector in marine national parks

Please circle ○ appropriate score.

List of impact	Level of impact on park tourism										Not Applicable (NA)
	Very high									Very low	
Immediate changes of coastal bathymetry altered coastal ecosystem both inland and underwater. It possibly causes behavior changes in marine animals in feeding and migrating. It also might reduce amount of fish and some kinds of marine animals.	10	9	8	7	6	5	4	3	2	1	
Immediate changes of coastal bathymetry and beach slope threaten navigation and tourism safety	10	9	8	7	6	5	4	3	2	1	
Immediate changes of coastal bathymetry and underwater condition cause difficulty in finding regular diving destinations	10	9	8	7	6	5	4	3	2	1	
Altered water current and sedimentation cause turbid coastal water	10	9	8	7	6	5	4	3	2	1	

Damaged coral reef and sea-fan reduces number of diving sites.	10	9	8	7	6	5	4	3	2	1	
Seagrass beds in some areas are completely smothered by sand and sediment	10	9	8	7	6	5	4	3	2	1	
Huge amount of debris both inland and underwater reduce natural aesthetics	10	9	8	7	6	5	4	3	2	1	
Pointed and sharp debris on beaches threaten tourist safety	10	9	8	7	6	5	4	3	2	1	
In some places, white and clean sandy beaches are covered by black and dirty-looking sediment	10	9	8	7	6	5	4	3	2	1	
Eroded beaches, dying mangrove and dying beach forest reduce landscape aesthetics	10	9	8	7	6	5	4	3	2	1	
Seawater intrusion into surface and underground water system not only causes beach forest and peat swam forest deterioration but it also causes lack of potable water for local people.	10	9	8	7	6	5	4	3	2	1	

1.3 Natural resource and ecosystem-related response and recovery efforts taken in 2005 and their effectiveness with respect to marine national park tourism recovery

Please circle ○ appropriate score.

Response-Recovery Actions Undertaken	Effectiveness of natural resource and ecosystem-related response-recovery efforts, with respect to marine park tourism recovery										Not Applicable (NA)
	Very high									Very low	
Clean up of land and underwater areas – volunteer divers, military, DMCR, NGOs, and park officials	10	9	8	7	6	5	4	3	2	1	
Repaired damaged corals and seafans – volunteer divers, university staff, park officials, and private business volunteers	10	9	8	7	6	5	4	3	2	1	
Transplanted and replanted corals – marine biologists, DMCR, and volunteer divers	10	9	8	7	6	5	4	3	2	1	
Designed artificial reef to replace damage diving sites – universities and DMCR	10	9	8	7	6	5	4	3	2	1	
Designed trails in mangrove forest – DMCR	10	9	8	7	6	5	4	3	2	1	
Designed underwater trail for divers – universities and DMCR	10	9	8	7	6	5	4	3	2	1	
Mitigated the lack of potable water issue due to seawater intrusion – National Park Department and Department of Underground Water	10	9	8	7	6	5	4	3	2	1	
Installed new anchoring buoys within park boundaries – by DMCR and Marine Park Division	10	9	8	7	6	5	4	3	2	1	
Assigned new activity zones within park boundaries to allow for recovery – universities and Marine Park Div.	10	9	8	7	6	5	4	3	2	1	
Replanted mangrove and beach forests – school children, adult volunteers, NGOs, and DMCR	10	9	8	7	6	5	4	3	2	1	
Initiated educational and tourism promotional project within marine parks	10	9	8	7	6	5	4	3	2	1	

– DMCR, NGOs, and Tourism Development Division											
Closed some damaged diving destinations to allow natural recovery – Marine Park Division	10	9	8	7	6	5	4	3	2	1	

1.4 Obstacles or constraints to recovery of natural resources and ecosystems, and of marine park tourism

[Please review and/or provide additional comments on responses from round I questionnaire](#)

1. Major storms and associated winds and currents during 2005 monsoon season (May to November) significantly delayed underwater and offshore assessment and recovery operations, including underwater debris clean-up.
2. Turbid seawater and a separate layer of turbid seawater caused difficulty for underwater operations.
3. Lack of experienced and skilled personnel to conduct underwater operations, resulting in trial and error process that caused delay and waste of limited financial resources.
4. Lack of appropriate equipment to remove and clean up underwater debris.
5. Volunteers who participated in recovery responses lack knowledge and basic understanding of coastal environment, sometimes resulting in additional damage of marine environment, for example, loss of recoverable corals.
6. Volunteers had to pay their own expenses up front, due to sluggishness in getting budgets approved by government agencies and NGOs and directing international assistance.
7. Underwater operations to undertake and monitor recovery process are very expensive and resources are limited and dwindling; recovery monitoring in particular will be difficult to sustain.
8. Bureaucratic regulations of government agencies slow the delivery of needed financial resources and in some cases prevented the purchase of critical cleanup and other equipment and materials.
9. Fragmentation of government agency responsibilities, lack of communication and collaboration (both between and within governmental levels, and with NGOs), inconsistent policies, and poorly managed funds cause significant difficulty and confusion in recovery efforts.
10. Lack of local involvement in natural resource and ecosystem recovery efforts has caused delay and threatens a lack of continuity in the long-term recovery process.
11. Some governmental agencies and NGOs take advantage of recovery resources and activities to promote their own agendas and take “credit”, without focusing on quality or effectiveness of activities.
12.
13.

SECTION 2: BUILT ENVIRONMENT

This would include the direct and indirect impact of all damages that occurred to built environment within and nearby marine national parks’ boundaries such as transportation network, infrastructural system, power plant and distribution network, communication network, residential houses, commercial buildings, government agencies’ offices, schools, etc.

2.1 Impacts of the 2004 tsunami on the built environment that occurred within and/or nearby marine park boundaries

[Please review and/or provide additional comments on responses from Round I questionnaire](#)

1. Park office, park rangers’ dormitory, infirmary, built landscape demolished or destroyed.
2. Bungalows, campground, and tourism facilities damaged or/and destroyed.
3. Basic infrastructures including electric power, drinking water, and communication network destroyed.

4.	Park's vehicles and local tour operators' vehicles (boats, cars, trucks, etc.) damaged or destroyed.
5.	Exhibition areas, natural trails, and interpretative signs damaged or destroyed.
6.	Piers that accommodate tourists and park's staff between mainland and marine parks damaged or destroyed.
7.	Sea Gypsy village—the Moken tribe—completely destroyed.
8.	Buoys in diving destinations lost or damaged.
9.	.....
10.	.....

2.2 How these built environment impacts affected tourism in marine parks.

Please circle ○ appropriate score.

Built Environment Impacts	Level of impact on park tourism										Not Applicable (NA)
	Very high									Very low	
Park offices, park ranger dormitories, infirmaries, built landscape destroyed.	10	9	8	7	6	5	4	3	2	1	
Bungalows, campgrounds, and tourism facilities damaged or/and destroyed, resulting in temporary closures of marine parks.	10	9	8	7	6	5	4	3	2	1	
Basic infrastructures including electric power, water lines, and communication network destroyed.	10	9	8	7	6	5	4	3	2	1	
Potable water wells/reservoirs contaminated by saltwater and bacteria causing lack of potable water in parks.	10	9	8	7	6	5	4	3	2	1	
Basic infrastructure and communication networks destroyed, isolating parks and reducing tourist safety.	10	9	8	7	6	5	4	3	2	1	
Diving gear and facilities both for snorkeling and SCUBA are damaged or lost.	10	9	8	7	6	5	4	3	2	1	
Damaged or lost diving buoys cause inconvenience for divers and tour operators.	10	9	8	7	6	5	4	3	2	1	
Images of destroyed and damaged areas in national/international media show poor condition of tourism destination/facilities and cause sadness among tourists.	10	9	8	7	6	5	4	3	2	1	
Exhibition areas, nature trails, and interpretative signs/exhibits damaged or destroyed.	10	9	8	7	6	5	4	3	2	1	
Piers that accommodate tourists, parks staff boats, and private transports between mainland and marine parks damaged or destroyed.	10	9	8	7	6	5	4	3	2	1	
Sea Gypsy village—the Moken tribe—completely destroyed.	10	9	8	7	6	5	4	3	2	1	

2.3 Built Environment response and recovery efforts taken in 2005 and their effectiveness with respect to marine national park tourism recovery

Please circle ○ appropriate score.

Response-Recovery Actions Undertaken	Effectiveness of built environment-related response and recovery efforts, with respect to marine park tourism recovery										Not Applicable (NA)
	Very high									Very low	
Construction of new park offices, new office supplies, new cafeteria, and new dormitory – Marine Park Division, Pollution Control Department, and foreign agencies.	10	9	8	7	6	5	4	3	2	1	

Install new basic infrastructural system (potable water and electric power) within marine parks – Marine Park Division.	10	9	8	7	6	5	4	3	2	1	
Replace damaged observatory boats and vehicles with new ones – Marine Park Division.	10	9	8	7	6	5	4	3	2	1	
Purchase new rescue boats for emergency situation – Marine Park Division.	10	9	8	7	6	5	4	3	2	1	
Establish communication headquarter and network to communicate among marine parks – Marine Park Division.	10	9	8	7	6	5	4	3	2	1	
Restore and improve park landscape and appearance – universities and tour operator coalitions.	10	9	8	7	6	5	4	3	2	1	
Install tsunami warning system within parks – Marine Park Division.	10	9	8	7	6	5	4	3	2	1	
Repair pier and dock – Harbour Department and Marine Park Division.	10	9	8	7	6	5	4	3	2	1	
Study and initiate new park zoning management plan – researchers from universities.	10	9	8	7	6	5	4	3	2	1	
Replace damaged or lost buoys with new buoys in and around diving areas – Marine Park Division.	10	9	8	7	6	5	4	3	2	1	
Improve Phuket Aquarium at Phuket Marine Biological Center for education and outreach purposes – DMCR and foreign agencies.	10	9	8	7	6	5	4	3	2	1	

2.4. Obstacles or constraints to recovery of the built environment related to marine park tourism

Please review and/or provide additional comments on responses from round I questionnaire

1. Major storms and associated winds and currents during monsoon season (May to November) significantly delayed transportation of construction materials between mainland and islands and subsequent recovery operations.
2. Budgets proposed for recovery efforts insufficient in part due to rapid increase in the price of gasoline.
3. The Prime Minister promised special funding for recovery efforts without considering that Thai laws and regulations did not allow for that, resulting in unfulfilled expectations.
4. The construction of new buildings to help recover tourism has been undertaken too quickly and without careful consideration of impacts on natural environments and ecosystems.
5. New zoning for park use areas has gone very slowly, in part due to a lack of collaboration among various stakeholders and process failures.
6. Incomprehensible policies handed down by the national government have caused confusion and resulted in inaction by policy implementers and business operators.
7. Complicated paperwork processes, the lack of overall recovery plans, and lack of collaboration among/within agencies has delayed the damage assessment process; the time allowed to complete recovery tasks have also been inadequate.
8. Lack of clear missions for marine parks and distorted goals associated with pressure to recover tourism quickly contribute to failure of the new zoning process supposedly design to solve pre-tsunami problems.
9. The lack of systematic process for financial and logistic assistance has resulted in gaps and redundancy of relief and recovery efforts.
10. Recently decentralized government agencies (national responsibilities have devolved to provincial and local levels) lack appropriate understanding of the dynamic nature of marine and coastal ecosystems and tsunami mitigation principles. These misunderstanding have led to inappropriate siting of redevelopment and infrastructure, such as new coastal roads, new dykes, and beach reclamation; problems would have been identified in environmental impact assessment studies, but none were conducted, though required by law.
11. Establishments of new settlements and housing have been undertaken by NGO and government donors without careful consideration of relatively primitive local livelihoods, reducing the uniqueness of local communities and attractiveness of tourism destinations.
12.

SECTION 3: BUSINESS COMMUNITY/ENVIRONMENT

Impacts in this category are almost all indirect effects, resulting mainly from direct physical damages to the natural environment, the built environment, or social system impacts.

3.1 Impacts of the 2004 tsunami on business community/environment occur within and nearby marine park boundary

Please review and/or provide additional comments responses from round I questionnaire

1.	Tourism related businesses are short of trained or knowledgeable employees due to death or emigration.
2.	Business operators were injured, died or lost their assets and wealth; they and their business are thus not ready to serve tourists.
3.	Boats that accommodated tourists and divers have been damaged or destroyed.
4.	Accommodations for tourists not available because hotels or guesthouses within and nearby parks were destroyed or damaged.
5.	Tour operators' equipment and facilities, such as camping tents, bedding, diving gear, etc. were damaged or destroyed
6.	Businesses' reputations deteriorated due to unavailability of normal services and opportunities.
7.	Business records were destroyed, affecting marketing, finances, and other operations.
8.	Employees of parks and tourism businesses have a new fear of the sea, are terrified at the prospect of future tsunami, of the ghosts of those who were swept into the sea, and other supernatural aspects of the event. Many quit their jobs or emigrated out of the region, contributing to the shortage of skilled help.
9.	The reduction of tourist numbers during tourism season (November – April) on the Andaman Sea coast resulted in short-term funding gaps for tourism-related businesses, including hotels, boat rentals, and rental vehicles. This has caused the closure or bankruptcy of some businesses.
10.	The temporary closure of marine parks induces closure of park-related tourism businesses.
11.	The temporary closure of marine parks results in financial shortfalls for parks, which depend on fees to operate and to manage facilities.
12.	.....
13.	.....

3.2 How these business community/environment impacts affected tourism in marine parks.

Please circle O appropriate score.

List of impact	Level of impact on park tourism										Not Applicable (NA)
	Very high									Very low	
Tourism-related business network within and nearby park boundaries, including hotels, rental boats, and rental vehicles is disrupted or non-existent. Tourists thus not served.	10	9	8	7	6	5	4	3	2	1	
Business operators are short of money to repair or replace damaged assets. Therefore, they do not have tourism facilities to accommodate tourists.	10	9	8	7	6	5	4	3	2	1	
Tourism-related businesses are short of skillful or knowledgeable employees due to death or emigration.	10	9	8	7	6	5	4	3	2	1	
Some businesses are closed due to psychological trauma, lack of financial resources, and no capability to provide services.	10	9	8	7	6	5	4	3	2	1	
Deterioration of business' reputation and reliability due to tourism safety issue.	10	9	8	7	6	5	4	3	2	1	

3.3 Business Community-Environment response and recovery efforts taken in 2005 and their effectiveness with respect to marine national park tourism recovery

Please circle ○ appropriate score.

Response-Recovery Actions Undertaken	Effectiveness of business community-environment response and recovery efforts, with respect to marine park tourism recovery										Not Applicable (NA)
	Very high									Very low	
Built new facilities to accommodate tourists (e.g. restrooms and cafeteria) – Marine Park Division.	10	9	8	7	6	5	4	3	2	1	
Compensated businesses for basic damages – Department of Disaster Prevention and Mitigation.	10	9	8	7	6	5	4	3	2	1	
Extend duration of the tsunami victims' loan – banks.	10	9	8	7	6	5	4	3	2	1	
Offered low interest loans to affected businesses – government agencies.	10	9	8	7	6	5	4	3	2	1	
Promoted both domestic and international tourism campaigns – Tourism Authority of Thailand, Thai Airways, and tour operator coalitions.	10	9	8	7	6	5	4	3	2	1	
Arranged marine conservation activities such as debris clean-up dives and beach forest and mangrove reforestation – Marine Park Division, and tour operators.	10	9	8	7	6	5	4	3	2	1	
Launched aggressive marketing plan – reduced tour package price in order to increase income and compete with tour operators in unaffected areas.	10	9	8	7	6	5	4	3	2	1	
Trained local workforces for alternative jobs – Ministry of Labour.	10	9	8	7	6	5	4	3	2	1	
Arranged training courses for staff that were laid-off at affected tourism businesses in 3 impacted provinces to increase their skills and pay them daily allowance – Tourism Authority of Thailand.	10	9	8	7	6	5	4	3	2	1	
Waived marine park entrance fee to promote park tourism – Marine Park Division.	10	9	8	7	6	5	4	3	2	1	
Recovered physical appearance of hotels that located near park boundary – private owners.	10	9	8	7	6	5	4	3	2	1	
Organized local tour operator alliances for mutual support and to increase power to negotiate with government agencies – local tourism operators.	10	9	8	7	6	5	4	3	2	1	

3.4. Obstacles or constraints to recovery of the business community-environment related to marine park tourism

Please review and/or provide additional comments on responses from round I questionnaire

1. Major storms and associated winds and currents during monsoon season (May to November) significantly delayed recovery operations.
2. Over-stated reports regarding tourism resource damages (especially coral reefs and beaches) and of coral reef damages generated by media causes misunderstanding among tourists, limiting visitation.
3. General public in Thailand have deteriorated mental health associated with the tsunami and its aftermath, particularly dead people, ghosts, and other supernatural matters. This significantly affects psychological and tourism recovery process in affected and adjacent areas.
4. General public and tourists do not have accurate knowledge of natural disasters, so they now fear the Andaman Sea and avoid visiting.
5. Complicated government's paperwork for businesses seeking assistance significantly delays recovery tasks requiring resources.
6. Banks and other funding sources have complicated and unclear policies to release loans for business victimized by the tsunami.
7. Chaotic flux of aid into affected areas has caused corruption; often, aid money does not reach those actually in need.
8. Lack of collaboration among tour operators and highly competitive tourism market causes significant price reduction of package tour which in turn damages the whole business community especially small businesses.
9. Small- and mid-scale tourism businesses are short of money to market their businesses or to buy new assets because they do not fit in funding sources' financial aid criteria.
10. There has been a lack of continuity of relief and recovery efforts from governmental and non-governmental agencies.
11. Individuals and businesses who lost their benefits from new land use zoning plan within and nearby park boundary reject government's re-organization plan.
12. Ambiguous governmental policies cause confusion at all levels of decision making process. This causes problems of collaboration within and among governmental agencies, private sectors, NGOs, and donors which resulted in chaotic aid, redundancy, and unfair aid distribution.
13. In promoting recovered tourism opportunities to the Asian market, misunderstanding of concerns about ghosts and the supernatural led to failure of the effort. They later learned that the same campaign works well in European and Australian market.
14. Both domestic and international tour operators and tourists do not have accurate information and understanding of the recovery situation of affected areas; this should have been provided by tourism promotion agencies. This caused strong negative halo effects to areas adjacent to tsunami-affected areas.
15. Government agencies that are responsible for tourism recovery emphasize their tasks on marketing but do not prioritize their aid to support the whole business community, especially local, small-scale businesses. This strongly delays recovery of local tourism business environment.
16. The waiver of marine park entrance fee as tourism recovery plan lacked continuity in its promotion.
17.
18.

SECTION 4: SOCIAL, HEALTH, AND SAFETY SYSTEMS

4.1 Impacts of the 2004 tsunami on social, health, and safety occur within and nearby marine park boundary

Please review and/or provide additional comments responses from round I questionnaire

1. People in affected areas including park rangers, officers, and staff have to stay in unsanitary condition. Their shelters were crowded. Food and water were contaminated.
2. Contagious diseases which spread by mosquitoes which broke out due to interrupted coastal ecosystem.
3. Hazardous waste such as dead animals was not appropriately destroyed.
4. People in affected areas including park rangers, officers, and staff lost their lives and their loved ones'. They have faced massive death, injury, disability, and separation.
5. General public and tourists have deteriorated mental health, depression and distress as results of the disaster. They also fear of ghost and supernatural matter.
6. People, business operators, and park staff are worried of their own safety. They fear of the sea and possible following tsunami. These cause emigration, changes of job, and changes of their way of life in affected area.
7. Tools of the trade were damaged. These lead to unmanageable debt, business closure, unemployment, insecure lives, stress, family and community problems.
8. The massive loss of family members and leaders, the increasing number of disabilities, both physically and psychologically, and the rising number of orphans in community which has increased the degree of local dependencies. These significantly change communities' social and economic structure.
9. People are disappointed by government's chaotic and ineffective relief and recovery system. This has caused deep sense of discouragement.
10. Villagers were discouraged and desperate for mental and physical support due to the crisis. Therefore, many families have converted from their original believes to Christianity because of donors' influence. This might lead to long term changes of local structure and lifestyle.
11. The death of business owners or business leaders drastically interrupts business and may lead to business closure.
12. Schools were damaged or destroyed and teachers died or were affected. Children cannot find local education providers. In some case, these lead to overloaded classroom and insufficient number of teachers in unaffected schools nearby disaster impacted area.
13.

4.2 How these social, health, and safety impacts affected tourism in marine parks.

Please circle ○ appropriate score.

List of impact	Level of impact on park tourism										Not Applicable (NA)
	Very high		.....						Very low		
General public have psychological problems and depression due to seeing massive death and loss that reduce their willingness to travel or to greet tourists.	10	9	8	7	6	5	4	3	2	1	
Tour operators and park employees are discouraged and the lack of work safety has significantly reduced quality of their services.	10	9	8	7	6	5	4	3	2	1	
Tourists lack confidence in their safety, disaster warning network, and emergency response. These strongly influence their decision to avoid traveling to the Andaman Coast.	10	9	8	7	6	5	4	3	2	1	
Tourists think that affected marine parks and adjacent areas are still not ready for tourism so they avoid visiting these areas.	10	9	8	7	6	5	4	3	2	1	
Tourists fear ghosts and supernatural concern.	10	9	8	7	6	5	4	3	2	1	
Tourists fear the sea, staying over-night on islands, and camping nearby the sea.	10	9	8	7	6	5	4	3	2	1	

Tourists are concerned about sanitization, food and water contamination and contagious diseases in affected areas.	10	9	8	7	6	5	4	3	2	1	
There is a lack of public health system and functional hospitals.	10	9	8	7	6	5	4	3	2	1	
There were insecurity issues in affected areas during the crisis due to Thai robbers and foreign piracies.	10	9	8	7	6	5	4	3	2	1	
There are changes of community structure in areas adjacent to parks due to massive loss of lives and the swelling number of disabilities.	10	9	8	7	6	5	4	3	2	1	
The unique lifestyle of sea gypsies (Moken tribe) who lives in Surin Islands marine national park are immediately altered due to flux of donation and attention from media.	10	9	8	7	6	5	4	3	2	1	

4.3 Social, Health, Safety-related response and recovery efforts taken in 2005 and their effectiveness with respect to marine national park tourism recovery

Please circle O appropriate score.

List of recovery responses or actions	Effectiveness of recovery responses in recovering social, health, and safety and park tourism										Not Applicable (NA)
	Very high									Very low	
Installed new freshwater wells and new tap water systems – Ministry of Natural Resources and Environment.	10	9	8	7	6	5	4	3	2	1	
Cleaned up debris in freshwater reservoirs – Marine Park Division and volunteers.	10	9	8	7	6	5	4	3	2	1	
Cleaned up debris on land and underwater – Marine Park Division and volunteers.	10	9	8	7	6	5	4	3	2	1	
Gave money to comfort park officers – Department of Forestry's co-op.	10	9	8	7	6	5	4	3	2	1	
Gave special medals for park officers who worked hard in the affected areas during crisis time in order to show appreciation – Office of the Prime Minister.	10	9	8	7	6	5	4	3	2	1	
Developed and practiced tsunami warning procedure and evacuation plan in high risk areas – park officers, police, Tourism Authority of Thailand, and volunteers.	10	9	8	7	6	5	4	3	2	1	
Sent doctors and medical teams to help victims recover psychologically and physically – Ministry of Public Health, medical schools, Red Cross and many foundations (victims included park staff, tourists, and villagers).	10	9	8	7	6	5	4	3	2	1	
Gave relief and donated food, basic needs, and medicine to victims — government agencies, private sectors, and individuals.	10	9	8	7	6	5	4	3	2	1	
Replaced damaged or destroyed schools with new schools – government agencies, private sectors, and foundations.	10	9	8	7	6	5	4	3	2	1	
Alternative job training provided to victims for victims – government agencies, private sectors, and foundations.	10	9	8	7	6	5	4	3	2	1	
Provided financial aid, shelters, boarding schools for orphans and school children – Ministry of Education and many private foundations.	10	9	8	7	6	5	4	3	2	1	
Built the 2004 tsunami victim memorial – Ministry of Natural Resources and Environment	10	9	8	7	6	5	4	3	2	1	

4.4. Obstacles or constraints to recovery of social, health and safety systems related to marine park tourism

Please review and/or provide additional comments on responses from round I questionnaire

1. The distribution of relief and emergency response did not cover the whole affected area, due in part to the massive and widespread damages.
2. The number of medical personnel and health care providers in affected areas, especially psychologists, were insufficient when compared with substantial number of victims.
3. There was a significant lack of rescue personnel, tools, and instruments.
4. General public and villagers fear ghosts and strongly believe in supernatural causes for the disaster, resulting in significant negative effect on mental recovery.
5. The broad enforcement of park regulations on Mu Ko Surin generated conflict with the primitive lifestyle of sea gypsies who stayed in the park following the disaster.
6. In some areas, there was a hidden agenda by donors or aid providers who tried to convert people to their religion, resulting in resentment among some victims.
7. No one government agency was in charge of coordinate relief and recovery efforts, resulting in systematic problems in distribution of financial aid and donations, and uneven, sporadic, and redundant aid allocation, including money, housing, and fishing boat and gear replacement.
8. Limitations in budgets and technical issues have hampered or delayed establishing a comprehensive disaster warning network.
9. Although job retraining was provided by the government for displaced workers, the actual market for those jobs has failed to materialize, leaving many trainees out of work. .
10. There is a general understanding on the part of the public that psychologists are only for insane people, resulting in underutilization of services made available in many areas.
11. There is gender inequality in aid distribution; female victims tend to receive less support, particularly financial, than males although they have similar degrees of responsibility in their families.
12.
13.

Section 5 Additional Recovery Actions Needed.

Please describe (and rate/rank) the additional (or improved) governmental or private recovery actions that should have been taken in the past, or should be taken in the future with respect to recover tourism in marine national parks. These include all four dimensions of recovery efforts.

- Natural resource and ecosystem
- Built environment
- Business community
- Social, health, and safety

Needed Recovery Action	By Whom?	Priority			NA
		High	Moderate	Low	
Install natural disaster warning network (especially tsunami). This includes complete network of technical warning, all level of education and outreach (what to do or what not to do during disaster), evacuation plan in risk areas especially in marine parks, and recovery and mitigation researches.	Experts in specific fields, Marine Park Division.				
Explore coastal morphology and seafloor changes to promote navigation safety.	Hydrographic Department or D.M.C.R.				
Inventory natural resource quantity and quality in marine parks to serve as a baseline for monitoring ecosystem recovery.	Marine Park Division or universities				
Using the baseline, provide ongoing monitoring and reporting of natural resource recovery, providing distribution to agencies, tour operators, tourists, divers, and the general public.	Marine Park Division or universities				
Monitor tsunami impacts on social, health, and safety	Experts from specific fields				
Monitor impacts on natural resource and ecosystem	Experts from specific fields				

Repair or replace damaged reservoirs and repair or install new water treatment plants within marine parks.	Marine Park Division				
Minimize the construction of new buildings in marine parks and use caution in the new development, especially close to shore. A priority for all construction should be to take natural ecosystem concerns and natural hazards into consideration.	Marine Park Division				
Clarify activity zone in park	Marine Park Division				
Build professional capacity for marine park management, including enhanced training and increased numbers.	Marine Park Division				
Identify activity zoning plans in each marine park and strictly enforce the plan	Marine Park Division, each marine park				
Study tourism carrying capacity in each marine park in order to control number of boats and tourists not to exceed capacity of parks and to insure tourism safety.	Marine Park Division				
Reduce park management cost by leasing bungalows in parks to property management companies.	Marine Park Division				
Prepare emergency response and disaster mitigation plan for each park; include rescue tools such as boats, emergency communications, emergency food and water supply to be used in parks following a disaster.	Marine Park Division				
Develop recovery plan for coral reefs, including installation of artificial reefs where appropriate.	D.M.C.R.				
Establish collaborative network to develop knowledge and conduct research needed for enhanced park management. The network should consist of government agencies, universities and educational institutes, and the private sector.	Educational institutes, Marine Park Division, and D.M.C.R.				
Identify new diving destinations to replace damaged diving sites, thus reducing pressure on existing diving sites and allowing damaged diving sites time to recover.	Educational institutes, Marine Park Division, and D.M.C.R.				
Encourage communities located near park boundaries to get involved in designing park management plans and conservation projects such as mangrove reforestation, beach cleaning projects and education & outreach projects regarding marine environment and coastal disaster.	Educational institutes, Local government agencies, NGOs, Marine Park Division, and D.M.C.R.				
Enforce park regulations among tourists and tour operators especially in and around diving sites.	Tour operators, Marine Park Division				
Promote and raise awareness of tourism impacts on natural resources among tourists.	Educational institutes, tour operators, Marine Park Division				
Promote tourism safety measures.	T.A.T.				
Create continuous tourism promotion campaign in affected areas to promote sustainable recovery.	T.A.T.				
Persuade the tourism businesses to emphasize their competitiveness by increasing service quality rather than reducing price.	T.A.T.				
Monitor tsunami impacts on business community/environment and find financial sources to recover business environment.	Experts from specific field, Ministry of Commerce, Financial institutes				
Establish a one-stop agency that is responsible for receiving requests and concerns from tsunami victims. This is not a short term relief plan but is necessary as long term agenda to continuously reduce stress and discouragement of victims.	Specific government agency				
Provide aid by asking for victims' actual needs. This will increase effectiveness of aid allocation, receiver satisfaction, and will reduce conflict with primitive cultures such as sea gypsies and artisanal fishermen.	Specific government agency and NGOs				
Promote clean beach campaigns to reduce debris in coastal areas.	Everyone (?)				

Remark: T.A.T. is Tourism Authority of Thailand
 D.M.D.R. is Department of Marine and Coastal Resources

Section 6 Positive Impacts of the 2004 tsunami that you have faced or known of.

- a. Example: Better quality of seawater and cleaner beaches.
- b.
- c.
- d.
- e.

Comments and suggestions

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Your Identification Number
(Please see on Page 1)

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Appendix G Questionnaire Round II for the Delphi survey (Thai version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

<วันที่>

เขียน ...<ชื่อ>.....

ดิฉันขอขอบพระคุณเป็นอย่างสูงที่ท่านกรุณาเสียสละกำลังความคิดและเวลาอันมีค่า เข้าร่วมงานวิจัยและตอบแบบสอบถามฉบับที่ 1 เกี่ยวกับผลกระทบและการฟื้นฟูผลกระทบของคลื่นสึนามิที่มีต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเล หลังจากที่ได้ดิฉันได้รับแบบสอบถามฉบับที่ 1 จากท่านแล้วนั้น ดิฉันได้รวบรวมผลการตอบแบบสอบถามจากผู้เชี่ยวชาญเช่นท่านจำนวน 23 ท่าน ซึ่งเป็นผู้แทนจาก 6 กลุ่มผู้เชี่ยวชาญ คือ

- เจ้าหน้าที่อุทยานฯ
- เจ้าหน้าที่หน่วยงานภาครัฐในการจัดการทรัพยากรทางทะเล
- นักวิทยาศาสตร์ทางทะเล
- บุคลากรจากองค์กรพัฒนาภาคเอกชน(NGOs) ชมรม อาสาสมัคร
- เจ้าหน้าที่ส่งเสริมการท่องเที่ยว และ
- ผู้ประกอบการธุรกิจท่องเที่ยวในเขตอุทยานฯและพื้นที่ใกล้เคียง

และนำคำตอบเหล่านั้นมาใช้ในออกแบบคำถามในแบบสอบถามฉบับที่ 2 นี้

แบบสอบถามครั้งนี้ เป็นแบบสอบถามรอบที่ 2 ในจำนวนแบบสอบถามทั้งสิ้น 3 รอบ ความคิดเห็นและประสบการณ์ของท่านมีคุณค่าเป็นอย่างยิ่งต่อการฟื้นฟูผลกระทบจากภัยธรรมชาติ คำตอบจากทุกชุดคำถามจะถูกเก็บเป็นความลับ มีเพียงผลวิเคราะห์ทางสถิติเท่านั้นที่จะถูกนำไปเผยแพร่ในการรายงาน

หากท่านมีข้อสงสัยหรือข้อใจเกี่ยวกับการวิจัยนี้ กรุณาส่งอีเมลล์ถึงดิฉันได้ที่ somdeem@yahoo.com หรือทางโทรศัพท์ที่ (02) 579-9645 หรือ (05) 802-3931 หรือทางโทรสารที่ (02) 941-8649 ดิฉันขอความกรุณาท่านส่งคืนแบบสอบถามที่ตอบเรียบร้อยแล้วกลับมายังดิฉัน ภายใน <วันที่> และเพื่อความสะดวกของท่านในการส่งแบบสอบถาม ดิฉันได้สอของเปล่า พร้อมที่อยู่ และติดแสตมป์มาพร้อมกับเอกสารชุดนี้ ดิฉันขอขอบพระคุณล่วงหน้าที่ได้รับความร่วมมือจากท่าน

ขอแสดงความเคารพอย่างสูง

นางสาว สมฤดี มีประเสริฐ

*****กรุณาเริ่มต้นที่นี่*****

รหัสประจำตัวของท่าน

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แบบสอบถาม รอบที่ 2

แบบสอบถามชุดนี้มีทั้งสิ้น 6 ส่วน โดย 4 ส่วนแรกเน้นที่แต่ละประเภทของผลกระทบ คือ

- ส่วนที่ 1 ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ (Natural resource and ecosystem)
- ส่วนที่ 2 ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น (Built environment)
- ส่วนที่ 3 ด้านธุรกิจ (Business community)
- ส่วนที่ 4 ด้านสังคม สุขภาพ และความปลอดภัย (Social, health, and safety)
- ส่วนที่ 5 ข้อเสนอแนะเพิ่มเติม เพื่อฟื้นฟูสภาพการท่องเที่ยวในเขตอุทยานอย่างยั่งยืน ภายหลังภัยธรรมชาติ
- และ ส่วนที่ 6 ผลกระทบในแง่จิตของสึนามิที่ท่านพบเห็นหรือรับรู้ และข้อเสนอแนะอื่นๆ

ในการตอบแบบสอบถามรอบที่ 2 นี้ คิฉันทขอความกรุณาท่านใช้ประสบการณ์ที่ท่านได้เ็น ได้เห็น หรือรับรู้ และ/ หรือความคิดเห็น
ของตัวเอง ดำเนินการดังต่อไปนี้

๑. พิจารณาหรือเขียนเพิ่มเติม ผลกระทบทั้ง 4 ด้าน ของคลื่นสึนามิที่มีต่ออุทยานแห่งชาติทางทะเล
๒. พิจารณาระดับของผลกระทบของสึนามิที่มีต่อการท่องเที่ยวในเขตอุทยานฯ โดยวงกลมให้คะแนน 1 – 10
๓. พิจารณาระดับประสิทธิภาพและประสิทธิภาพของกิจกรรม การช่วยเหลือหรือแนวทางการฟื้นฟูผลกระทบ โดย
ภาครัฐและเอกชนในช่วงระยะเวลาหนึ่งปีที่ผ่านมา (ปี 2548) โดยวงกลมให้ค่าคะแนน 1 – 10
๔. พิจารณาหรือเขียนเพิ่มเติม อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ
๕. พิจารณากิจกรรม หรือแนวทางที่เป็นไปได้ในการฟื้นฟูผลกระทบ และกำหนดลำดับความเร่งด่วนเมื่อเปรียบเทียบกับทุกรายการ
๖. เสนอแนะความคิดเห็นเพิ่มเติม

ส่วนที่ 1 ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ (Natural resource and ecosystem)

ตัวอย่างของผลกระทบประเภทนี้ คือ ความเสียหายโดยตรงทางกายภาพและชีวภาพที่มีต่อระบบนิเวศชายฝั่ง สัตว์ป่า และสัตว์ทะเล เช่นแนวปะการังพังเสียหาย การพังทลายชายฝั่ง และผลกระทบทางอ้อมที่เกี่ยวข้องกับซากความเสียหาย หรือน้ำมันและสารพิษที่รั่วไหลลงสู่ทะเล และระบบนิเวศชายฝั่ง

1.1 ผลกระทบของสินทรัพย์ที่มีต่อทรัพยากรและสิ่งแวดล้อมทางธรรมชาติในบริเวณอุทยานฯ

กฎเกณฑ์การประเมินเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่คิดอันได้รวบรวม และนำเสนอในที่นี้

1.	พื้นที่ท่องเที่ยวและร่องน้ำเปลี่ยนแปลงอย่างรวดเร็ว มีผลกระทบต่อระบบนิเวศชายฝั่งทั้งบนบกและในน้ำ ทำให้ปลาหรือสิ่งมีชีวิตเปลี่ยนแปลงพฤติกรรมการหากินและอพยพฝูงปลาบางแห่งลดจำนวนลง
2.	สภาพใต้น้ำที่เปลี่ยนไปทำให้พื้กัลปังหา หรือหอยค้ำน้ำกลดเคลื่อน
3.	ชายฝั่งถูกกัดเซาะและชายหาดพังทลายมีผลกระทบต่อระบบนิเวศชายฝั่ง เช่น ลดพื้นที่หาดทรายซึ่งเป็นแหล่งวางไข่ของเต่าทะเล แนวป่าชายเลนและป่าชายหาดเสียหายล้มตาย
4.	หาดทรายบางแห่ง เดิมเคยละเอียดขาวสะอาด ปัจจุบันถูกปกคลุมด้วยทรายปนโคลนสีคล้ำ
5.	แหล่งหญ้าทะเลในบางบริเวณถูกทำลาย เนื่องจากถูกตะกอนดินและทรายทับถม
6.	ความรุนแรงของคลื่นและกระแสน้ำทำให้ปะการัง และกัลปังหาบางส่วนได้รับความเสียหาย โดยแตกหัก พลิกคว่ำ ถูกทรายกลบ
7.	ขยะและซากหักพังจำนวนมากทำความเสียหายต่อระบบนิเวศชายฝั่ง โดยเฉพาะปะการังที่โดนซากคันไม้ ขยะขนาดใหญ่ล้มทับ หรือขยะมีคม เช่นสังกะสีมุงหลังคาเสียดสี
8.	น้ำเค็มรุกล้ำเข้าสู่แหล่งน้ำจืดทั้งน้ำผิวดินและน้ำใต้ดิน ทำให้ระบบนิเวศชายฝั่ง เช่น ป่าชายหาดและป่าพรุเสื่อมโทรม และขาดแหล่งน้ำจืดเพื่อกินใช้
9.	ปัญหาดินเค็ม บริเวณชายฝั่งทำให้พืชบางชนิดไม่สามารถทนเค็มได้ล้มตาย
10.	แหล่งน้ำปนเปื้อนเชื้อแบคทีเรีย มีผลให้สัตว์เลี้ยง เช่น วัว ควายเป็นโรคปากเท้าเปื่อย
11.	.....
12.	.....

1.2 ผลกระทบด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ ที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กฎเกณฑ์การประเมิน ○ ค่าคะแนนที่ท่านเห็นสมควร

ผลกระทบของสินทรัพย์ในอุทยานฯ	มีผลกระทบต่อการท่องเที่ยวในอุทยานฯ										ไม่ทราบ หรือ ไม่มี ความเห็น
	สูงมาก	.....	.....	.....	.....	.....	.....	.....	.....	น้อยมาก	
เกิดการเปลี่ยนแปลงของพื้นที่ท่องเที่ยวและร่องน้ำ มีผลกระทบต่อระบบนิเวศชายฝั่งทั้งบนบกและในน้ำ ทำให้ปลาหรือสิ่งมีชีวิตเปลี่ยนแปลงพฤติกรรมการหากินและอพยพ	10	9	8	7	6	5	4	3	2	1	
ร่องน้ำและความลาดชันของชายฝั่งเปลี่ยนแปลงทำให้เป็นอันตรายต่อนักท่องเที่ยว และเป็นอุปสรรคต่อการเดินเรือ	10	9	8	7	6	5	4	3	2	1	
สภาพใต้น้ำที่เปลี่ยนไปทำให้พื้กัลปังหา หรือหอยค้ำน้ำกลดเคลื่อน มีผลต่อเรือท่องเที่ยวในการหาจุดดำน้ำ	10	9	8	7	6	5	4	3	2	1	
การเปลี่ยนแปลงของกระแสน้ำและการสะสมของตะกอนในมวลน้ำมาก น้ำทะเลจึงขุ่นบางบริเวณ	10	9	8	7	6	5	4	3	2	1	
แนวปะการังและกัลปังหาซึ่งเป็นทรัพยากรการท่องเที่ยวค้ำน้ำในอุทยานฯ ได้รับความเสียหาย ปลาสาวยามบางชนิดลดจำนวนลง ทำให้แหล่งดำน้ำที่สวยงามมีจำนวนลดลง	10	9	8	7	6	5	4	3	2	1	
แหล่งหญ้าทะเลได้รับความเสียหายจากตะกอนทับถม	10	9	8	7	6	5	4	3	2	1	
ขยะและซากหักพังทั้งบนบกและในน้ำทำให้ลดความสวยงามตามธรรมชาติ	10	9	8	7	6	5	4	3	2	1	
ซากปะการังที่มีคม หรือเศษขยะมีคมทับถมในบริเวณชายหาดทำให้การเดินหรือเล่นน้ำชายหาดต้องเพิ่มความระมัดระวัง	10	9	8	7	6	5	4	3	2	1	
หาดทรายเดิมเคยละเอียดขาวสะอาดถูกปกคลุมด้วยทรายปนโคลนสีคล้ำ ลดความสวยงาม	10	9	8	7	6	5	4	3	2	1	
ชายฝั่งและชายหาดพังทลายทำให้ป่าชายเลนและป่าชายหาดล้มตาย ลดความสวยงามของภูมิทัศน์	10	9	8	7	6	5	4	3	2	1	
น้ำเค็มรุกล้ำเข้าสู่แหล่งน้ำจืดทั้งน้ำผิวดินและน้ำใต้ดิน ทำให้ระบบนิเวศชายฝั่ง เช่น ป่าชายหาดและป่าพรุเสื่อมโทรม และขาดน้ำกินน้ำใช้	10	9	8	7	6	5	4	3	2	1	

1.3 ประสิทธิภาพของกิจกรรมหรือแนวทางการฟื้นฟูผลกระทบด้านการท่องเที่ยวที่เกี่ยวข้องกับการฟื้นฟูทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ ในช่วงระยะเวลาหนึ่งปีที่ผ่านมา (ปี 2548)

กรณาวางกลม ○ ค่าคะแนนประสิทธิภาพของกิจกรรมดังต่อไปนี้ ตามที่ท่านเห็นสมควร

กิจกรรมหรือแนวทางการฟื้นฟู	มีประสิทธิภาพของกิจกรรมในการฟื้นฟูทรัพยากรและสิ่งแวดล้อมทางธรรมชาติและการท่องเที่ยว										ไม่ทราบหรือไม่มีความเห็น
	สูงมาก									น้อยมาก	
เก็บขยะทั้งบนบกและในน้ำ โดยนักดำน้ำอาสาสมัคร ท.ช. ทหาร นักเรียน องค์การเอกชนต่างๆ และเจ้าหน้าที่อุทยาน	10	9	8	7	6	5	4	3	2	1	
ดำน้ำเพื่อปลูกซ่อมปะการังและกัลปังหาโดยนักดำน้ำอาสาสมัคร บุคลากรจากมหาวิทยาลัยต่างๆ เจ้าหน้าที่กรมอุทยานฯ และเอกชนอื่นๆ	10	9	8	7	6	5	4	3	2	1	
ปลูกปะการังใหม่ โดยนักวิชาการจากมหาวิทยาลัย ท.ช. และนักดำน้ำอาสาสมัคร	10	9	8	7	6	5	4	3	2	1	
ออกแบบประติมากรรมปะการังเทียมเพื่อทดแทนแหล่งดำน้ำที่เสียหายไป โดยนักวิชาการจากมหาวิทยาลัย และท.ช.	10	9	8	7	6	5	4	3	2	1	
จัดทำเส้นทางศึกษาธรรมชาติในป่าชายเลนโดย ท.ช.	10	9	8	7	6	5	4	3	2	1	
จัดทำเส้นทางศึกษาธรรมชาติใต้ทะเลสำหรับนักดำน้ำ โดยนักวิชาการจากมหาวิทยาลัย และท.ช.	10	9	8	7	6	5	4	3	2	1	
แก้ปัญหาหน้ากินน้ำใช้ปนเปื้อนน้ำเค็ม โดยกรมอุทยานฯ กรมป่าไม้ และกรมน้ำบาดาล	10	9	8	7	6	5	4	3	2	1	
การซ่อมปะการังที่หักพัง โดยกรมอุทยานฯ ท.ช. และ NGOs	10	9	8	7	6	5	4	3	2	1	
ติดตั้งหุ่นจอดเรือใหม่ในแนวปะการัง โดย ท.ช. และอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
จัดระบบแบ่งเขตกิจกรรมในอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
การปลูกป่าชายหาด และป่าชายเลน โดยอาสาสมัคร NGOs นักเรียน และกรมทรัพยากรทางทะเลและชายฝั่ง	10	9	8	7	6	5	4	3	2	1	
โครงการสนับสนุนวิชาการและพัฒนาการท่องเที่ยวในบริเวณอุทยานฯ โดย ท.ช. NGOs และสำนักงานพัฒนาการท่องเที่ยว	10	9	8	7	6	5	4	3	2	1	
ประกาศปิดจุดดำน้ำบางแห่งที่เสียหายมาก เพื่อให้ธรรมชาติฟื้นตัว โดยอุทยานฯ	10	9	8	7	6	5	4	3	2	1	

1.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กรุณาพิจารณาหรือเขียนเพิ่มเติม คำตอบของท่านผู้เข้าร่วมทุกท่านจากแบบสอบถามรอบที่ 1 ที่จัดขึ้นได้รวบรวม และนำเสนอในที่นี้

1. ฤดูมรสุม ทะเลมึลคลื่นลมแรงทำให้กิจกรรมการฟื้นฟูผลกระทบของอุทยานฯที่เป็นหมู่เกาะกลางทะเลทำได้ช้า ไม่สะดวกโดยเฉพาะช่วงเดือนพฤษภาคม ถึง พฤศจิกายน
2. สภาพน้ำทะเลขุ่นมากและแยกชั้นขุ่นใสในบางบริเวณ ทำให้ทำงานได้ทะเลได้ยากลำบาก
3. บุคลากรขาดประสบการณ์ความรู้ความชำนาญในการปฏิบัติงานฟื้นฟูได้ทะเล ทำให้ต้องลองผิดลองถูก สูญเสียงบประมาณ งานล่าช้า
4. ขาดเครื่องมือที่เหมาะสมในการปฏิบัติงานเก็บกู้ซากและขยะขนาดใหญ่จากใต้
5. ผู้เข้าร่วมในกิจกรรมการฟื้นฟูผลกระทบต่างๆ มีเจตนาอันดีแต่ขาดความรู้ความเข้าใจในการปฏิบัติงาน และความรู้พื้นฐานของสภาพธรรมชาติ บางกรณีทำให้เกิดความเสียหายต่อสภาพแวดล้อมมากขึ้น
6. ความล่าช้าในการขออนุมัติเงินเพื่อการฟื้นฟูผลกระทบ ของทั้งทางราชการและหน่วยงานเอกชน ทำให้อาสาสมัครที่มาทำงานต้องออกเงินส่วนตัวไปก่อน
7. งบประมาณ ไม่เพียงพอในการติดตามผลการเก็บกู้ปะการัง เนื่องการฟื้นฟูทรัพยากรได้ทะเลต้องการงบประมาณสูง
8. ระเบียบการเบิกจ่ายเงินของภาครัฐทำให้งานล่าช้า และไม่สามารถเบิกค่าใช้จ่ายได้ตามที่จ่ายจริง
9. ขาดการประสานงานอย่างเป็นระบบทั้งภายในและระหว่างหน่วยงานของรัฐที่รับผิดชอบเรื่องการฟื้นฟูผลกระทบ มีความขัดแย้งเรื่องสิทธิถือครองพื้นที่ ที่งานซ้ำซ้อน และแข่งแย้งกันนำเสนอโครงการ ทำให้งานล่าช้า การจัดการงบประมาณเป็นไปอย่างไร้ทิศทาง และไม่มีประสิทธิภาพเท่าที่ควร
10. ขาดการประสานความร่วมมือระหว่างภาครัฐ เอกชน และชาวบ้านในพื้นที่ในการฟื้นฟูทรัพยากร ทำให้ขาดการมีส่วนร่วมจากท้องถิ่น และอาจมีผลการดำเนินงานที่ไม่ต่อเนื่องในระยะยาว
11. บางหน่วยงานถือโอกาสใช้กิจกรรมการฟื้นฟู เพื่อประชาสัมพันธ์องค์กรของตัวเอง โดยมีได้เน้นที่คุณภาพของผลงาน
12.

ส่วนที่ 2 ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น (Built environment)

ผลกระทบเหล่านี้รวมถึงผลกระทบทางกายภาพโดยตรงและโดยอ้อม และความเสียหายที่เกิดขึ้นกับสิ่งแวดล้อมที่มนุษย์สร้างขึ้น ได้แก่ ระบบขนส่ง ถนน ระบบสาธารณูปโภค ไฟฟ้า โทรศัพท์ บ้านเรือนที่อยู่อาศัย อาคารพาณิชย์ อาคารของทางราชการ โรงเรียน สถานศึกษา เป็นต้น ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง

2.1 ผลกระทบของสินทรัพย์ที่มีต่อสิ่งแวดล้อมที่มนุษย์สร้างขึ้น

กฎบัตรการประเมินเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่คิดกันไว้รวบรวม และนำเสนอในที่นี้

1.	อาคารที่ทำการอุทยานฯ บ้านพักเจ้าหน้าที่ หน่วยปฐมพยาบาล สภากาชาด อุทยานฯ หรือได้รับความเสียหาย
2.	อาคารที่พัก ลานกางเต็นท์ และสิ่งอำนวยความสะดวกแก่นักท่องเที่ยวเสียหาย และ/หรือถูกทำลาย
3.	ระบบสาธารณูปโภคในอุทยานฯ ไฟฟ้า ประปา การสื่อสาร ถูกทำลาย
4.	เรือตรวจการของอุทยานฯ เรือและยานพาหนะของผู้ประกอบการท่องเที่ยวเสียหาย หรือถูกทำลาย
5.	อาคารนิทรรศการ เส้นทางศึกษาธรรมชาติ และป้ายให้ความรู้แก่นักท่องเที่ยวได้รับความเสียหาย
6.	ท่าเทียบเรือสำหรับเรือนำนักท่องเที่ยวถูกทำลาย เสียหาย
7.	หมู่บ้านชาวประมงถูกทำลาย
8.	หมู่เกาะหรือบริเวณจุดดำน้ำเสียหาย สูญหาย
9.	.....
10.	.....

2.2 ผลกระทบด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้นที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรุณาวางกลม ☐ ค่าคะแนนที่ท่านเห็นสมควร

ผลกระทบของสินทรัพย์ในอุทยานฯ	มีผลกระทบต่อการท่องเที่ยวในอุทยานฯ										ไม่ทราบหรือ ไม่มีความเห็น
	สูง มาก									น้อย มาก	
อาคารที่ทำการอุทยานฯ หน่วยปฐมพยาบาลถูกทำลาย หรือได้รับความเสียหาย	10	9	8	7	6	5	4	3	2	1	
อาคารที่พักและสิ่งอำนวยความสะดวกแก่นักท่องเที่ยวเสียหาย และ/หรือถูกทำลาย ทำให้ต้องปิดอุทยานฯ ชั่วคราวเพื่อซ่อมแซม	10	9	8	7	6	5	4	3	2	1	
ระบบสาธารณูปโภค (น้ำ ไฟฟ้า) ในอุทยานฯ ถูกทำลาย	10	9	8	7	6	5	4	3	2	1	
บ่อน้ำกินน้ำใช้ปนเปื้อนน้ำเค็ม หรือแบคทีเรียจากซากสิ่งมีชีวิตอื่นๆ ทำให้ขาดน้ำกินน้ำใช้ในอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
ยานพาหนะ เช่นรถยนต์ หรือ เรือในอุทยานฯ และผู้ประกอบการท่องเที่ยวได้รับความเสียหาย ทำให้ไม่สามารถเดินทางไป-กลับอุทยานฯ ที่เป็นเกาะได้ และเจ้าหน้าที่ไม่สามารถปฏิบัติงานได้สะดวก	10	9	8	7	6	5	4	3	2	1	
เครื่องมือสื่อสาร และอุปกรณ์สำนักงานถูกทำลาย ทำให้อุทยานฯ ถูกตัดขาด นักท่องเที่ยวติดต่อไม่ได้ และขาดความมั่นใจในความปลอดภัย	10	9	8	7	6	5	4	3	2	1	
อุปกรณ์เพื่อการดำน้ำของอุทยานฯ ทั้งแบบ Snorkeling และแบบ SCUBA ได้รับความเสียหายทำให้สูญเสียนักท่องเที่ยวกลุ่มเป้าหมาย	10	9	8	7	6	5	4	3	2	1	
หมอยาและหมู่เกาะหรือบริเวณจุดดำน้ำสูญหาย ทำให้การดำน้ำไม่สะดวก	10	9	8	7	6	5	4	3	2	1	
เกิดสภาพเสื่อมโทรมของสิ่งก่อสร้างและความเสียหายในภาพรวมที่แพร่ทางสื่อทั่วไปแสดงถึงสภาพที่ไม่พร้อมรับนักท่องเที่ยว และเห็นแล้วเกิดความสลดใจ	10	9	8	7	6	5	4	3	2	1	
อาคารนิทรรศการ เส้นทางศึกษาธรรมชาติ และป้ายให้ความรู้แก่นักท่องเที่ยวได้รับความเสียหาย	10	9	8	7	6	5	4	3	2	1	
ท่าเทียบเรือสำหรับเรือนำนักท่องเที่ยวถูกทำลาย เสียหาย	10	9	8	7	6	5	4	3	2	1	
หมู่บ้านชาวประมงถูกทำลาย	10	9	8	7	6	5	4	3	2	1	

2.3 ประสิทธิภาพของกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยวที่เกี่ยวข้องเนื่องกับการฟื้นฟูสิ่งแวดล้อมที่มนุษย์สร้างขึ้น ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

กรุณาวางกลม ○ ค่าคะแนนประสิทธิภาพของกิจกรรมดังต่อไปนี้ ตามที่ท่านเห็นสมควร

กิจกรรมหรือแนวทางการฟื้นฟู	มีประสิทธิภาพของกิจกรรมในการฟื้นฟูสิ่งแวดล้อมที่มนุษย์สร้างขึ้น และการท่องเที่ยว										ไม่ทราบ หรือ ไม่มีความเห็น
	สูง มาก									น้อย มาก	
สร้างสิ่งก่อสร้าง ที่ทำการ อุปกรณ์สำนักงาน โรงอาหาร และที่พักใหม่ โดยกรมอุทยานฯ กรมควบคุมมลพิษ และหน่วยงานช่วยเหลือจากต่างประเทศ	10	9	8	7	6	5	4	3	2	1	
ติดตั้งระบบสาธารณูปโภคขั้นพื้นฐาน(น้ำ ไฟฟ้า) ในอุทยานฯ ใหม่ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
จัดซื้อจัดหาเรือตรวจการณ์ และยานพาหนะในอุทยานฯ ใหม่ทดแทน โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
จัดซื้อเรือค้นหาและกู้ภัย โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
ติดตั้งเครื่องมือ และศูนย์สื่อสารระหว่างอุทยานฯ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
ปรับปรุงพื้นที่และภูมิทัศน์ภายในอุทยานฯ โดยอุทยานฯ นักวิชาการจากมหาวิทยาลัย และชมรมผู้ประกอบการการท่องเที่ยว	10	9	8	7	6	5	4	3	2	1	
ติดตั้งระบบเตือนภัยสึนามิในอุทยานฯ โดยอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
ซ่อมแซมท่าเทียบเรือ โดยกรมเจ้าท่า และอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
จัดทำผังการจัดการพื้นที่ในอุทยานฯใหม่ โดยกลุ่มนักวิจัย	10	9	8	7	6	5	4	3	2	1	
วางท่อน้ำเสียในบริเวณลำน้ำใหม่ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
ปรับปรุง Aquarium ที่ศูนย์ชีววิทยาภูเก็ต เพื่อเป็นแหล่งเรียนรู้ โดย ท.ช. และรัฐบาล เยอรมัน	10	9	8	7	6	5	4	3	2	1	

2.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กรุณาพิจารณาหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่ดิฉันได้รวบรวม และนำเสนอในที่นี้

1. ฤดูมรสุม ทะเลมีคลื่นลมแรงทำให้การขนส่งวัสดุอุปกรณ์ทางเรือ และกิจกรรมการฟื้นฟูผลกระทบเป็นไปอย่างล่าช้ามาก
2. น้ำมันและสินค้าขึ้นราคาทำให้งบประมาณที่ตั้งไว้ไม่เพียงพอ
3. งบประมาณภาครัฐ ไม่มีจริง แม้นายกรัฐมนตรีบอกว่าจะมีก็ตาม แต่ระเบียบราชการไม่สามารถทำได้อย่างที่นายบอก
4. การสร้างสิ่งก่อสร้างใหม่เพื่อฟื้นฟูสภาพการท่องเที่ยว เป็นไปด้วยความรวดเร็วเกินไป ขาดการพิจารณาด้านผลกระทบสิ่งแวดล้อมอย่างรอบคอบ
5. การจัดแบ่งเขตพื้นที่ใช้สอยในอุทยานฯ เป็นไปด้วยความล่าช้า และขาดการร่วมมือกัน
6. นโยบายของภาครัฐ ไม่ชัดเจน ทำให้ผู้ปฏิบัติงานสับสน งานล่าช้า
7. ระเบียบขั้นตอนทางราชการยุ่งยากซับซ้อน ขาดการวางแผน และประสานการฟื้นฟูที่ดี ทำให้การสำรวจความเสียหายเป็นไปด้วยความล่าช้า ในขณะที่การดำเนินงานอยู่ภายใต้กรอบเวลาที่จำกัด
8. ขาดความชัดเจนของภารกิจ และเป้าหมายในการดำเนินงานของอุทยานฯ ทำให้กระบวนวางผังพื้นที่ใหม่ไม่เป็นการแก้ไขข้อบกพร่องของผังเดิม
9. ขาดการจัดการความช่วยเหลืออย่างต่อเนื่องและเป็นระบบ ทำให้เกิดความซ้ำซ้อนของการมอบหมายงานและกิจกรรมการช่วยเหลือฟื้นฟู
10. องค์การบริหารในท้องถิ่นยังขาดความเข้าใจที่ถูกต้องในการอนุรักษ์ฟื้นฟูธรรมชาติและป้องกันภัยสึนามิในอนาคต เช่น การก่อสร้างเขื่อน ถนน ถมชายหาด
11. การสร้างบ้าน หรือชุมชนใหม่โดยไม่คำนึงถึงวิถีชีวิตดั้งเดิมของคนท้องถิ่น ทำให้สูญเสียเอกลักษณ์และลดความน่าสนใจของแหล่งท่องเที่ยว
12.

ส่วนที่ 3 ด้านธุรกิจ (Business community)

ผลกระทบของสึนามิที่มีต่อ **ธุรกิจ** ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง ในที่นี้ผลกระทบทางด้านธุรกิจ หมายรวมทั้งระบบธุรกิจมิใช่เพียงอาคาร หรือสิ่งก่อสร้าง ในที่นี้ได้รวมถึงชื่อเสียงของกิจการ กลุ่มลูกค้าเป้าหมาย เจ้าหน้าที่และบุคลากร ผลกระทบประเภทนี้มักเป็นผลกระทบทางอ้อม ซึ่งเป็นผลพวงมาจากความเสียหายโดยตรงทางกายภาพต่อสิ่งแวดล้อม

3.1 ผลกระทบของสึนามิที่มีต่อระบบธุรกิจ

กรุณาพิจารณาหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่ดิฉันได้รวบรวม และนำเสนอในที่นี้

1.	ผู้ประกอบการขาดแคลนพนักงานหรือบุคลากรผู้มีความเชี่ยวชาญ เนื่องจากเสียชีวิต หรือย้ายถิ่นฐาน
2.	ผู้ประกอบการได้รับความเสียหายทั้งชีวิตและทรัพย์สิน ทำให้ไม่พร้อมให้บริการนักท่องเที่ยว
3.	เรือประกอบการดำน้ำ และเรือหางยาวสำหรับนำนักท่องเที่ยวชมปะการังได้รับความเสียหาย
4.	ที่พักและโรงแรมใกล้ และ/หรือในเขตอุทยานฯเสียหาย
5.	อุปกรณ์ของผู้ประกอบการ เพื่ออำนวยความสะดวกแก่นักท่องเที่ยวสูญหาย และ/หรือเสียหาย เช่น เต้นท์ เครื่องนอน อุปกรณ์ดำน้ำ
6.	ชื่อเสียงของธุรกิจได้รับความเสียหาย
7.	ข้อมูลและบันทึกทางธุรกิจสูญหาย
8.	บุคลากรถูกจ้างกัณฑ์เด กัณฑ์ขี้สันทมิ กัณฑ์ ลากออกจากงาน หรือย้ายถิ่น ไปทำงานแห่งอื่น
9.	นักท่องเที่ยวมีจำนวนลดลงอย่างมาก ทำให้ธุรกิจที่เกี่ยวข้องกับการให้บริการ (เช่น โรงแรม รอดและเรือรับจ้าง) ได้รับความกระทบกระเทือน ขาดรายได้ บางแห่งต้องปิดกิจการ
10.	อุทยานฯปิดบริการเพื่อฟื้นฟู ธุรกิจอื่นๆที่ต้องปิดคาม
11.	อุทยานฯขาดรายได้จากการท่องเที่ยว ทำให้ต้องขาดแคลนงบประมาณในการบริหารจัดการ
12.	.....

3.2 ผลกระทบด้านธุรกิจที่ต่อการท่องเที่ยวในเขตอุทยานฯ

กรุณาวางกลม ☐ ค่าคะแนนที่ท่านเห็นสมควร

ผลกระทบของสินไหมในอุทยานฯ	มีผลกระทบต่อการท่องเที่ยวในอุทยานฯ										ไม่ทราบ หรือไม่มี ความเห็น
	สูง มาก									น้อยมาก	
เครือข่ายธุรกิจบริการที่คอยอำนวยความสะดวกให้แก่นักท่องเที่ยว ในอุทยานฯ และบริเวณใกล้เคียง(เช่น โรงแรม รอดและเรือรับจ้าง) ได้รับความเสียหาย และบางรายเลิกกิจการ ทำให้ไม่สามารถ บริการนักท่องเที่ยวได้	10	9	8	7	6	5	4	3	2	1	
ผู้ประกอบการขาดเงินทุนในการจัดหาสิ่งอำนวยความสะดวกใหม่ ขึ้นมาทดแทน ทำให้ขาดแคลนอุปกรณ์และบริการสำหรับ นักท่องเที่ยว	10	9	8	7	6	5	4	3	2	1	
ผู้ประกอบการท่องเที่ยวขาดแคลนพนักงานหรือบุคลากรผู้มีความ เชี่ยวชาญ เนื่องจากเสียชีวิต หรือย้ายถิ่นฐาน	10	9	8	7	6	5	4	3	2	1	
กิจการบางแห่งเลิกดำเนินงานเนื่องจากอยู่ในภาวะโศกเศร้า และ ขาดเงินทุน ไม่มีศักยภาพในการให้บริการ	10	9	8	7	6	5	4	3	2	1	
ชื่อเสียงของกิจการได้รับความเสียหาย นักท่องเที่ยวขาดความ เชื่อถือ	10	9	8	7	6	5	4	3	2	1	

3.3 ประสิทธิภาพของกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยวที่เกี่ยวข้องกับการฟื้นฟูธุรกิจ ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

กรุณาวางกลม ☐ ค่าคะแนนประสิทธิภาพของกิจกรรมดังต่อไปนี้ ตามที่ท่านเห็นสมควร

กิจกรรมหรือแนวทางการฟื้นฟู	มีประสิทธิภาพของกิจกรรมในการฟื้นฟูธุรกิจ และ การท่องเที่ยว										ไม่ทราบ หรือ ไม่มีความเห็น
	สูง มาก									น้อยมาก	
สร้างสิ่งอำนวยความสะดวกแก่นักท่องเที่ยวใหม่ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
ลดความเสียหายเบื้องต้น โดยกรมบรรเทาสาธารณภัย	10	9	8	7	6	5	4	3	2	1	
ผ่อนผันภาระหนี้สิน โดยธนาคารต่างๆ	10	9	8	7	6	5	4	3	2	1	
ให้ผู้ประกอบการกู้ยืมเงินลงทุน โดยโครงการพิเศษของรัฐบาล	10	9	8	7	6	5	4	3	2	1	
รณรงค์นโยบายส่งเสริมการท่องเที่ยว ทั้งในและต่างประเทศ รูปแบบต่างๆ โดย ท.ท.ท. การบินไทย และชมรมผู้ประกอบการ การท่องเที่ยว	10	9	8	7	6	5	4	3	2	1	
จัดกิจกรรมประชาสัมพันธ์ เช่น ดำน้ำเก็บขยะ ปลูกต้นไม้ โดย อุทยานฯ และผู้ประกอบการ	10	9	8	7	6	5	4	3	2	1	
กำหนดแผนการตลาดที่ลดราคาค่าบริการเพื่อส่งเสริมการท่องเที่ยว โดยผู้ประกอบการ	10	9	8	7	6	5	4	3	2	1	

พัฒนาอบรมแรงงานท้องถิ่น เพื่อเพิ่มทางเลือกในการประกอบอาชีพ โดยกรมแรงงาน	10	9	8	7	6	5	4	3	2	1	
อบรมวิชาชีพให้พนักงานบริการที่สถานประกอบการได้รับผลกระทบและปิดกิจการใน 3 จังหวัด (พังงา ภูเก็ต กระบี่) โดยจ่ายเบี้ยเลี้ยง จัดโดย ท.ท.ท.	10	9	8	7	6	5	4	3	2	1	
ยกเลิกค่าธรรมเนียมการเข้าอุทยานฯ เพื่อส่งเสริมการท่องเที่ยวในอุทยานฯ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1	
ฟื้นฟูกิจการ โรงแรมที่พักใกล้เขตอุทยานฯ โดยเอกชนเอง	10	9	8	7	6	5	4	3	2	1	
การรวมตัวเป็นชมรมธุรกิจการท่องเที่ยวของท้องถิ่นเพื่อช่วยเหลือกัน และเพิ่มความสามารถในการต่อรองกับหน่วยงานรัฐ โดยผู้ประกอบการท้องถิ่น	10	9	8	7	6	5	4	3	2	1	

3.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กฎาทิจรณาวหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่คัดสรรได้รวบรวม และนำเสนอในที่นี้

1.	ถูกรมศุน ทะเลมิดลันลมแรงทำให้กิจกรรมการฟื้นฟูผลกระทบทำได้ช้า ไม่สะดวก
2.	สื่อมวลชนเสนอข่าวความเสียหายของปะการังมากเกินไป ทำให้นักท่องเที่ยวคิดว่าปะการังเสียหายมาก ไม่มีอะไรสวยงามให้ดูอีก
3.	ประชาชนมีสภาพจิตใจที่อ่อนแอ มีความหวาดกลัววิญญูชนคนตาย และความเชื่อเรื่องเหนือธรรมชาติอยู่มาก ทำให้มีผลกระทบต่อการฟื้นฟูสภาพจิตใจโดยรวม และการฟื้นฟูธุรกิจการท่องเที่ยวในพื้นที่ประสบภัยและพื้นที่ใกล้เคียงเป็นไปได้ยาก
4.	ประชาชนและนักท่องเที่ยวขาดความรู้ความเข้าใจเกี่ยวกับภัยธรรมชาติ จึงกลัวทะเลอันดามันและไม่มาท่องเที่ยว
5.	ระเบียบขั้นตอนทางราชการที่ยุ่งยากซับซ้อน ทำให้เกิดความล่าช้า
6.	ระบบการกู้เงินจากสถาบันการเงินไม่ชัดเจน และมีความยุ่งยาก
7.	ขาดการจัดการเรื่องเงินช่วยเหลือด้านเครื่องมือทำกิน และที่พักอาศัยอย่างเป็นระบบทำให้เกิดปัญหาทุจริต ยักยอกเงิน และเงินไม่ถึงมือผู้เดือดร้อนอย่างแท้จริง
8.	ขาดการร่วมมือกันของผู้ประกอบการนำเที่ยวในการฟื้นฟูการท่องเที่ยว เกิดการคัดราคาแข่งขัน เพื่อแย่งชิงนักท่องเที่ยว โดยไม่คำนึงต้นทุนในการประกอบการ ทำให้ระบบธุรกิจการนำเที่ยวเสียหายมากยิ่งขึ้น โดยเฉพาะผู้ประกอบการรายย่อย
9.	ผู้ประกอบการรายย่อยขาดเงินทุนในการประชาสัมพันธ์เพื่อฟื้นฟูภาพพจน์ของธุรกิจ หรือจัดซื้ออุปกรณ์ใหม่ เนื่องจากการกระจายแหล่งเงินทุนในการฟื้นฟูธุรกิจท่องเที่ยวไม่ทั่วถึง และผู้ประกอบการบางรายไม่เข้าหลักเกณฑ์ในการรับความช่วยเหลือทางการเงิน
10.	ขาดความต่อเนื่องงบประมาณ และแผนการในการฟื้นฟูผลกระทบ
11.	ผู้สูญเสียผลประโยชน์จากการแบ่งเขตกิจกรรม ทั้งเอกชนและชาวบ้านต่อต้านการจัดระเบียบ
12.	ขาดความชัดเจนของภาครัฐในการกำหนดนโยบาย สืบสนในกระบวนการคิดและตัดสินใจ ทำให้เกิดปัญหาการประสานงานระหว่างหน่วยงานราชการ เอกชน กลุ่มองค์กรเอกชน (NGOs) และผู้บริจาคเงิน ที่ไม่มีประสิทธิภาพ เกิดความซ้ำซ้อน หรือความไม่ทั่วถึงของการช่วยเหลือ
13.	กลุ่มเป้าหมายของการประชาสัมพันธ์การท่องเที่ยวไม่ชัดเจน ผิดทิศทาง โดยการส่งเสริมการท่องเที่ยวควรทำกับตลาดยุโรปและออสเตรเลียซึ่งได้ผลมากกว่าตลาดเอเชีย เพราะตลาดเอเชีย มีปัญหาเรื่องทัศนคติและความเชื่อเรื่องวิญญูชนอยู่มาก
14.	ขาดการประชาสัมพันธ์จากหน่วยงานกลางในการประกาศแหล่งท่องเที่ยวที่ได้รับผลกระทบและไม่ได้รับผลกระทบอย่างชัดเจน เพื่อเป็นข้อมูลแก่ผู้ประกอบการและนักท่องเที่ยว
15.	หน่วยงานภาครัฐเน้นประชาสัมพันธ์ฟื้นฟูการท่องเที่ยว แต่ไม่ให้ความสำคัญต่อการฟื้นฟูปัจจัยการท่องเที่ยวทั้งระบบ เช่น ขาดการช่วยเหลือผู้ประกอบการรายย่อยในท้องถิ่นให้ฟื้นตัวเองได้ ซึ่งมีผลต่อศักยภาพการรับนักท่องเที่ยวมาก
16.	การยกเลิกค่าธรรมเนียมเข้าอุทยานฯ ขาดการประชาสัมพันธ์อย่างต่อเนื่อง
17.	.....
18.	.....

ส่วนที่ 4 ด้านสังคม สุขภาพ และความปลอดภัย (Social, health, and safety)

ในพื้นที่ผลกระทบทางด้าน**สังคม สุขภาพ และความปลอดภัย** คือผลกระทบที่มีต่อกลุ่มประชากร ทั้งสุขภาพกายและใจ ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง เช่น การสูญเสียชีวิต และบุคคลอันเป็นที่รัก ความพิการเนื่องจากแรงกระแทกของสึนามิ การตกงาน การสูญเสียเครื่องมือหรือแหล่งทำมาหากิน ความเครียดของครอบครัวอันเนื่องมาจากความสูญเสีย และความขาดแคลน ซึ่งอาจนำไปสู่ปัญหาครอบครัว และ โครงสร้างชุมชนในระยะยาว

4.1 ผลกระทบของสินามิที่มีต่อ **สังคม สุขภาพ และความปลอดภัย**

กฎพิจารณาหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่คิดขึ้นได้รวบรวม และนำเสนอในที่นี้

1.	ประชาชนท้องถิ่น และเจ้าหน้าที่อุทยานฯ มีสภาพความเป็นอยู่ไม่ถูกสุขลักษณะ อยู่รวมกันอย่างแออัด ขาดที่พักอาศัยที่เหมาะสม อาหารและน้ำที่มีการปนเปื้อน
2.	เกิดโรคระบาดอันเนื่องมาจากสูง เพราะระบบนิเวศชายฝั่งถูกรบกวน
3.	ขยะติดเชื้อ เช่นซากสัตว์เลี้ยงไม่ได้รับการฝังกลบอย่างถูกวิธี
4.	ประชาชน และเจ้าหน้าที่อุทยานฯ รวมทั้งของบุคคลอันเป็นที่รัก ครอบครัว ผู้ร่วมงานและทรัพย์สิน สูญเสียชีวิต พิการ พลัดพราก
5.	ประชาชนและนักท่องเที่ยวมีปัญหาสุขภาพจิต จิตใจอ่อนแอ ซึมเศร้า เจ็บปวดฝังใจกับเหตุการณ์ความสูญเสีย หวาดกลัววิญญูณคนตาย และสิ่งเหนือธรรมชาติ
6.	ประชาชน ผู้ประกอบการ และเจ้าหน้าที่อุทยานฯ วิตกกังวล หวาดกลัว ระแวง กลัวทะเล ไม่มั่นใจในความปลอดภัย กลัวว่าจะเกิดสินามิอีก ทำให้เกิดการย้ายถิ่นฐาน เปลี่ยนอาชีพ หรือวิถีชีวิตไป
7.	เครื่องมือประกอบอาชีพเสียหาย ธุรกิจเลิกกิจการ ขาดความมั่นคงในชีวิต เกิดภาวะว่างงาน ไม่มีรายได้เลี้ยงครอบครัว ภาวะหนี้สิน เครียด
8.	การสูญเสียผู้นำครอบครัวและจำนวนสมาชิกในครอบครัว มีผลต่อการเปลี่ยนแปลงโครงสร้างของชุมชน โดยมีคนบาดเจ็บเรื้อรัง คนพิการ และเด็กกำพร้ามากขึ้น
9.	ประชาชนคิดหวง ขาดความมั่นใจในระบบการช่วยเหลือจากภาครัฐ ทำให้ทอดทิ้งรู้สึกขาดที่พึ่ง
10.	ชาวบ้านหลายครอบครัวขาดที่พึ่งทางใจ มีการเปลี่ยนศาสนาเป็นศาสนาคริสต์ (จากเดิมที่ประชากรส่วนใหญ่นับถือพุทธหรืออิสลาม) เป็นการเปลี่ยนไปตามการชักนำของผู้นำเงินและสิ่งของมาบริจาค ซึ่งอาจมีผลต่อโครงสร้างและวิถีชีวิตของชุมชนในอนาคต
11.	เจ้าอาภิกการ หรือบุคลากรซึ่งเป็นตัวหลักในการทำงานเสียชีวิต ทำให้กิจการธุรกิจหยุดชะงัก หรือเลิกกิจการ
12.	เด็กไม่มีที่เรียนหนังสือ เนื่องจากโรงเรียนเสียหายและครูก็ได้รับผลกระทบ บางโรงเรียนต้องรับภาระสอนเด็กนักเรียนในจำนวนที่มากขึ้น เกิดขาดแคลนครูและเงินทุนเลี้ยงดูเด็ก
13.	.....
14.	.....

4.2 ผลกระทบด้าน**สังคม สุขภาพ และความปลอดภัย**ที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรุณาวางกลม ○ ถ้าคะแนนที่ท่านเห็นสมควร

ผลกระทบของสินามิในอุทยานฯ	มีผลกระทบต่อการท่องเที่ยวในอุทยานฯ										ไม่ทราบ หรือไม่มีความเห็น
	สูง มาก	.....								น้อย มาก	
คนทั่วไปไม่มีปัญหาสุขภาพจิต ซึมเศร้า จากการพบเห็นการสูญเสีย ทำให้ไม่ อยากเดินทางท่องเที่ยว หรือต้อนรับนักท่องเที่ยว	10	9	8	7	6	5	4	3	2	1	
การขาดขวัญกำลังใจและความปลอดภัยในการทำงานของบุคลากรของ อุทยานฯ มีผลต่อคุณภาพการให้บริการนักท่องเที่ยว	10	9	8	7	6	5	4	3	2	1	
นักท่องเที่ยวขาดความมั่นใจในความปลอดภัย การเตือนภัย และระบบให้ การช่วยเหลือกรณีเกิดภัยพิบัติ ทำให้ไม่มาเที่ยวในบริเวณอุทยานฯฝั่งทะเล อันดามัน	10	9	8	7	6	5	4	3	2	1	
นักท่องเที่ยวคิดว่าอุทยานฯและพื้นที่ใกล้เคียงยังไม่พร้อมให้บริการ นักท่องเที่ยว จึงไม่มาเที่ยว	10	9	8	7	6	5	4	3	2	1	
นักท่องเที่ยวกลัวข่าวเรื่องการพบเห็นวิญญูณคนตาย	10	9	8	7	6	5	4	3	2	1	
นักท่องเที่ยวกลัวทะเล การพักผ่อนบนเกาะ และชายทะเล	10	9	8	7	6	5	4	3	2	1	
ความกังวลเรื่องความสะอาดของน้ำกิน น้ำใช้ อาหาร และโรคระบาดบริเวณ ประสมกัย	10	9	8	7	6	5	4	3	2	1	
ขาดระบบสาธารณสุข โรงพยาบาลในการรักษาผู้ป่วย	10	9	8	7	6	5	4	3	2	1	
ความไม่ปลอดภัยในชีวิตและทรัพย์สิน เนื่องจากโจร โจรและต่างชาติฉวย โอกาสปล้นสะดม	10	9	8	7	6	5	4	3	2	1	
โครงสร้างของประชากรในชุมชนใกล้เคียงอุทยานฯเปลี่ยนแปลงไปเนื่องจาก สมาชิกในชุมชนเสียชีวิต หรือพิการเป็นจำนวนมาก	10	9	8	7	6	5	4	3	2	1	
ชาวผ่านแดนซึ่งเป็นทรัพยากรการท่องเที่ยวทางวัฒนธรรม เปลี่ยนวิถีชีวิต ลักษณะชุมชนบ้านเรือน ทำให้สูญเสียความเป็นเอกลักษณ์ของชนเผ่า	10	9	8	7	6	5	4	3	2	1	

4.3 ประสิทธิภาพของกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยวที่เกี่ยวข้องกับการฟื้นฟูสังคม สุขภาพ และความปลอดภัย ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

กรุณาวางกลม ○ ค่าคะแนนประสิทธิภาพของกิจกรรมดังต่อไปนี้ ตามที่ท่านเห็นสมควร

กิจกรรมหรือแนวทางการฟื้นฟู	ประสิทธิภาพของกิจกรรมในการฟื้นฟูสังคม สุขภาพ และความปลอดภัย และการท่องเที่ยว										ไม่ทราบ หรือ ไม่มี ความเห็น
	สูง มาก									น้อย มาก	
ขุดเจาะน้ำบาดาลและวางระบบน้ำประปาใหม่ โดยกรมน้ำและกรมน้ำบาดาล	10	9	8	7	6	5	4	3	2	1	
ทำความสะอาดเก็บขยะในแหล่งน้ำกิน น้ำใช้ โดยกรมอุทยานฯ และอาสาสมัคร	10	9	8	7	6	5	4	3	2	1	
เก็บขยะทั้งบนบกและในน้ำ โดยกรมอุทยานฯ และอาสาสมัคร	10	9	8	7	6	5	4	3	2	1	
ให้เงินช่วยเหลือปลอดภาษีเจ้าหน้าที่อุทยานฯ โดยสหกรณ์กรมป่าไม้	10	9	8	7	6	5	4	3	2	1	
มอบเครื่องราชอิสริยาภรณ์พิเศษ แก่เจ้าหน้าที่ผู้ปฏิบัติงาน เพื่อเป็นกำลังใจ โดยสำนักนายกรัฐมนตรี	10	9	8	7	6	5	4	3	2	1	
อบรมวางแผนการเดินทางและหนีภัยสึนามิ โดยเจ้าหน้าที่อุทยานฯ, ตำรวจ, ทพท., อาสาสมัคร	10	9	8	7	6	5	4	3	2	1	
ส่งแพทย์ พยาบาลเข้าดูแลรักษา และตรวจสุขภาพให้ความช่วยเหลือด้านจิตเวช และฟื้นฟูสุขภาพจิตแก่เจ้าหน้าที่อุทยานฯ และชาวบ้านทั่วไป โดยกระทรวงสาธารณสุข มหาวิทยาลัย มูลนิธิต่างๆ และสภาวิชาชีพไทย	10	9	8	7	6	5	4	3	2	1	
มอบสิ่งของเครื่องใช้ อาหาร ยารักษาโรคในการดำเนินชีวิต	10	9	8	7	6	5	4	3	2	1	
สร้างโรงเรียนใหม่ให้แก่เยาวชนในท้องถิ่นทดแทนโรงเรียนที่เสียหายไป โดยภาครัฐ เอกชนและมูลนิธิต่างๆ	10	9	8	7	6	5	4	3	2	1	
ฝึกอาชีพและจัดหาเครื่องมือในการประกอบอาชีพให้แก่กลุ่มผู้ประสบภัย โดยภาครัฐ เอกชนและมูลนิธิต่างๆ	10	9	8	7	6	5	4	3	2	1	
ช่วยเหลือนักเรียนและเด็กกำพร้า โดย กระทรวงศึกษาธิการ และมูลนิธิต่างๆ	10	9	8	7	6	5	4	3	2	1	
สร้างอนุสรณ์สถาน โดยกรมทรัพยากรฯ	10	9	8	7	6	5	4	3	2	1	

4.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กรุณาพิจารณาหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่คลื่นได้รวบรวม และนำเสนอในที่นี้

1. การให้การดูแลผู้ประสบภัยล่าช้า ไม่ทั่วถึง เนื่องจากมีการกระจายตัวในพื้นที่กว้าง
2. บุคลากรทางการแพทย์ และผู้ให้บริการฟื้นฟูด้านสุขภาพในภาคสนาม โดยเฉพาะด้านจิตเวชมีน้อย ไม่เพียงพอ โดยเฉพาะเมื่อเทียบกับจำนวนนักท่องเที่ยว และชาวบ้าน
3. ขาดอุปกรณ์และบุคลากรในการช่วยเหลือและกู้ชีวิต
4. ประชาชนทั่วไป และชาวบ้านในท้องถิ่นมีความหวาดกลัววิญญูชนคนตาย และมีความเชื่อเรื่องเหนือธรรมชาติอยู่มาก ทำให้มีผลกระทบต่อการฟื้นฟูสภาพจิตใจโดยรวม
5. การบังคับใช้กฎหมายของอุทยานฯ บางข้อ ขัดแย้งกับวิถีชีวิตดั้งเดิมของชาวมอแกน
6. มีการแอบแฝงเผยแพร่ศาสนาเกมบั้งคับ มากับการให้เงินหรือความช่วยเหลือแก่ชาวบ้านท้องถิ่น
7. ไม่มีหน่วยงานที่ประสานความช่วยเหลือ และประสานการเบิกจ่ายงบประมาณอย่างค่องเค้งและเป็นระบบ ทำให้การช่วยเหลือไม่ทั่วถึงและไม่ต่อเนื่อง บางแห่งซ้ำซ้อน เช่น บ้าน เครื่องมือประมง เรือ
8. มีปัญหาด้านงบประมาณและเทคโนโลยีสำหรับการวางระบบเตือนภัย
9. ภาครัฐส่งเสริมการศึกษาแต่ไม่สร้างตลาดให้แก่แรงงาน
10. ทัศนคติที่ไม่ถูกต้องของคนทั่วไป ที่คิดว่าการปฎิมาจิตแพทย์มีไว้สำหรับผู้ป่วยโรคจิตเท่านั้น
11. มีการเลือกปฏิบัติระหว่างเพศ โดยผู้หญิงมักไม่ได้รับการช่วยเหลือมากเท่าที่ควร แม้ว่าต้องรับการระงับการครอบครัวยากกว่าผู้ชาย
12.

ส่วนที่ 5 ข้อเสนอแนะเพิ่มเติม เพื่อฟื้นฟูสภาพการท่องเที่ยวในเขตอุทยานอย่างยั่งยืน ภายหลังภัยธรรมชาติ

คลื่นได้รวบรวมและสรุปคำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 และนำเสนอในที่นี้ กรุณาพิจารณาหรือเขียนเพิ่มเติม ความจำเป็นเร่งด่วนของกิจกรรมหรือแนวทางการฟื้นฟูผลกระทบทั้ง 4 ด้าน

- ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ (Natural resource and ecosystem)
- ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น (Built environment)
- ด้านธุรกิจ (Business community)
- ด้านสังคม สุขภาพ และความปลอดภัย (Social, health, and safety)

ที่ยังไม่ได้รับการตอบสนอง ทั้งที่ควรทำในช่วงเวลาหนึ่งปีที่ผ่านมา และที่ควรทำในอนาคต เพื่อฟื้นฟูสภาพการจัดการการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเล ภายหลังภัยธรรมชาติ

รายการข้อเสนอแนะ และ ความต้องการ	ควรจะดำเนินการโดยใคร หรือหน่วยงานใด	ระดับความเร่งด่วน เมื่อเปรียบเทียบกับทุกรายการในที่นี้			ไม่มีความเห็นหรือไม่เห็นด้วย
		มากที่สุด	มาก	น้อย	
จัดวางระบบการเตือนภัยจากภัยธรรมชาติ โดยเฉพาะสึนามิอย่างเต็มรูปแบบทั้งทางด้านเทคโนโลยีและเครือข่ายการเตือนภัย การให้การศึกษาในทุกระดับเพื่อการปฏิบัติตัวที่ถูกต้องหากมีสึนามิเกิดขึ้นอีก การวางแผนหนีภัยในพื้นที่เสี่ยงภัย โดยเฉพาะในเขตอุทยานฯ และการศึกษาวิจัยทั้งเพื่อการฟื้นฟูผลกระทบและลดความเสี่ยงในอนาคต	ผู้เชี่ยวชาญเฉพาะด้าน, กรมอุทยานฯ				
สำรวจการเปลี่ยนแปลงสัณฐานชายฝั่งและใต้ทะเล	กรมอุทกศาสตร์ หรือท.ช.				
จัดทำระบบข้อมูลทรัพยากรภายในอุทยานฯ ทั้งในด้านปริมาณและคุณภาพ เพื่อใช้เป็นข้อมูลพื้นฐานและตัวชี้เทียบ การฟื้นตัวของสภาพธรรมชาติ	กรมอุทยานฯ หรือ นักวิชาการ				
จัดทำรายงานความก้าวหน้าการฟื้นตัวของสภาพทรัพยากรเผยแพร่แก่คนทั่วไปอย่างต่อเนื่อง เป็นระยะ เพื่อเป็นข้อมูลแก่ผู้ประกอบการและนักท่องเที่ยว และนักดำน้ำ	สถาบันการศึกษา และ กรมอุทยานฯ				
ติดตามประเมินผลกระทบด้านสังคม สุขภาพ และความปลอดภัย	ผู้เชี่ยวชาญเฉพาะด้าน				
ติดตามประเมินผลกระทบด้านสิ่งแวดล้อม	ผู้เชี่ยวชาญเฉพาะด้าน				
พัฒนาแหล่งน้ำจืดทดแทนแหล่งที่เสียหาย เพื่อให้เพียงพอต่อความต้องการ และการคิดตั้งระบบบำบัดน้ำเสียภายในอุทยานฯ	กรมอุทยานฯ				
ลดการก่อสร้างสิ่งก่อสร้างใหม่ในบริเวณชายฝั่ง และวางแผนการก่อสร้างสิ่งปลูกสร้างอย่างรอบคอบ โดยคำนึงถึงสภาพธรรมชาติ และความปลอดภัยจากภัยธรรมชาติ	กรมอุทยานฯ				
จัดแบ่งเขตกิจกรรม (zoning) ในอุทยานฯแต่ละแห่งอย่างชัดเจน	กรมอุทยานฯ				
พัฒนาทรัพยากรบุคคลของอุทยานฯให้เพียงพอกับการจัดการอุทยานฯ ทั้งด้านจำนวนคนและคุณภาพ	กรมอุทยานฯ				
กำหนดแผนแม่บทการจัดการอุทยานแห่งชาติในการจัดแบ่งเขตการใช้ประโยชน์ของแต่ละอุทยานฯให้ชัดเจน และดำเนินการตามอย่างเคร่งครัด	กรมอุทยานฯ และ อุทยานฯต่างๆ				
ศึกษาความสามารถในการรองรับนักท่องเที่ยวในแต่ละพื้นที่อุทยานฯเพื่อการควบคุมจำนวนเรือ และนักท่องเที่ยวสอดคล้องกับพื้นที่และทรัพยากรที่มี เพื่อไม่ให้มีจำนวนนักท่องเที่ยวมากเกินไปจนเกิดการรองรับของอุทยานฯ และเพื่อความปลอดภัยของนักท่องเที่ยวเอง	กรมอุทยานฯ				
ใช้ระบบสัมปทานที่พักนักท่องเที่ยวโดยให้ออกชนบริหาร และอุทยานฯ ควบคุม เพื่อลดการะคำใช้จ่ายของอุทยานฯ	กรมอุทยานฯ				
จัดทำแผนป้องกันภัย ค้นหาภัยกรณีฉุกเฉิน และจัดเตรียมเครื่องมือช่วยชีวิตต่างๆ เช่น เรือ วิทยุสื่อสาร อาหารและน้ำสำรอง ภายในอุทยานแห่งชาติทางทะเล	กรมอุทยานฯ				
ฟื้นฟูปะการัง และการวางปะการังเทียมในบริเวณที่เหมาะสม	ท.ช.				
สร้างเครือข่าย ประสานความร่วมมือระหว่างหน่วยงานภาครัฐ สถาบันการศึกษา และเอกชน เพื่อสนับสนุนการศึกษาวิจัย พัฒนาองค์ความรู้ที่เกี่ยวข้องกับการจัดการอุทยานฯ	สถาบันการศึกษา กรมอุทยานฯ และท.ช.				
สำรวจแหล่งดำน้ำใหม่เพื่อทดแทนแหล่งดำน้ำเดิม และเพื่อให้แหล่งดำน้ำที่เสียหายมีโอกาสฟื้นตัว	สถาบันการศึกษา กรมอุทยานฯ และท.ช.				
ส่งเสริมการมีส่วนร่วมของชุมชนใกล้เคียงอุทยานฯให้มีส่วนร่วมในการ	สถาบันการศึกษา อ.บ.ค.				

Appendix H Questionnaire Round III for the Delphi survey (English version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

<date>

Dear ...<name>,

Thank you very much for completing and returning the Round II questionnaire that asked you to review the impacts of the 2004 tsunami on tourism in marine parks and recovery efforts to minimize the impacts using a nine-point rating scale. The results from all responses have been compiled, statistically analyzed, and used to construct the Round III questionnaire.

In this Round III questionnaire which is **the final round of the survey**, you are provided with the statistics values for combined respondents' answers from Round II and, for comparison, your own Round II rating. I hope that this brief statistical summary is useful as you reconsider and think about look at your opinion in the context of those of the larger group.

Please complete and return the Round III questionnaire as soon as you can or by <date>. Please accept my sincere appreciation for your kind cooperation and assistance. If you have any questions or comments about this study, please do not hesitate to contact me. My telephone number is 02-579-9645, or you can write to me at the email addresses (somdeem@yahoo.com or mepraserts@geo.orst.edu).

Sincerely Yours,
Somrudee Meprasert

****Please start here****

Your Secret Code

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Round III questionnaire

Primary objective of this final round questionnaire is to give you a chance to compare your rating response in the previous round with that of the entire panel. This questionnaire consists of seven sections. The first four sections focus on the four categories of tsunami impacts, including aggregated assessments of effects on marine tourism, disaster responses and their effectiveness, and obstacles to response and recovery. Section five addresses additional response actions that are needed. Section six focuses on the positive outcomes of the disaster. Section seven focus on comments on the methodology of this Delphi study.

For Round III of this Delphi study, please use the following protocol, drawing on your own experience:

For Sections 1 through 4:

1. Review the Round I aggregated list of tsunami impacts for each category, adding to them if necessary.
2. Re-considering your previous rating and that of the entire panel using statistics values of these impacts, use the 10-point scale to re-assess the extent to which each impact affected marine park tourism.
3. Re-considering your previous rating and that of the entire panel using statistics values of the tsunami response and recovery actions identified in Round II, use the 10-point scale to assess the effectiveness of each in recovering marine park tourism.
4. Review and add to the list of constraints to response and recovery

For Section 5:

1. Assign a priority (high, moderate, or low) to each of the additional response/recovery actions identified by Round I participants.

For Section 6:

1. Describe any positive impacts that the tsunami and its impacts have had (or might have) on marine park tourism.

For Section 7:

1. Give comments on the methodology of this Delphi study.

Followings are simple definitions of each statistics value that are presented in this questionnaire.

1. Mode is the most frequent value within the list of data.
2. Median is the is a number that separates the higher half of a data set from the lower half.
3. IQR or Inter-Quartile Range is the difference between the third and first quarters when data are sorted.

The following explanation would help you understand more about the statistics values.

The 2004 tsunami impact-----the statement

“Dirty, dark looking sand after the tsunami reduce aesthetics of the beach”

Mode	= 10
Median	= 6
IQR	= 6

From above example, majority of participants think that dirty-looking sand on the beach after the tsunami **strongly affects** tourism in marine parks (majority of them rated 10 and middle value is 6). The IQR value shows degree of agreement on this vote. That means, although, majority of participants vote 10 for this statement, the rest of participants' vote are varied (IQR=6 is very wide range).

****Please consider these value while you complete this questionnaire.****

SECTION 1: NATURAL RESOURCES AND ECOSYSTEMS

Examples of these impacts would include direct physical and biological damages on coastal ecosystem, wildlife, and marine animals. It would also include coral reef damage and coastal erosion. Examples of indirect impacts would be damages that are related to debris, oil spill, and leakage of toxic substances into coastal water and coastal ecosystem.

1.5 Impacts of the 2004 tsunami on natural resources and ecosystems that occurred within and/or nearby marine park boundaries

[Please review and/or provide additional comments on responses from Round I questionnaire](#)

1.	Changes in offshore/nearshore bathymetry due to sand entrainment by tsunami waves.
2.	Loss of marine fish and other marine animals due to direct physical damage and transport inland.
3.	Changes in behavior of some marine fish and animals due to physical damage to habitats.
4.	Tsunami changed underwater depths and habitat conditions adversely impact regular diving destinations.
5.	Severely eroded beaches affect coastal wildlife habitat, including nesting areas for sea turtles, mangrove bird nesting and fish nurseries, and beach forests.
6.	White, clean sandy beaches covered by black, dirty-looking sediment and debris in some areas.
7.	Seagrass beds and mangroves uprooted up and/or smothered by sand and sediment in some areas.
8.	Coral reef communities directly damaged by the force of tsunami waves and entrained sediment, resulting in broken, upended, or smothered corals and other animals and plants.
9.	Creation, transport, and deposition of huge amounts of tsunami-generated debris (building remnants, vehicles, trees and other abrasive materials) exacerbate direct physical damage to both marine and coastal resources and ecosystems.
10.	Seawater intrusion into surface and underground freshwater supplies makes them unpotable for human and stock consumption, kills trees and vegetation, particularly beach forests and peat swamp forests, and reduces agricultural capacity of coastal lands.
11.	Sea turtles and some rare marine species were stranded on beaches by tsunami wave.
12.	Mangrove forests were smothered and died because of tsunami sand deposit.
13.	.....

1.2 How these natural resource and ecosystem impacts affected the tourism sector in marine national parks

Please circle O appropriate score.

List of impact	Level of impact on park tourism										Not Applicable (NA)	Your previous score	Group's popular vote (Mode)	Middle value (Median)	Data distribution (IQR)
	Very high									Very low					
Immediate changes of coastal bathymetry altered coastal ecosystem both inland and underwater. It possibly causes behavior changes in marine animals in feeding and migrating. It also might reduce amount of fish and some kinds of marine animals.	10	9	8	7	6	5	4	3	2	1			5	5	3.75
Immediate changes of coastal bathymetry and beach slope threaten navigation and tourism safety	10	9	8	7	6	5	4	3	2	1			2	4.5	4
Immediate changes of coastal bathymetry and underwater condition cause difficulty in finding regular diving destinations	10	9	8	7	6	5	4	3	2	1			1	3	4
Altered water current and sedimentation cause turbid coastal water	10	9	8	7	6	5	4	3	2	1			7	5.5	4
Damaged coral reef and sea-fan reduces number of diving sites.	10	9	8	7	6	5	4	3	2	1			7	7	4.5
Seagrass beds in some areas are completely smothered by sand and sediment	10	9	8	7	6	5	4	3	2	1			6	5.5	3.25
Huge amount of debris both inland and underwater reduce natural aesthetics	10	9	8	7	6	5	4	3	2	1			7	7	2.5

Pointed and sharp debris on beaches threaten tourist safety	10	9	8	7	6	5	4	3	2	1			10	6	5.25
In some places, white and clean sandy beaches are covered by black and dirty-looking sediment	10	9	8	7	6	5	4	3	2	1			4	5.5	4.25
Eroded beaches, dying mangrove and dying beach forest reduce landscape aesthetics	10	9	8	7	6	5	4	3	2	1			4	6	3.25
Seawater intrusion into surface and underground water system not only causes beach forest and peat swam forest deterioration but it also causes lack of potable water for local people.	10	9	8	7	6	5	4	3	2	1			5	6	4

Check this box ☐ if you confirm **ALL** of your previous votes in this section

1.3 Natural resource and ecosystem-related response and recovery efforts taken in 2005 and their effectiveness with respect to marine national park tourism recovery

Please circle O appropriate score.

Response-Recovery Actions Undertaken	Effectiveness of natural resource and ecosystem-related response-recovery efforts, with respect to marine park tourism recovery											Not Applicable (NA)	Your previous score	Group's popular vote (Mode)	Middle value (Median)	Data distribution (IQR)
	Very high										Very low					
Cleaned up of land and underwater areas – volunteer divers, military, DMCR, NGOs, and park officials	10	9	8	7	6	5	4	3	2	1				8	8	1
Repaired damaged corals and seafans – volunteer divers, university staff, park officials, and private business volunteers	10	9	8	7	6	5	4	3	2	1				7	7.5	1.5
Transplanted and replanted corals – marine biologists, DMCR, and volunteer divers	10	9	8	7	6	5	4	3	2	1				5	5	2
Designed artificial reef to replace damage diving sites – universities and DMCR	10	9	8	7	6	5	4	3	2	1				7	5	4.5
Designed trails in mangrove forest – DMCR	10	9	8	7	6	5	4	3	2	1				5	5	3.5
Designed underwater trail for divers – universities and DMCR	10	9	8	7	6	5	4	3	2	1				6	5.5	3.5
Mitigated the lack of potable water issue due to seawater intrusion – National Park Department and Department of Underground Water	10	9	8	7	6	5	4	3	2	1				5	6	2
Installed new anchoring buoys within park boundaries – by DMCR and Marine Park Division	10	9	8	7	6	5	4	3	2	1				9	8	3
Assigned new activity zones within park boundaries to allow for recovery – universities and Marine Park Div.	10	9	8	7	6	5	4	3	2	1				8	5	2.5
Replanted mangrove and beach forests – school children, adult volunteers, NGOs, and DMCR	10	9	8	7	6	5	4	3	2	1				7	7	2
Initiated educational and tourism promotional project within marine parks – DMCR, NGOs, and Tourism Development Division	10	9	8	7	6	5	4	3	2	1				7	6	3
Closed some damaged diving destinations to allow natural recovery – Marine Park Division	10	9	8	7	6	5	4	3	2	1				9	8.5	3.5

Check this box ☐ if you confirm **ALL** of your previous votes in this section

1.4 Obstacles or constraints to recovery of natural resources and ecosystems, and of marine park tourism

[Please review and/or provide additional comments on responses from round 1 questionnaire](#)

1. Major storms and associated winds and currents during 2005 monsoon season (May to November) significantly delayed underwater and offshore assessment and recovery operations, including underwater debris clean-up.
2. Turbid seawater and a separate layer of turbid seawater caused difficulty for underwater operations.
3. Lack of experienced and skilled personnel to conduct underwater operations, resulting in trial and error process that caused delay and waste of limited financial resources.
4. Lack of appropriate equipment to remove and clean up underwater debris.
5. Volunteers who participated in recovery responses lack knowledge and basic understanding of coastal environment, sometimes resulting in additional damage of marine environment, for example, loss of recoverable corals.
6. Volunteers had to pay their own expenses up front, due to sluggishness in getting budgets approved by government agencies and NGOs and directing international assistance.
7. Underwater operations to undertake and monitor recovery process are very expensive and resources are limited and dwindling; recovery monitoring in particular will be difficult to sustain.
8. Bureaucratic regulations of government agencies slow the delivery of needed financial resources and in some cases prevented the purchase of critical cleanup and other equipment and materials.
9. Fragmentation of government agency responsibilities, lack of communication and collaboration (both between and within governmental levels, and with NGOs), inconsistent policies, and poorly managed funds cause significant difficulty and confusion in recovery efforts.
10. Lack of local involvement in natural resource and ecosystem recovery efforts has caused delay and threatens a lack of continuity in the long-term recovery process.
11. Some governmental agencies and NGOs take advantage of recovery resources and activities to promote their own agendas and take "credit", without focusing on quality or effectiveness of activities.
12. Some governmental agencies and NGOs accelerated the uses of donated money in order to meet limited time frame. This caused ineffective, inappropriate, and chaotic uses of money.
13. There is lack of reliable long term monitoring program on natural resource and ecosystem recovering process.
14. There is lack of appropriate post-disaster action plan in parks.
15.

SECTION 2: BUILT ENVIRONMENT

This would include the direct and indirect impact of all damages that occurred to built environment within and nearby marine national parks' boundaries such as transportation network, infrastructural system, power plant and distribution network, communication network, residential houses, commercial buildings, government agencies' offices, schools, etc.

2.1 Impacts of the 2004 tsunami on the built environment that occurred within and/or nearby marine park boundaries

[Please review and/or provide additional comments on responses from Round 1 questionnaire](#)

1. Park office, park rangers' dormitory, infirmary, built landscape demolished or destroyed.
2. Bungalows, campground, and tourism facilities damaged or/and destroyed.
3. Basic infrastructures including electric power, drinking water, and communication network destroyed.
4. Park's vehicles and local tour operators' vehicles (boats, cars, trucks, etc.) damaged or destroyed.
5. Exhibition areas, natural trails, and interpretative signs damaged or destroyed.
6. Piers that accommodate tourists and park's staff between mainland and marine parks damaged or destroyed.
7. Sea Gypsy village—the Moken tribe—completely destroyed.
8. Buoys in diving destinations lost or damaged.
9.
10.

2.2 How these built environment impacts affected tourism in marine parks.

Please circle ○ appropriate score.

Built Environment Impacts	Level of impact on park tourism											Not Applicable (NA)	Your previous score	Group's popular vote (Mode)	Middle value (Median)	Data distribution (IQR)
	Very high										Very low					
Park offices, park ranger dormitories, infirmaries, built landscape destroyed.	10	9	8	7	6	5	4	3	2	1				10	8	4
Bungalows, campgrounds, and tourism facilities damaged or/and destroyed, resulting in temporary closures of marine parks.	10	9	8	7	6	5	4	3	2	1				8	8	3
Basic infrastructures including electric power, water lines, and communication network destroyed.	10	9	8	7	6	5	4	3	2	1				8	8	1.5
Potable water wells/reservoirs contaminated by saltwater and bacteria causing lack of potable water in parks.	10	9	8	7	6	5	4	3	2	1				10	9	2.5
Basic infrastructure and communication networks destroyed, isolating parks and reducing tourist safety.	10	9	8	7	6	5	4	3	2	1				8	8	1.75
Diving gear and facilities both for snorkeling and SCUBA are damaged or lost.	10	9	8	7	6	5	4	3	2	1				8	8	1.75
Damaged or lost diving buoys cause inconvenience for divers and tour operators.	10	9	8	7	6	5	4	3	2	1				5	7	3.75
Images of destroyed and damaged areas in national/international media show poor condition of tourism destination/facilities and cause sadness among tourists.	10	9	8	7	6	5	4	3	2	1				7	7	4
Exhibition areas, nature trails, and interpretative signs/exhibits damaged or destroyed.	10	9	8	7	6	5	4	3	2	1				9	8	3
Piers that accommodate tourists, parks staff boats, and private transports between mainland and marine parks damaged or destroyed.	10	9	8	7	6	5	4	3	2	1				8	7	2.5
Sea Gypsy village—the Moken tribe—completely destroyed.	10	9	8	7	6	5	4	3	2	1				9	6	3
Park offices, park ranger dormitories, infirmaries, built landscape destroyed.	10	9	8	7	6	5	4	3	2	1				8	7	3

Check this box ☐ if you confirm **ALL** of your previous votes in this section

2.3 Built Environment response and recovery efforts taken in 2005 and their effectiveness with respect to marine national park tourism recovery

Please circle O appropriate score.

Response-Recovery Actions Undertaken	Effectiveness of built environment-related response and recovery efforts, with respect to marine park tourism recovery										Not Applicable (NA)	Your previous score	Group's popular vote (Mode)	Middle value (Median)	Data distribution (IQR)
	Very high									Very low					
Constructed new park offices, new office supplies, new cafeteria, and new dormitory – Marine Park Division, Pollution Control Department, and foreign agencies.	10	9	8	7	6	5	4	3	2	1			9	7	2.5
Installed new basic infrastructural system (potable water and electric power) within marine parks – Marine Park Division.	10	9	8	7	6	5	4	3	2	1			7	7	2.5
Replaced damaged observatory boats and vehicles with new ones – Marine Park Division.	10	9	8	7	6	5	4	3	2	1			7	7	2
Purchased new rescue boats for emergency situation – Marine Park Division.	10	9	8	7	6	5	4	3	2	1			8	8	2.5
Established communication headquarter and network to communicate among marine parks – Marine Park Division.	10	9	8	7	6	5	4	3	2	1			7	7	1.75
Restored and improved park landscape and appearance – universities and tour operator coalitions.	10	9	8	7	6	5	4	3	2	1			7	7	2.5
Installed tsunami warning system within parks – Marine Park Division.	10	9	8	7	6	5	4	3	2	1			8	7	2.5
Repaired pier and dock – Harbour Department and Marine Park Division.	10	9	8	7	6	5	4	3	2	1			7	6.5	2
Studied and initiated new park zoning management plan – researchers from universities.	10	9	8	7	6	5	4	3	2	1			6	6	2
Replaced damaged or lost buoys with new buoys in and around diving areas – Marine Park Division.	10	9	8	7	6	5	4	3	2	1			7	7	2.5
Improved Phuket Aquarium at Phuket Marine Biological Center for education and outreach purposes – DMCR and foreign agencies.	10	9	8	7	6	5	4	3	2	1			5	7	3

Check this box ☐ if you confirm **ALL** of your previous votes in this section

2.4. Obstacles or constraints to recovery of the built environment related to marine park tourism

Please review and/or provide additional comments on responses from round I questionnaire

- Major storms and associated winds and currents during monsoon season (May to November) significantly delayed transportation of construction materials between mainland and islands and subsequent recovery operations.
- Budgets proposed for recovery efforts insufficient in part due to rapid increase in the price of gasoline.
- The Prime Minister promised special funding for recovery efforts without considering that Thai laws and regulations did not allow for that, resulting in unfulfilled expectations.
- The construction of new buildings to help recover tourism has been undertaken too quickly and without careful consideration of impacts on natural environments and ecosystems.
- New zoning for park use areas has gone very slowly, in part due to a lack of collaboration among various stakeholders and process failures.
- Incomprehensible policies handed down by the national government have caused confusion and resulted in inaction by policy implementers and business operators.

7. Complicated paperwork processes, the lack of overall recovery plans, and lack of collaboration among/within agencies has delayed the damage assessment process; the time allowed to complete recovery tasks have also been inadequate.
8. Lack of clear missions for marine parks and distorted goals associated with pressure to recover tourism quickly contribute to failure of the new zoning process supposedly design to solve pre-tsunami problems.
9. The lack of systematic process for financial and logistic assistance has resulted in gaps and redundancy of relief and recovery efforts.
10. Recently decentralized government agencies (national responsibilities have devolved to provincial and local levels) lack appropriate understanding of the dynamic nature of marine and coastal ecosystems and tsunami mitigation principles. These misunderstanding have led to inappropriate siting of redevelopment and infrastructure, such as new coastal roads, new dykes, and beach reclamation; problems would have been identified in environmental impact assessment studies, but none were conducted, though required by law.
11. Establishments of new settlements and housing have been undertaken by NGO and government donors without careful consideration of relatively primitive local livelihoods, reducing the uniqueness of local communities and attractiveness of tourism destinations.
12.

SECTION 3: BUSINESS COMMUNITY/ENVIRONMENT

Impacts in this category are almost all indirect effects, resulting mainly from direct physical damages to the natural environment, the built environment, or social system impacts.

3.1 Impacts of the 2004 tsunami on **business community/environment** occur within and nearby marine park boundary

Please review and/or provide additional comments responses from round I questionnaire

1. Tourism related businesses are short of trained or knowledgeable employees due to death or emigration.
2. Business operators were injured, died or lost their assets and wealth; they and their business are thus not ready to serve tourists.
3. Boats that accommodated tourists and divers have been damaged or destroyed.
4. Accommodations for tourists not available because hotels or guesthouses within and nearby parks were destroyed or damaged.
5. Tour operators' equipment and facilities, such as camping tents, bedding, diving gear, etc. were damaged or destroyed
6. Businesses' reputations deteriorated due to unavailability of normal services and opportunities.
7. Business records were destroyed, affecting marketing, finances, and other operations.
8. Employees of parks and tourism businesses have a new fear of the sea, are terrified at the prospect of future tsunami, of the ghosts of those who were swept into the sea, and other supernatural aspects of the event. Many quit their jobs or emigrated out of the region, contributing to the shortage of skilled help.
9. The reduction of tourist numbers during tourism season (November – April) on the Andaman Sea coast resulted in short-term funding gaps for tourism-related businesses, including hotels, boat rentals, and rental vehicles. This has caused the closure or bankruptcy of some businesses.
10. The temporary closure of marine parks induces closure of park-related tourism businesses.
11. The temporary closure of marine parks results in financial shortfalls for parks, which depend on fees to operate and to manage facilities.
12.
13.

3.2 How these **business community/environment** impacts affected tourism in marine parks.

Please circle ○ appropriate score.

List of impact	Level of impact on park tourism											Not Applicable (NA)	Your previous score	Group's popular vote (Mode)	Middle value (Median)	Data distribution (IQR)
	Very high										Very low					
Tourism-related business network within and nearby park boundaries, including hotels, rental boats, and rental vehicles is disrupted or non-existent. Tourists thus not served.	10	9	8	7	6	5	4	3	2	1				8	8	2
Business operators are short of money to repair or replace damaged assets. Therefore, they do not have tourism facilities to accommodate tourists.	10	9	8	7	6	5	4	3	2	1				8	9	2
Tourism-related businesses are short of skillful or knowledgeable employees due to death or emigration.	10	9	8	7	6	5	4	3	2	1				8	8	2.5
Some businesses are closed due to psychological trauma, lack of financial resources, and no capability to provide services.	10	9	8	7	6	5	4	3	2	1				10	8	3
Deterioration of business' reputation and reliability due to tourism safety issue.	10	9	8	7	6	5	4	3	2	1				10	7	4

Check this box ☐ if you confirm **ALL** of your previous votes in this section

3.3 Business Community-Environment response and recovery efforts taken in 2005 and their effectiveness with respect to marine national park tourism recovery

Please circle ○ appropriate score.

Response-Recovery Actions Undertaken	Effectiveness of business community-environment response and recovery efforts, with respect to marine park tourism recovery											Not Applicable (NA)	Your previous score	Group's popular vote (Mode)	Middle value (Median)	Data distribution (IQR)
	Very high										Very low					
Built new facilities to accommodate tourists (e.g. restrooms and cafeteria) – Marine Park Division.	10	9	8	7	6	5	4	3	2	1				8	7	3
Compensated businesses for basic damages – Department of Disaster Prevention and Mitigation .	10	9	8	7	6	5	4	3	2	1				5	5	2.5
Extended duration of the tsunami victims' loan – banks.	10	9	8	7	6	5	4	3	2	1				5	5	2
Offered low interest loans to affected businesses – government agencies.	10	9	8	7	6	5	4	3	2	1				5	5	3
Promoted both domestic and international tourism campaigns – Tourism Authority of Thailand, Thai Airways, and tour operator coalitions.	10	9	8	7	6	5	4	3	2	1				8	8	1.7 5

Arranged marine conservation activities such as debris clean-up dives and beach forest and mangrove reforestation – Marine Park Division, and tour operators.	10	9	8	7	6	5	4	3	2	1				8	7	2
Launched aggressive marketing plan – reduced tour package price in order to increase income and compete with tour operators in unaffected areas.	10	9	8	7	6	5	4	3	2	1				9	7	2.75
Trained local workforces for alternative jobs – Ministry of Labour.	10	9	8	7	6	5	4	3	2	1				7	6	2
Arranged training courses for staff that were laid-off at affected tourism businesses in 3 impacted provinces to increase their skills and pay them daily allowance – Tourism Authority of Thailand.	10	9	8	7	6	5	4	3	2	1				6	6	2
Waived marine park entrance fee to promote park tourism – Marine Park Division.	10	9	8	7	6	5	4	3	2	1				2	5	3
Recovered physical appearance of hotels that located near park boundary – private owners.	10	9	8	7	6	5	4	3	2	1				6	6	2.25
Organized local tour operator alliances for mutual support and to increase power to negotiate with government agencies – local tourism operators.	10	9	8	7	6	5	4	3	2	1				7	7	2

Check this box ☐ if you confirm **ALL** of your previous votes in this section

3.4. Obstacles or constraints to recovery of the business community-environment related to marine park tourism

[Please review and/or provide additional comments on responses from round I questionnaire](#)

- Major storms and associated winds and currents during monsoon season (May to November) significantly delayed recovery operations.
- Over-stated reports regarding tourism resource damages (especially coral reefs and beaches) and of coral reef damages generated by media causes misunderstanding among tourists, limiting visitation.
- General public in Thailand have deteriorated mental health associated with the tsunami and its aftermath, particularly dead people, ghosts, and other supernatural matters. This significantly affects psychological and tourism recovery process in affected and adjacent areas.
- General public and tourists do not have accurate knowledge of natural disasters, so they now fear the Andaman Sea and avoid visiting.
- Complicated government's paperwork for businesses seeking assistance significantly delays recovery tasks requiring resources.
- Banks and other funding sources have complicated and unclear policies to release loans for business victimized by the tsunami.
- Chaotic flux of aid into affected areas has caused corruption; often, aid money does not reach those actually in need.
- Lack of collaboration among tour operators and highly competitive tourism market causes significant price reduction of package tour which in turn damages the whole business community especially small businesses.
- Small- and mid-scale tourism businesses are short of money to market their businesses or to buy new assets because they do not fit in funding sources' financial aid criteria.
- There has been a lack of continuity of relief and recovery efforts from governmental and non-governmental agencies.
- Individuals and businesses who lost their benefits from new land use zoning plan within and nearby park boundary reject government's re-organization plan.
- Ambiguous governmental policies cause confusion at all levels of decision making process. This causes problems of collaboration within and among governmental agencies, private sectors, NGOs, and donors which resulted in chaotic aid, redundancy, and unfair aid distribution.
- In promoting recovered tourism opportunities to the Asian market, misunderstanding of concerns about ghosts and the supernatural led to failure of the effort. They later learned that the same campaign works well in European and Australian market.
- Both domestic and international tour operators and tourists do not have accurate information and understanding of the recovery situation of affected areas; this should have been provided by tourism promotion agencies. This caused strong negative halo effects to areas adjacent to tsunami-affected areas.
- Government agencies that are responsible for tourism recovery emphasize their tasks on marketing but do not prioritize their aid to support the whole business community, especially local, small-scale businesses. This strongly delays recovery of local tourism business environment.
- The waiver of marine park entrance fee as tourism recovery plan lacked continuity in its promotion.

17. Tour operators that were not ready to operate provided low quality and unsafe services. Their poor services affected tourists' confidence on business community.
18. There is lack of cooperative center (including ineffective structure and human resources of existing agencies) to link between local businesses and national agencies.
19.

SECTION 4: SOCIAL, HEALTH, AND SAFETY SYSTEMS

4.1 Impacts of the 2004 tsunami on social, health, and safety occur within and nearby marine park boundary

[Please review and/or provide additional comments responses from round I questionnaire](#)

1. People in affected areas including park rangers, officers, and staff have to stay in unsanitary condition. Their shelters were crowded. Food and water were contaminated.
2. Contagious diseases which spread by mosquitoes which broke out due to interrupted coastal ecosystem.
3. Hazardous waste such as dead animals was not appropriately destroyed.
4. People in affected areas including park rangers, officers, and staff lost their lives and their loved ones'. They have faced massive death, injury, disability, and separation.
5. General public and tourists have deteriorated mental health, depression and distress as results of the disaster. They also fear of ghost and supernatural matter.
6. People, business operators, and park staff are worried of their own safety. They fear of the sea and possible following tsunami. These cause emigration, changes of job, and changes of their way of life in affected area.
7. Tools of the trade were damaged. These lead to unmanageable debt, business closure, unemployment, insecure lives, stress, family and community problems.
8. The massive loss of family members and leaders, the increasing number of disabilities, both physically and psychologically, and the rising number of orphans in community which has increased the degree of local dependencies. These significantly change communities' social and economic structure.
9. People are disappointed by government's chaotic and ineffective relief and recovery system. This has caused deep sense of discouragement.
10. Villagers were discouraged and desperate for mental and physical support due to the crisis. Therefore, many families have converted from their original believes to Christianity because of donors' influence. This might lead to long term changes of local structure and lifestyle.
11. The death of business owners or business leaders drastically interrupts business and may lead to business closure.
12. Schools were damaged or destroyed and teachers died or were affected. Children cannot find local education providers. In some case, these lead to overloaded classroom and insufficient number of teachers in unaffected schools nearby disaster impacted area.
13.

4.2 How these social, health, and safety impacts affected tourism in marine parks.

Please circle O appropriate score.

List of impact	Level of impact on park tourism										Not Applicable (NA)	Your previous score	Group's popular vote (Mode)	Middle value (Median)	Data distribution (IQR)
	Very high									Very low					
General public have psychological problems and depression due to seeing massive death and loss that reduce their willingness to travel or to greet tourists.	10	9	8	7	6	5	4	3	2	1			8	7	1.5
Tour operators and park employees are discouraged and the lack of work safety has significantly reduced quality of their services.	10	9	8	7	6	5	4	3	2	1			8	8	2
Tourists lack confidence in their safety, disaster warning network, and emergency response. These strongly influence their	10	9	8	7	6	5	4	3	2	1			8	8	3.5

decision to avoid traveling to the Andaman Coast.																	
Tourists think that affected marine parks and adjacent areas are still not ready for tourism so they avoid visiting these areas.	10	9	8	7	6	5	4	3	2	1					8	8	2
Tourists fear ghosts and supernatural concern.	10	9	8	7	6	5	4	3	2	1					7	7	3
Tourists fear the sea, staying over-night on islands, and camping nearby the sea.	10	9	8	7	6	5	4	3	2	1					8	7	3.5
Tourists are concerned about sanitization, food and water contamination and contagious diseases in affected areas.	10	9	8	7	6	5	4	3	2	1					7	7	2
There is a lack of public health system and functional hospitals.	10	9	8	7	6	5	4	3	2	1					7	6	3
There were insecurity issues in affected areas during the crisis due to Thai robbers and foreign piracies.	10	9	8	7	6	5	4	3	2	1					3	4	2.5
There are changes of community structure in areas adjacent to parks due to massive loss of lives and the swelling number of disabilities.	10	9	8	7	6	5	4	3	2	1					8	5.5	3.5
The unique lifestyle of sea gypsies (Moken tribe) who lives in Surin Islands marine national park are immediately altered due to flux of donation and attention from media.	10	9	8	7	6	5	4	3	2	1					9	6	4

Check this box ☐ if you confirm **ALL** of your previous votes in this section

4.3 Social, Health, Safety-related response and recovery efforts taken in 2005 and their effectiveness with respect to marine national park tourism recovery

Please circle ○ appropriate score.

List of recovery responses or actions	Effectiveness of recovery responses in recovering social, health, and safety and park tourism											Not Applicable (NA)	Your previous score	Group's popular vote (Mode)	Middle value (Median)	Data distribution (IQR)
	Very high										Very low					
Installed new freshwater wells and new tap water systems – Ministry of Natural Resources and Environment.	10	9	8	7	6	5	4	3	2	1				4	5	3.75
Cleaned up debris in freshwater reservoirs – Marine Park Division and volunteers.	10	9	8	7	6	5	4	3	2	1				7	7	2.25
Cleaned up debris on land and underwater – Marine Park Division and volunteers.	10	9	8	7	6	5	4	3	2	1				7	7.5	1
Gave money to comfort park officers – Department of Forestry's co-op.	10	9	8	7	6	5	4	3	2	1				5	5	3
Gave special medals for park officers who worked hard in the affected areas during crisis time in order to show appreciation – Office of the Prime Minister.	10	9	8	7	6	5	4	3	2	1				5	5	3.75
Developed and practiced tsunami warning procedure and evacuation plan in high risk areas – park officers, police, Tourism Authority of Thailand, and volunteers.	10	9	8	7	6	5	4	3	2	1				7	7	3.75
Sent doctors and medical teams to help victims recover psychologically and physically – Ministry of Public Health, medical schools, Red Cross and many	10	9	8	7	6	5	4	3	2	1				5	6.5	2

foundations (victims included park staff, tourists, and villagers).																
Gave relief and donated food, basic needs, and medicine to victims — government agencies, private sectors, and individuals.	10	9	8	7	6	5	4	3	2	1				5	5	2
Replaced damaged or destroyed schools with new schools – government agencies, private sectors, and foundations.	10	9	8	7	6	5	4	3	2	1				8	7	1.75
Alternative job training provided to victims for victims – government agencies, private sectors, and foundations.	10	9	8	7	6	5	4	3	2	1				6	7	2
Provided financial aid, shelters, boarding schools for orphans and school children – Ministry of Education and many private foundations.	10	9	8	7	6	5	4	3	2	1				8	7	1
Built the 2004 tsunami victim memorial – Ministry of Natural Resources and Environment	10	9	8	7	6	5	4	3	2	1				4	4	3.25

Check this box ☐ if you confirm **ALL** of your previous votes in this section

4.4. Obstacles or constraints to recovery of social, health and safety systems related to marine park tourism

Please review and/or provide additional comments on responses from round I questionnaire

1. The distribution of relief and emergency response did not cover the whole affected area, due in part to the massive and widespread damages.
2. The number of medical personnel and health care providers in affected areas, especially psychologists, were insufficient when compared with substantial number of victims.
3. There was a significant lack of rescue personnel, tools, and instruments.
4. General public and villagers fear ghosts and strongly believe in supernatural causes for the disaster, resulting in significant negative effect on mental recovery.
5. The broad enforcement of park regulations on Mu Ko Surin generated conflict with the primitive lifestyle of sea gypsies who stayed in the park following the disaster.
6. In some areas, there was a hidden agenda by donors or aid providers who tried to convert people to their religion, resulting in resentment among some victims.
7. No one government agency was in charge of coordinate relief and recovery efforts, resulting in systematic problems in distribution of financial aid and donations, and uneven, sporadic, and redundant aid allocation, including money, housing, and fishing boat and gear replacement.
8. Limitations in budgets and technical issues have hampered or delayed establishing a comprehensive disaster warning network.
9. Although job retraining was provided by the government for displaced workers, the actual market for those jobs has failed to materialize, leaving many trainees out of work. .
10. There is a general understanding on the part of the public that psychologists are only for insane people, resulting in underutilization of services made available in many areas.
11. There is gender inequality in aid distribution; female victims tend to receive less support, particularly financial, than males although they have similar degrees of responsibility in their families.
12. There is a lack of tangible implementation plan on recovery efforts to reach needy target groups.
13. Inappropriate aids were given to tribal people (Moken sea gypsies). This affected social structure of the tribe that probably led to negative changes in culture and natural resource utilization in marine parks.
14. There was a significant lack of local crisis management plan after the disaster. This caused chaotic in conducting recovery projects.
15. People were desperate and changed their attitude from having high degree of self-contained to having high degree of dependency. They waited for all kinds of aids and did not hesitate to receive redundant aids e.g. boats, houses, money, etc. Therefore, due to this behavior, all agencies had to spend more time to re-check aid allocation which had delayed the whole process.
16.
17.

Section 5 Additional Recovery Actions Needed.

Please describe (and rate/rank) the additional (or improved) governmental or private recovery actions that should have been taken in the past, or should be taken in the future with respect to recover tourism in marine national parks. These include all four dimensions of recovery efforts.

- Natural resource and ecosystem
- Built environment
- Business community
- Social, health, and safety

Needed Recovery Action	By Whom?	Priority			Not Applicable (NA)	Group's popular vote (Mode)	Your previous score
		High	Moderate	Low			
Install natural disaster warning network (especially tsunami). This includes complete network of technical warning, all level of education and outreach (what to do or what not to do during disaster), evacuation plan in risk areas especially in marine parks, and recovery and mitigation researches.	Experts in specific fields, Marine Park Division.					High	
Explore coastal morphology and seafloor changes to promote navigation safety.	Hydrographic Department or D.M.C.R.					Moderate	
Inventory natural resource quantity and quality in marine parks to serve as a baseline for monitoring ecosystem recovery.	Marine Park Division or universities					High	
Using the baseline, provide ongoing monitoring and reporting of natural resource recovery, providing distribution to agencies, tour operators, tourists, divers, and the general public.	Marine Park Division or universities					Moderate	
Monitor tsunami impacts on social, health, and safety	Experts from specific fields					Moderate	
Monitor impacts on natural resource and ecosystem	Experts from specific fields					Moderate	
Repair or replace damaged reservoirs and repair or install new water treatment plants within marine parks.	Marine Park Division					High	
Minimize the construction of new buildings in marine parks and use caution in the new development, especially close to shore. A priority for all construction should be to take natural ecosystem concerns and natural hazards into consideration.	Marine Park Division					High	
Clarify activity zone in park	Marine Park Division					High	
Build professional capacity for marine park management, including enhanced training and increased numbers.	Marine Park Division					Moderate	
Identify activity zoning plans in each marine park and strictly enforce the plan	Marine Park Division, each marine park					High	
Study tourism carrying capacity in each marine park in order to control number of boats and tourists not to exceed capacity of parks and to insure tourism safety.	Marine Park Division					Moderate	
Reduce park management cost by leasing bungalows in parks to property management companies.	Marine Park Division					Low	

Needed Recovery Action	By Whom?	Priority			Not Applicable (NA)	Group's popular vote (Mode)	Your previous score
		High	Moderate	Low			
Prepare emergency response and disaster mitigation plan for each park; include rescue tools such as boats, emergency communications, emergency food and water supply to be used in parks following a disaster.	Marine Park Division					High	
Develop recovery plan for coral reefs, including installation of artificial reefs where appropriate.	D.M.C.R.					Moderate	
Establish collaborative network to develop knowledge and conduct research needed for enhanced park management. The network should consist of government agencies, universities and educational institutes, and the private sector.	Educational institutes, Marine Park Division, and D.M.C.R.					Moderate	
Identify new diving destinations to replace damaged diving sites, thus reducing pressure on existing diving sites and allowing damaged diving sites time to recover.	Educational institutes, Marine Park Division, and D.M.C.R.					Moderate	
Encourage communities located near park boundaries to get involved in designing park management plans and conservation projects such as mangrove reforestation, beach cleaning projects and education & outreach projects regarding marine environment and coastal disaster.	Educational institutes, Local government agencies, NGOs, Marine Park Division, and D.M.C.R.					Moderate	
Enforce park regulations among tourists and tour operators especially in and around diving sites.	Tour operators, Marine Park Division					High	
Promote and raise awareness of tourism impacts on natural resources among tourists.	Educational institutes, tour operators, Marine Park Division					High	
Promote tourism safety measures.	T.A.T.					High	
Create continuous tourism promotion campaign in affected areas to promote sustainable recovery.	T.A.T.					High	
Persuade the tourism businesses to emphasize their competitiveness by increasing service quality rather than reducing price.	T.A.T.					High	
Monitor tsunami impacts on business community/environment and find financial sources to recover business environment.	Experts from specific field, Ministry of Commerce, Financial institutes					Moderate	
Establish a one-stop agency that is responsible for receiving requests and concerns from tsunami victims. This is not a short term relief plan but is necessary as long term agenda to continuously reduce stress and discouragement of victims.	Specific government agency					Moderate	

Needed Recovery Action	By Whom?	Priority			Not Applicable (NA)	Group's popular vote (Mode)	Your previous score
		High	Moderate	Low			
Provide aid by asking for victims' actual needs. This will increase effectiveness of aid allocation, receiver satisfaction, and will reduce conflict with primitive cultures such as sea gypsies and artisanal fishermen.	Specific government agency and NGOs					Moderate	
Promote clean beach campaigns to reduce debris in coastal areas.	Everyone (?)					Moderate	

Remark: T.A.T. is Tourism Authority of Thailand
D.M.D.R. is Department of Marine and Coastal Resources

Section 6 Positive Impacts of the 2004 tsunami that you have faced or known of.

- a. Better quality of seawater and cleaner beaches.
- b. The disaster had revealed vagueness and constant corruption of coastal land ownership system of governmental agencies.
- c. The discontinuous recovery implementation revealed insincerity of the government in solving the problem. It clearly showed that the government took advantage of the crisis to promote their own agendas and take "credit", without focusing on quality or effectiveness of activities.
- d. NGOs and private sectors collaborated in recovery projects e.g. divers volunteered in clean-up activities.
- e. There were an unprecedented cooperation among government agencies, private sectors, academic researchers (especially marine scientists from different institutes), and public in helping victims and supporting natural resource recovery efforts.
- f. The disaster helped "reset" poor situation of coastal resource utilization. It allowed governmental sectors to re-identify resource management plan, for example, identify carrying capacity of marine parks and release new regulations to control coastal land invasion.
- g. The disaster helped increase awareness of human impacts on marine environment among government agencies and general public.
- h. The tsunami disaster helped increase coastal hazard preparedness among government agencies and public.
- i. The disaster was a lesson learned for policy makers and researchers. This leads to renovation of laws and regulations (both in general and those that related to coastal resources), emergence of new ideas, and changes in resource management paradigm.
- j. The disaster created opportunities for the country to receive international supports in term of funding, human resources, and technology.
- k. Reduced number of tourists during the year after the disaster (2005) helped decrease tourism pressure on natural resources which had been increasing continuously for decades.
- l. Tour operators, tourism stakeholders, and general public had realized that tourism is a sensitive industry that needs to be handled carefully toward sustainable goal.
- m. Some agencies received additional budgets to recover natural resources. This allowed agencies to launch projects in special need areas.
- n. In the mist of political instability in the country, the crisis united Thai people to help all the victims regardless of religion and nationality. This greatly created impression among domestic and international societies.
- o.
- p.

Additional comments and suggestions

- a. Implementing natural hazard warning center to the point that it actually "work" is top priority.
- b. Clear and tangible integrated coastal management plan that incorporated tourism sector is strongly important.
- c. Marine National Park authority should change its main focus from making profit to conserving natural environment. Also, transparency of how money from entrance and service fee has being used is vital. This will help clear negative perspective of general public on park's corruption and will increase level of willingness to pay among park users.
- d. Ministry of Tourism and Sports must play important role in designing national tourism master plan and providing accurate information regarding sustainable tourism to local communities and local government.

- e. Tourism Authority of Thailand which takes charge in promoting national tourism must more pay attention on tourism impacts on environment than solely plan marketing toward large number of tourists or tourism benefits.
- f. Long term monitoring plans on tsunami impact recovery in all aspects must be included in governmental agencies agendas to prevent victims and affected areas from social forgetfulness.
- g. The governmental contact center such as Department of Marine and Coastal Resource which unites funding and technical aids from international sources should encourage academic researchers from different institutes around the countries to get involved and to brainstorm on aid utilization. This will help allocate aids to cover all affected areas.

Section 7 Comments and suggestions on the methodology of this Delphi study.

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Your Identification Number
(Please see on Page 1)

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Appendix I Questionnaire Round III for the Delphi survey (Thai version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

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เรียน ...<ชื่อ>.....

ดิฉันขอขอบพระคุณเป็นอย่างสูงที่ท่านกรุณาเสียสละกำลังความคิดและเวลาอันมีค่า เข้าร่วมระดมความคิดเห็นและเสนอแนะ เกี่ยวกับผลกระทบและการฟื้นฟูผลกระทบของคลื่นสึนามิที่มีต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเล หลังจากที่ได้ดิฉันได้รับแบบสอบถามฉบับที่ 2 จากท่านแล้วนั้น ดิฉันได้รวบรวมผลการตอบแบบสอบถาม และนำคำตอบเหล่านั้นมาใช้ในการออกแบบคำถามในแบบสอบถามฉบับที่ 3 นี้

แบบสอบถามครั้งนี้ เป็นแบบสอบถาม**ชุดสุดท้าย**ในการวิจัยนี้ ความคิดเห็นและประสบการณ์ของท่านมีคุณค่าเป็นอย่างยิ่งต่อการฟื้นฟูผลกระทบจากภัยธรรมชาติ คำตอบจากทุกชุดคำถามจะถูกเก็บเป็นความลับ มีเพียงผลวิเคราะห์ทางสถิติเท่านั้นที่จะถูกนำไปเผยแพร่ในการรายงาน ดิฉันสัญญาว่าเมื่อเสร็จสิ้นกระบวนการวิเคราะห์ข้อมูลแล้ว ดิฉันจะจัดส่งผลการศึกษามายังท่านโดยเร็วที่สุด

หากท่านมีข้อสงสัยหรือข้อข้องใจเกี่ยวกับการวิจัยนี้ กรุณาส่งอีเมลล์ถึงดิฉันได้ที่ somdeem@yahoo.com หรือทางโทรศัพท์ที่ (02) 579-9645 หรือ (05) 802-3931 หรือทางโทรสารที่ (02) 941-8649 ดิฉันขอความกรุณาท่านส่งคืนแบบสอบถามที่ตอบเรียบร้อยแล้วกลับมายังดิฉัน ภายใน <วันที่> และเพื่อความสะดวกของท่านในการส่งแบบสอบถามชุดสุดท้ายนี้ ดิฉันได้สอจดของเปล่า พร้อมที่อยู่ และติดแสตมป์มาพร้อมกับเอกสารชุดนี้แล้ว ดิฉันขอขอบพระคุณล่วงหน้าที่ได้รับความร่วมมือจากท่าน

ขอแสดงความเคารพอย่างสูง

นางสาว สมฤดี มีประเสริฐ

กรุณาเริ่มต้นที่นี่

รหัสประจำตัวของท่าน

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แบบสอบถาม รอบที่ 3 (รอบสุดท้าย)

จุดประสงค์หลักของแบบสอบถามชุดสุดท้ายนี้ คือ เพื่อให้ท่านได้มีโอกาสเปรียบเทียบแนวความคิดของท่าน กับความเห็นของผู้เชี่ยวชาญท่านอื่นๆ ซึ่งจะช่วยให้คุณมีโอกาสเปลี่ยน หรือคงคำคะแนนที่ท่านเคยให้ไว้ในแบบสอบถามชุดที่ 2

ในการตอบแบบสอบถามรอบสุดท้ายนี้ คิฉินขอความกรุณาท่านเปรียบเทียบความคิดเห็นของท่านกับของผู้เชี่ยวชาญท่านอื่นๆ ผ่านทางค่าสถิติที่นำเสนอ และ โปรดดำเนินการดังต่อไปนี้

สำหรับ ส่วนที่ ๑ ถึง ๔

๑. พิจารณาหรือเขียนเพิ่มเติม ผลกระทบทั้ง 4 ด้าน ของคลื่นสึนามิที่มีต่ออุทยานแห่งชาติทางทะเล
๒. พิจารณาระดับของผลกระทบของสึนามิที่มีต่อการท่องเที่ยวในเขตอุทยานฯ โดยวงกลมให้คะแนน 1 – 10
๓. พิจารณาระดับประสิทธิภาพและประสิทธิภาพของกิจกรรม การช่วยเหลือหรือแนวทางการฟื้นฟูผลกระทบ โดยภาครัฐและเอกชน ในช่วงระยะเวลาหนึ่งปีที่ผ่านมา (ปี 2548) โดยวงกลมให้คะแนน 1 – 10
๔. พิจารณาหรือเขียนเพิ่มเติม อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

สำหรับ ส่วนที่ ๕

๑. พิจารณากิจกรรม หรือแนวทางที่เป็นไปได้ในการฟื้นฟูผลกระทบ และกำหนดลำดับความเร่งด่วนเมื่อเปรียบเทียบกับทุกรายการ

สำหรับ ส่วนที่ ๖

๑. อธิบายผลกระทบทางด้านบวกที่สึนามิมีต่อการท่องเที่ยวในเขตอุทยานฯ

สำหรับ ส่วนที่ ๗

๑. เสนอแนะและให้ความเห็นที่มีต่อการวิธีการวิจัยแบบเดลฟาย

คำนิยามของค่าสถิติเพื่อใช้ประกอบการตอบแบบสอบถามฉบับนี้

1. ค่าฐานนิยม (Mode) คือค่าที่ถูกเลือกมากที่สุดสำหรับคำถามข้อนั้นๆ
2. ค่ามัธยฐาน (Median) คือ ค่ากลางของข้อมูลชุดนั้นๆ เมื่อถูกนำมาเรียงลำดับจากน้อยไปมาก หรือมากไปน้อย
3. ค่าพิสัยระหว่างควอไทล์ (Inter-Quartile Range, IQR) คือ ค่าสถิติที่ใช้ชี้แสดงการกระจาย (Dispersion) ของข้อมูลที่ร้อยละ 25 กับร้อยละ 75 เมื่อชุดข้อมูลเมื่อถูกเรียงลำดับจากมากไปน้อยแล้ว

ตัวอย่างการอธิบายค่าสถิติ เช่น

ผลกระทบของสึนามิ-----หาดทรายเดิมเคยละเอียดขาวสะอาดถูกปกคลุมด้วยทรายปนโคลนสีคล้ำ ลดความสวยงาม

พบว่า ค่าฐานนิยม (Mode) = 10

 ค่ามัธยฐาน (Median) = 6

 ค่าการกระจาย (IQR) = 6

จากตัวอย่างนี้แสดงให้เห็นว่า ผู้เชี่ยวชาญส่วนใหญ่คิดว่าการที่หาดทรายขาวเปลี่ยนเป็นมีสีคล้ำนั้น มีผลกระทบต่อการท่องเที่ยวในอุทยานฯ สูงมาก (เลือกตอบค่าคะแนน 10 มากที่สุด และมีค่ากลาง (Median) ของข้อมูลชุดนี้อยู่ที่ 6 คะแนน) ส่วนค่าการกระจายของข้อมูล มีค่าเท่ากับ 6 ซึ่งค่อนข้างสูง แสดงว่าแม้ผู้เชี่ยวชาญส่วนใหญ่จะเลือกค่า 10 แต่กลุ่มผู้เชี่ยวชาญก็มีความคิดเห็นที่แตกต่างกันอย่างมากสำหรับการตอบคำถามข้อนี้

กรุณาพิจารณาค่าสถิติเหล่านี้ขณะตอบแบบสอบถามนี้

ส่วนที่ 1 ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ (Natural resource and ecosystem)

ตัวอย่างของผลกระทบประเภทนี้ คือ ความเสียหายโดยตรงทางกายภาพและชีวภาพที่มีต่อระบบนิเวศชายฝั่ง สัตว์ป่า และสัตว์ทะเล เช่นแนวปะการังพังเสียหาย การพังทลายชายฝั่ง และผลกระทบทางอ้อมที่เกี่ยวข้องกับซากความเสียหาย หรือน้ำมันและสารพิษที่รั่วไหลลงสู่ทะเล และระบบนิเวศชายฝั่ง

1.1 ผลกระทบของสินทรัพย์ธรรมชาติและสิ่งแวดล้อมทางธรรมชาติในบริเวณอุทยานฯ

กรุณาพิจารณาหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่คิดจนได้รวบรวม และนำเสนอในที่นี้

1.	พื้นที่ของทะเลและร่องน้ำเปลี่ยนแปลงอย่างรวดเร็ว มีผลต่อระบบนิเวศชายฝั่งทั้งบนบกและในน้ำ ทำให้ปลาหรือสิ่งมีชีวิตเปลี่ยนแปลงพฤติกรรมหากินและอพยพ ฝูงปลาบางแห่งลดจำนวนลง
2.	สภาพใต้น้ำที่เปลี่ยนไปทำให้จุดหรือหมายำน้ำเดิมเปลี่ยนแปลงไป
3.	ชายฝั่งถูกกัดเซาะและชายหาดพังทลายมีผลต่อระบบนิเวศชายฝั่ง เช่น ลดพื้นที่หาดทรายซึ่งเป็นแหล่งวางไข่ของเต่าทะเล แนวป่าชายเลนและป่าชายหาดเสียหายล้มตาย
4.	หาดทรายบางแห่ง เดิมเคยละเอียดขาวสะอาด ปัจจุบันถูกปกคลุมด้วยทรายปนโคลนสีคล้ำ
5.	แหล่งหญ้าทะเลในบางบริเวณถูกทำลาย เนื่องจากถูกตะกอนดินและทรายทับถม
6.	ความรุนแรงของคลื่นและกระแสน้ำทำให้ปะการัง และกัลปังหาบางส่วนได้รับความเสียหาย โดยแตกหัก พลิกคว่ำ ถูกทรายกลบ
7.	ขยะและซากหักพังจำนวนมากทำความเสียหายต่อระบบนิเวศชายฝั่ง โดยเฉพาะปะการังที่โดนซากคันไม้ ขยะขนาดใหญ่ล้มทับ หรือขยะมีคม เช่นสังกะสีมุงหลังคาเสียหาย
8.	น้ำเค็มรุกเข้าสู่แหล่งน้ำจืดทั้งน้ำผิวดินและน้ำใต้ดิน ทำให้ระบบนิเวศชายฝั่ง เช่น ป่าชายหาดและป่าพรุเสื่อมโทรม และขาดแหล่งน้ำจืดเพื่อกินใช้
9.	ปัญหาดินเค็ม บริเวณชายฝั่งทำให้พืชบางชนิดไม่สามารถทนเค็มได้ล้มตาย
10.	แหล่งน้ำปนเปื้อนเชื้อแบคทีเรีย มีผลให้สัตว์เลี้ยง เช่น วัว ควายเป็นโรคปากเท้าเปื่อย
11.	เต่าทะเลและสัตว์ทะเลหายากบางชนิดถูกซัดขึ้นมาเกยหาด
12.	ทรายเข้าไปถมโคลนในป่าชายเลน ทำให้ดินไม่ตาย
13.	.....
14.	.....

1.2 ผลกระทบด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ ที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรูณาวงกลม ○ ค่าคะแนนที่ท่านเห็นสมควร

ผลกระทบของสินทรัพย์ในอุทยานฯ	มีผลกระทบต่อการท่องเที่ยวในอุทยานฯ										ไม่ทราบ/ไม่มีความเห็น (NA)	ค่าที่ท่านเลือกในร้อยละแล้ว	ค่าที่ผู้เชี่ยวชาญส่วนใหญ่เลือก (Mode)	ค่ากลางของข้อมูล (Median)	ค่าการกระจายของข้อมูล (IQR)
	สูงมาก									น้อยมาก					
เกิดการเปลี่ยนแปลงของพื้นที่ของทะเลและร่องน้ำ มีผลต่อระบบนิเวศชายฝั่งทั้งบนบกและในน้ำ ทำให้ปลาหรือสิ่งมีชีวิตเปลี่ยนแปลงพฤติกรรมหากินและอพยพ	10	9	8	7	6	5	4	3	2	1			5	5	3.75
ร่องน้ำและความลาดชันของชายฝั่งเปลี่ยนแปลงทำให้เป็นอันตรายต่อนักท่องเที่ยว และเป็นอุปสรรคต่อการเดินเรือ	10	9	8	7	6	5	4	3	2	1			2	4.5	4
สภาพใต้น้ำที่เปลี่ยนไปทำให้หมายำน้ำเดิมเปลี่ยนแปลงไป	10	9	8	7	6	5	4	3	2	1			1	3	4
การเปลี่ยนแปลงของกระแสน้ำและการสะสมของตะกอนในมวลน้ำมาก น้ำทะเลจึงขุ่นบางบริเวณ	10	9	8	7	6	5	4	3	2	1			7	5.5	4
แนวปะการังและกัลปังหาซึ่งเป็นทรัพยากรการท่องเที่ยวด้านน้ำในอุทยานฯ ได้รับความเสียหาย ปลาตายงามบางชนิดลดจำนวนลง ทำให้แหล่งดำน้ำที่สวยงามมีจำนวนลดลง	10	9	8	7	6	5	4	3	2	1			7	7	4.5
แหล่งหญ้าทะเลได้รับความเสียหายจากตะกอนทับถม	10	9	8	7	6	5	4	3	2	1			6	5.5	3.25
ขยะและซากหักพังทั้งบนบกและในน้ำทำให้ลดความสวยงามตามธรรมชาติ	10	9	8	7	6	5	4	3	2	1			7	7	2.5

ซากปะการังที่มีคม หรือเศษขยะมีคมทับถมในบริเวณชายหาด ทำให้การเดินหรือเล่นน้ำชายหาดต้องเพิ่มความระมัดระวัง	10	9	8	7	6	5	4	3	2	1			10	6	5.25
หาดทรายเดิมเคยละเอียดขาวสะอาดถูกปกคลุมด้วยทรายปนโคลนสีคล้ำ ลดความสวยงาม	10	9	8	7	6	5	4	3	2	1			4	5.5	4.25
ชายฝั่งและชายหาดพังทลายทำให้ป่าชายเลนและป่าชายหาดล้มตาย ลดความสวยงามของภูมิทัศน์	10	9	8	7	6	5	4	3	2	1			4	6	3.25
น้ำดื่มรุกล้ำเข้าสู่แหล่งน้ำจืดทั้งน้ำผิวดินและน้ำใต้ดิน ทำให้ระบบนิเวศชายฝั่ง เช่น ป่าชายหาดตายและป่าพรุเสื่อมโทรม และขาดน้ำกินน้ำใช้	10	9	8	7	6	5	4	3	2	1			5	6	4

กรุณากากบาท X ที่นี้ ☐ หากท่าน**ยืนยันคำตอบเดิม** จากรอบที่แล้วทุกข้อ

1.3 ประสิทธิภาพของกิจกรรมหรือแนวทางการฟื้นฟูผลกระทบด้านการท่องเที่ยวที่เกี่ยวข้องกับการฟื้นฟูทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ ในช่วงระยะเวลาหนึ่งปีที่ผ่านมา (ปี 2548)

กรุณาวงกลม O ค่าคะแนนประสิทธิภาพของกิจกรรมดังต่อไปนี้ ตามที่ท่านเห็นสมควร

กิจกรรมหรือแนวทางการฟื้นฟู	มีประสิทธิภาพของกิจกรรมในการฟื้นฟูทรัพยากรและสิ่งแวดล้อมทางธรรมชาติและการท่องเที่ยว											ไม่ทราบ / ไม่มีความเห็น (NA)	ค่าที่ทำานเลือกในรอบที่แล้ว	ค่าที่ผู้เข้าร่วมวิจัยส่วนใหญ่เลือก (Mode)	ค่ากลางของข้อมูล (Median)	ค่าการกระจายของข้อมูล (Q3)
	สูงมาก										น้อยมาก					
เก็บขยะทั้งบนบกและในน้ำ โดยนักดำน้ำอาสาสมัคร ท.ช. ทหาร นักเรียนองค์กรเอกชนต่างๆ และเจ้าหน้าที่อุทยาน	10	9	8	7	6	5	4	3	2	1				8	8	1
ดำน้ำเพื่อพลิกซ่อมปะการังและกัลปังหาโดยนักดำน้ำอาสาสมัคร บุคลากรจากมหาวิทยาลัยต่างๆ เจ้าหน้าที่กรมอุทยานฯ และเอกชนอื่นๆ	10	9	8	7	6	5	4	3	2	1				7	7.5	1.5
ปลูกปะการังใหม่ โดยนักวิชาการจากมหาวิทยาลัย ท.ช. และนักดำน้ำอาสาสมัคร	10	9	8	7	6	5	4	3	2	1				5	5	2
ออกแบบประติมากรรมปะการังเทียมเพื่อทดแทนแหล่งดำน้ำที่เสียหายไปโดยนักวิชาการจากมหาวิทยาลัย และท.ช.	10	9	8	7	6	5	4	3	2	1				7	5	4.5
จัดทำเส้นทางศึกษาธรรมชาติในป่าชายเลนโดย ท.ช.	10	9	8	7	6	5	4	3	2	1				5	5	3.5
จัดทำเส้นทางศึกษาธรรมชาติใต้ทะเลสำหรับนักดำน้ำ โดยนักวิชาการจากมหาวิทยาลัย และท.ช.	10	9	8	7	6	5	4	3	2	1				6	5.5	3.5
แก้ปัญหาหน้ากั้นน้ำใช้ปนเปื้อนน้ำเค็ม โดยกรมอุทยานฯ กรมน้ำ และกรม náน้ำบาดาล	10	9	8	7	6	5	4	3	2	1				5	6	2
ติดตั้งหุ่นจอดเรือใหม่ในแนวปะการัง โดย ท.ช. และอุทยานฯ	10	9	8	7	6	5	4	3	2	1				9	8	3
จัดระบบแบ่งเขตกิจกรรมในอุทยานฯ	10	9	8	7	6	5	4	3	2	1				8	5	2.5
การปลูกป่าชายหาด และป่าชายเลน โดยอาสาสมัคร NGOs นักเรียน และกรมทรัพยากรทางทะเลและชายฝั่ง	10	9	8	7	6	5	4	3	2	1				7	7	2
โครงการสนับสนุนวิชาการและพัฒนากองท่องเที่ยวในบริเวณอุทยานฯ โดย ท.ช. NGOs และสำนักพัฒนาการท่องเที่ยว	10	9	8	7	6	5	4	3	2	1				7	6	3
ประกาศปิดจุดดำน้ำบางแห่งที่เสียหายมาก เพื่อให้ธรรมชาติฟื้นตัว โดยอุทยานฯ	10	9	8	7	6	5	4	3	2	1				9	8.5	3.5

กรุณากากบาท X ที่นี้ ☐ หากท่าน**ยืนยันคำตอบเดิม** จากรอบที่แล้วทุกข้อ

1.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กฎเกณฑ์การตรวจหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่คิดค้นไว้รวบรวม และนำเสนอในที่นี้

1. ฤดูมรสุม ทะเลมึ่นคลื่นลมแรงทำให้กิจกรรมการฟื้นฟูผลกระทบของอุทยานฯที่เป็นหมู่เกาะกลางทะเลทำได้ช้า ไม่สะดวกโดยเฉพาะช่วงเดือนพฤษภาคม ถึงพฤศจิกายน
2. สภาพน้ำทะเลขุ่นมากและแยกชั้นขุ่นใสในบางบริเวณ ทำให้ทำงานได้ทะเลได้ยากลำบาก
3. บุคลากรทั้งภาครัฐและเอกชนขาดประสบการณ์ความรู้ความชำนาญในการปฏิบัติงานฟื้นฟูได้ทะเล ทำให้ต้องลองผิดลองถูก สูญเสียงบประมาณ งานล่าช้า ไม่เป็นไปตามแผนงาน
4. ขาดเครื่องมือที่เหมาะสมในการปฏิบัติงานเก็บข้อมูลและขยะขนาดใหญ่จากใต้ น้ำ
5. ผู้เข้าร่วมในกิจกรรมการฟื้นฟูผลกระทบต่างๆ มีเจตนาอันดีแต่ขาดความรู้ความเข้าใจในการปฏิบัติงาน และความรู้พื้นฐานของสภาพธรรมชาติ บางกรณีทำให้เกิดความเสียหายต่อสภาพแวดล้อมมากขึ้น
6. ความล่าช้าในการขออนุมัติเงินเพื่อการฟื้นฟูผลกระทบ ของทั้งทางราชการและหน่วยงานเอกชน ทำให้อาสาสมัครที่มาทำงานต้องออกเงินส่วนตัวไปก่อน
7. งบประมาณ ไม่เพียงพอในการติดตามผลการเก็บกู้ปะการัง เนื่องการฟื้นฟูทรัพยากรได้ทะเลต้องการงบประมาณสูง ส่งผลให้การดำเนินงานไม่ต่อเนื่อง ไม่ต่อเนื่องไปตั้งแต่ช่วงก่อนฤดูมรสุม (ก่อนเดือนพฤษภาคม 2548)
8. ระเบียบการเบิกจ่ายเงินของภาครัฐทำให้งานล่าช้า และไม่สามารถเบิกค่าใช้จ่ายได้ตามที่จ่ายจริง
9. ขาดการประสานงานอย่างเป็นระบบทั้งภายในและระหว่างหน่วยงานของรัฐที่รับผิดชอบเรื่องการฟื้นฟูผลกระทบ มีความขัดแย้งเรื่องสิทธิถือครองพื้นที่ ทำงานซ้ำซ้อน และแข่งแย้งกันนำเสนอ โครงการ ทำให้งานล่าช้า การจัดการงบประมาณเป็นไปอย่างไร้ทิศทาง และไม่มีประสิทธิภาพเท่าที่ควร
10. ขาดการประสานความร่วมมือระหว่างภาครัฐ เอกชน และชาวบ้านในพื้นที่ในการฟื้นฟูทรัพยากร ทำให้ขาดการมีส่วนร่วมจากท้องถิ่น และอาจมีผลการดำเนินงานที่ไม่ต่อเนื่องในระยะยาว
11. บางหน่วยงานถือโอกาสใช้กิจกรรมการฟื้นฟู เพื่อประชาสัมพันธ์องค์กรของตัวเอง โดยมีได้เน้นที่คุณภาพของผลงาน
12. บางหน่วยงานหรือองค์กรพัฒนาเอกชนเร่งใช้งบประมาณ หรือเงินบริจาคที่ได้รับมา โดยต้องการเพียงใช้จ่ายเงินออกภายในเวลาที่กำหนด ทำให้ขาดความรอบคอบ ไร้ทิศทาง และ ไม่เหมาะสม
13. ขาดการติดตามประเมินผลในระยะยาวอย่างจริงจังและเชื่อถือได้
14. ไม่มีแผนงาน แนวทางปฏิบัติที่เหมาะสมสำหรับเผชิญภัยพิบัติ
15.

ส่วนที่ 2 ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น (Built environment)

ผลกระทบเหล่านี้รวมถึงผลกระทบทางกายภาพโดยตรงและ โดยอ้อม และความเสียหายที่เกิดขึ้นกับสิ่งแวดล้อมที่มนุษย์สร้างขึ้น ได้แก่ ระบบขนส่ง ถนน ระบบสาธารณูปโภค ไฟฟ้า โทรศัพท บ้านเรือนที่อยู่อาศัย อาคารพาณิชย์ อาคารของทางราชการ โรงเรียน สถานศึกษา เป็นต้น ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง

2.1 ผลกระทบของสิ่งที่มีต่อสิ่งแวดล้อมที่มนุษย์สร้างขึ้น

กฎเกณฑ์การตรวจหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่คิดค้นไว้รวบรวม และนำเสนอในที่นี้

1. อาคารที่ทำการอุทยานฯ บ้านพักเจ้าหน้าที่ หน่วยปฐมพยาบาล สถานีวิทยุ โทรทัศน์ ถูกทำลาย หรือได้รับความเสียหาย
2. อาคารที่พัก ลานกางเต็นท์ และสิ่งอำนวยความสะดวกแก่นักท่องเที่ยวเสียหาย และ/หรือถูกทำลาย
3. ระบบสาธารณูปโภคในอุทยานฯ ไฟฟ้า ประปา การสื่อสาร ถูกทำลาย
4. เรือตรวจการของอุทยานฯ เรือและยานพาหนะของผู้ประกอบการท้องถิ่นเสียหาย หรือถูกทำลาย
5. อาคารนิทรรศการ เส้นทางศึกษาธรรมชาติ และป้ายให้ความรู้แก่นักท่องเที่ยวได้รับความเสียหาย
6. ท่าเทียบเรือสำหรับเรือขนส่งนักท่องเที่ยวถูกทำลาย เสียหาย
7. หมู่บ้านชาวมอแกนถูกทำลาย
8. หุ่นผูกเรือบริเวณจุดดำน้ำเสียหาย สูญหาย
9.
10.

2.2 ผลกระทบด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้นที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรุณาวางกลม ○ ค่าคะแนนที่ท่านเห็นสมควร

ผลกระทบของสึนามิในอุทยานฯ	มีผลกระทบต่อการท่องเที่ยวในอุทยานฯ											ไม่ทราบ / ไม่มีความเห็น (NA)	ค่าที่ทำเนเลือกในกรณีที่แล้ว	ค่าที่ผู้เขยวษษญห่วยส่วนใหญ่เลือก(Mode)	ค่ากกลางของข้อมูล (Median)	ค่าการกระจายของข้อมูล (IQR)					
	สูงมาก																น้อยมาก				
อาคารที่ทำการอุทยานฯ หน่วยปฐมพยาบาลถูกทำลาย หรือได้รับความเสียหาย	10	9	8	7	6	5	4	3	2	1				10	8	4					
อาคารที่พักและสิ่งอำนวยความสะดวกแก่นักท่องเที่ยวเสียหาย และ/หรือถูกทำลาย ทำให้ต้องปิดอุทยานฯ ชั่วคราวเพื่อซ่อมแซม	10	9	8	7	6	5	4	3	2	1				8	8	3					
ระบบสาธารณูปโภค (น้ำ ไฟฟ้า) ในอุทยานฯ ถูกทำลาย	10	9	8	7	6	5	4	3	2	1				8	8	1.5					
บ่อน้ำกินน้ำใช้ปนเปื้อนน้ำเค็ม หรือแบคทีเรียจากซากสิ่งมีชีวิตอื่นๆ ทำให้ขาดน้ำกินน้ำใช้ในอุทยานฯ	10	9	8	7	6	5	4	3	2	1				10	9	2.5					
ยานพาหนะ เช่นรถยนต์ หรือ เรือในอุทยานฯ และผู้ประกอบการท่องเที่ยวได้รับความเสียหาย ทำให้ไม่สามารถเดินทางไป-กลับ อุทยานฯ ที่เป็นเกาะได้ และเจ้าหน้าที่ไม่สามารถปฏิบัติงานได้สะดวก	10	9	8	7	6	5	4	3	2	1				8	8	1.75					
เครื่องมือสื่อสาร และอุปกรณ์สำนักงานถูกทำลาย ทำให้อุทยานฯถูกตัดขาด นักท่องเที่ยวติดต่อกันไม่ได้ และขาดความมั่นใจในความปลอดภัย	10	9	8	7	6	5	4	3	2	1				8	8	1.75					
อุปกรณ์เพื่อการดำน้ำของอุทยานฯทั้งแบบ Snorkeling และแบบ SCUBA ได้รับความเสียหายทำให้สูญเสียนักท่องเที่ยวกลุ่มเป้าหมาย	10	9	8	7	6	5	4	3	2	1				5	7	3.75					
หมาดำน้ำและหุ่นผูกเรือบริเวณจุดดำน้ำสูญหาย ทำให้การดำน้ำไม่สะดวก	10	9	8	7	6	5	4	3	2	1				7	7	4					
เกิดสภาพเสื่อมโทรมของสิ่งก่อสร้างและความเสียหายในภาพรวมที่แพร่ทางสื่อทั่วไปแสดงถึงสภาพที่ไม่พร้อมรับนักท่องเที่ยว และเห็นแล้วเกิดความสลดใจ	10	9	8	7	6	5	4	3	2	1				9	8	3					
อาคารนิทรรศการ เส้นทางศึกษาธรรมชาติ และป้ายให้ความรู้แก่นักท่องเที่ยวได้รับความเสียหาย	10	9	8	7	6	5	4	3	2	1				8	7	2.5					
ท่าเทียบเรือสำหรับเรือขนส่งนักท่องเที่ยวถูกทำลาย เสียหาย	10	9	8	7	6	5	4	3	2	1				9	6	3					
หมู่บ้านชาวมอแกนถูกทำลาย	10	9	8	7	6	5	4	3	2	1				8	7	3					

กรุณาเกษนบท X ที่นี้ ☐ หากท่านยืนยันค่าคอมลิมจากรอบที่แล้วทุกข้อ

2.3 ประสิทธิภาพของกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยวที่เกี่ยวข้องกับการฟื้นฟูสิ่งแวดล้อมที่มนุษย์สร้างขึ้น ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

กรุณาวางกลม ○ ค่าคะแนนประสิทธิภาพของกิจกรรมดังต่อไปนี้ ตามที่ท่านเห็นสมควร

กิจกรรมหรือแนวทางการฟื้นฟู	มีประสิทธิภาพของ กิจกรรมในการฟื้นฟู สิ่งแวดล้อมที่มนุษย์ สร้างขึ้น และการท่องเที่ยว										ไม่ทราบ / ไม่มีความเห็น (N.A)	ค่าที่ผ่านเลือกในรอบที่แล้ว	ค่าที่ผู้เชี่ยวชาญส่วนใหญ่เลือก (Mode)	ค่ากลางของข้อมูล (Median)	ค่าการกระจายของข้อมูล (IQR)
	สูงมาก					น้อยมาก									
สร้างสิ่งก่อสร้าง ที่ทำการ อุปกรณ์สำนักงาน โรงอาหารและที่พักใหม่ โดยกรมอุทยานฯ กรมควบคุมมลพิษ และหน่วยงานช่วยเหลือจากต่างประเทศ	10	9	8	7	6	5	4	3	2	1			9	7	2.5
ติดตั้งระบบสาธารณูปโภคขั้นพื้นฐาน(น้ำ ไฟฟ้า) ในอุทยานฯ ใหม่ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1			7	7	2.5
จัดซื้อจัดหาเรือตรวจการณ์ และยานพาหนะในอุทยานฯใหม่ทดแทน โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1			7	7	2
จัดซื้อเรือค้นหาและกู้ภัย โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1			8	8	2.5
ติดตั้งเครื่องมือ และศูนย์สื่อสารระหว่างอุทยานฯ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1			7	7	1.75
ปรับปรุงพื้นที่และภูมิทัศน์ภายในอุทยานฯ โดยอุทยานฯ นักวิชาการจากมหาวิทยาลัย และชมรมผู้ประกอบการการท่องเที่ยว	10	9	8	7	6	5	4	3	2	1			7	7	2.5
ติดตั้งระบบเตือนภัยสึนามิในอุทยานฯ โดยอุทยานฯ	10	9	8	7	6	5	4	3	2	1			8	7	2.5
ซ่อมแซมท่าเทียบเรือ โดยกรมเจ้าท่า และอุทยานฯ	10	9	8	7	6	5	4	3	2	1			7	6.5	2
จัดทำผังการจัดการพื้นที่ในอุทยานฯใหม่ โดยกลุ่มนักวิจัย	10	9	8	7	6	5	4	3	2	1			6	6	2
วางหุ่นผูกเรือในบริเวณลำน้ำใหม่ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1			7	7	2.5
ปรับปรุง Aquarium ที่ศูนย์ชีววิทยาภูเก็ต เพื่อเป็นแหล่งเรียนรู้ โดย ท.ช. และรัฐบาล เยอรมัน	10	9	8	7	6	5	4	3	2	1			5	7	3

กรุณากากบาท X ที่นี้ ☐ หากท่านยืนยันคำตอบเดิมจากรอบที่แล้วทุกข้อ

2.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กรุณาพิจารณาหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่ได้รับไว้รวบรวม และนำเสนอในที่นี้

<ol style="list-style-type: none"> 1. ฤดูมรสุม ทะเลมึลลึมแรงทำให้การขนส่งวัสดุอุปกรณ์ทางเรือ และกิจกรรมการฟื้นฟูผลกระทบเป็นไปอย่างยากลำบาก 2. น้ำมันและสินค้าขึ้นราคาทำให้งบประมาณที่ตั้งไว้ไม่เพียงพอ 3. งบประมาณภาครัฐไม่มีจริง แม้นายกรัฐมนตรีบอกว่าจะมีก็ตาม แต่ระเบียบราชการไม่สามารถทำได้อย่างที่นายกฯบอก 4. การสร้างสิ่งก่อสร้างใหม่เพื่อฟื้นฟูสภาพการท่องเที่ยว เป็นไปด้วยความรวดเร็วเกินไป ขาดการพิจารณาถึงผลกระทบสิ่งแวดล้อมอย่างรอบคอบ 5. การจัดแบ่งเขตพื้นที่ใช้สอยในอุทยานฯ เป็นไปด้วยความล่าช้า และขาดการร่วมมือกัน 6. นโยบายของภาครัฐไม่ชัดเจน ทำให้ผู้ปฏิบัติงานสับสน งานล่าช้า 7. ระเบียบขั้นตอนทางราชการยุ่งยากซับซ้อน ขาดการวางแผน และประสานการฟื้นฟูที่ดี ทำให้การสำรวจความเสียหายเป็นไปด้วยความล่าช้า ในขณะที่การดำเนินงานอยู่ภายใต้กรอบเวลาที่จำกัด 8. ขาดความชัดเจนของการกิจ และเป้าหมายในการดำเนินงานของอุทยานฯ ทำให้กระบวนการวางแผนพื้นที่ใหม่ไม่เป็นการแก้ไขข้อบกพร่องของสังคม 9. ขาดการจัดการความช่วยเหลืออย่างต่อเนื่องและเป็นระบบ ทำให้เกิดความซ้ำซ้อนของการมอบหมายงานและกิจกรรมการช่วยเหลือ พื้นที่ 10. องค์การบริหารในท้องถิ่นยังขาดความเข้าใจที่ถูกต้องในการอนุรักษ์ฟื้นฟูธรรมชาติและป้องกันภัยสึนามิในอนาคต เช่น การก่อสร้างเขื่อน ถนน ฝายขาด 11. การสร้างบ้าน หรือชุมชนใหม่โดยไม่คำนึงถึงวิถีชีวิตดั้งเดิมของคนที่ท้องถิ่น ทำให้สูญเสียเอกลักษณ์และลดความน่าสนใจของแหล่งท่องเที่ยว 12.

ส่วนที่ 3 ด้านธุรกิจ (Business community)

ผลกระทบของสินามิที่มีต่อ **ธุรกิจ** ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง ในที่นี้ผลกระทบทางด้านธุรกิจ หมายรวมถึง **ระบบธุรกิจ** มิใช่เพียงอาคาร หรือ สิ่งก่อสร้าง ในที่นี้ได้รวมถึงชื่อเสียงของกิจการ กลุ่มลูกค้าเป้าหมาย เจ้าหน้าที่และบุคลากร ผลกระทบประเภทนี้มักเป็นผลกระทบทางอ้อม ซึ่งเป็นผลพวงมาจากความเสียหาย โดยตรงทางกายภาพต่อสิ่งแวดล้อม

3.1 ผลกระทบของสินามิที่มีต่อระบบธุรกิจ

กฎเกณฑ์พิจารณาหรือเขียนเพิ่มเติม ค่าตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่คิดกันไว้ได้รวบรวม และนำเสนอในที่นี้

1.	ผู้ประกอบการขาดแคลนพนักงานหรือบุคลากรผู้มีความเชี่ยวชาญ เนื่องจากเสียชีวิต หรือย้ายถิ่นฐาน
2.	ผู้ประกอบการได้รับความเสียหายทั้งชีวิตและทรัพย์สิน ทำให้ไม่พร้อมให้บริการนักท่องเที่ยว
3.	เรือประกอบการดำน้ำ และเรือหางยาวสำหรับน่าน้ำนักท่องเที่ยวชมปะการังได้รับความเสียหาย
4.	ที่พักและโรงแรมใกล้ และ/หรือในเขตอุทยานฯเสียหาย
5.	อุปกรณ์ของผู้ประกอบการ เพื่ออำนวยความสะดวกแก่นักท่องเที่ยวสูญหาย และ/หรือเสียหาย เช่น เดินที่ เครื่องนอน อุปกรณ์ดำน้ำ
6.	ชื่อเสียงของธุรกิจได้รับความเสียหาย
7.	ข้อมูลและบันทึกทางธุรกิจสูญหาย
8.	บุคลากรถูกจ้างกักตัวทะเล กลับกับสินามิ กลับดี ลาออกจากงาน หรือย้ายถิ่น ไปทำงานแหล่งอื่น
9.	นักท่องเที่ยวมีจำนวนลดลงอย่างมาก ทำให้ธุรกิจที่เกี่ยวข้องกับการให้บริการ (เช่น โรงแรม รถและเรือรับจ้าง) ได้รับความกระทบกระเทือน ขาดรายได้ บางแห่งต้องปิดกิจการ
10.	อุทยานฯปิดบริการเพื่อฟื้นฟู ธุรกิจอื่นๆก็ต้องปิดตาม
11.	อุทยานฯขาดรายได้จากการท่องเที่ยว ทำให้ต้องขาดแคลนงบประมาณในการบริหารจัดการ
12.	.....
13.	.....

3.2 ผลกระทบด้านธุรกิจที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรณาวางกลม ☐ ค่าคะแนนที่ท่านเห็นสมควร

ผลกระทบของสินามิในอุทยานฯ	มีผลกระทบต่อการท่องเที่ยวในอุทยานฯ										ไม่ทราบ / ไม่มีความเห็น (N/A)	ค่าที่ท่านเลือกในกรณีที่แล้ว	ค่าที่ผู้เชี่ยวชาญส่วนใหญ่เลือก (Mode)	ค่ากลางของข้อมูล (Median)	ค่าการกระจายของข้อมูล (QQR)
	สูงมาก									น้อยมาก					
เรือขายธุรกิจบริการที่เกี่ยวข้องอำนวยความสะดวกให้แก่ นักท่องเที่ยวในอุทยานฯ และบริเวณใกล้เคียง(เช่น โรงแรม รถและเรือรับจ้าง) ได้รับความเสียหาย และบางรายเลิกกิจการ ทำให้ไม่สามารถบริการนักท่องเที่ยวได้	10	9	8	7	6	5	4	3	2	1			8	8	2
ผู้ประกอบการขาดเงินทุนในการจัดหาสิ่งอำนวยความสะดวกใหม่ขึ้นมาตรฐาน ทำให้ขาดแคลนอุปกรณ์และบริการสำหรับนักท่องเที่ยว	10	9	8	7	6	5	4	3	2	1			8	9	2
ผู้ประกอบการท่องเที่ยวขาดแคลนพนักงานหรือบุคลากรผู้มีความเชี่ยวชาญ เนื่องจากเสียชีวิต หรือย้ายถิ่นฐาน	10	9	8	7	6	5	4	3	2	1			8	8	2.5
กิจการบางแห่งเลิกดำเนินงานเนื่องจากอยู่ในภาวะโศกเศร้า และขาดเงินทุน ไม่มีศักยภาพในการให้บริการ	10	9	8	7	6	5	4	3	2	1			10	8	3
ชื่อเสียงของกิจการ ได้รับความเสียหาย นักท่องเที่ยวขาดความเชื่อถือ	10	9	8	7	6	5	4	3	2	1			10	7	4

กรุณาเกะบาท X ที่นี้ ☐ หากท่านยืนยันคำตอบจากรอบที่แล้วทุกข้อ

3.3 ประสิทธิภาพของกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยวที่เกี่ยวข้องเนื่องกับการฟื้นฟูธุรกิจ ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

กฎวางกลม ○ ค่าคะแนนประสิทธิภาพของกิจกรรมดังต่อไปนี้ คำนวณที่ผ่านเห็นสมควร

กิจกรรมหรือแนวทางการฟื้นฟู	มีประสิทธิภาพ ของกิจกรรมใน การฟื้นฟูธุรกิจ และการท่องเที่ยว											ไม่ทราบ / ไม่มีความเห็น (NA)	ค่าที่ผ่านเลือกในรอบที่แล้ว	ค่าที่ผู้เชี่ยวชาญส่วนใหญ่เลือก (Mode)	ค่ากลางของข้อมูล (Median)	ค่าการกระจายของข้อมูล (IQR)
	สูงมาก					น้อยมาก										
สร้างสิ่งอำนวยความสะดวกแก่นักท่องเที่ยวใหม่ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1			8	7	3	
ลดความเสี่ยงหายเบื้องต้น โดยกรมบรรเทาสาธารณภัย	10	9	8	7	6	5	4	3	2	1			5	5	2.5	
ผ่อนผันภาระหนี้สิน โดยธนาคารต่างๆ	10	9	8	7	6	5	4	3	2	1			5	5	2	
ให้ผู้ประกอบการกู้ยืมเงินลงทุน โดยโครงการพิเศษของรัฐบาล	10	9	8	7	6	5	4	3	2	1			5	5	3	
รณรงค์นโยบายส่งเสริมการท่องเที่ยว ทั้งในและต่างประเทศ รูปแบบต่างๆ โดย ท.ท.ท. การบินไทย และชมรมผู้ประกอบการท่องเที่ยว	10	9	8	7	6	5	4	3	2	1			8	8	1.75	
จัดกิจกรรมประชาสัมพันธ์ เช่น คำน้ำเก็บขยะ ปลูกต้นไม้ โดยอุทยานฯ และผู้ประกอบการ	10	9	8	7	6	5	4	3	2	1			8	7	2	
กำหนดแผนการตลาดที่ลดราคาค่าบริการเพื่อส่งเสริมการท่องเที่ยว โดยผู้ประกอบการ	10	9	8	7	6	5	4	3	2	1			9	7	2.75	
พัฒนาอบรมแรงงานท้องถิ่น เพื่อเพิ่มทางเลือกในการประกอบอาชีพ โดยกรมแรงงาน	10	9	8	7	6	5	4	3	2	1			7	6	2	
อบรมวิชาชีพให้พนักงานบริการที่สถานประกอบการได้รับผลกระทบและเปิดกิจการใน 3 จังหวัด (พังงา ภูเก็ต กระบี่) โดยจ่ายเบี้ยเลี้ยง จัดโดย ท.ท.ท.	10	9	8	7	6	5	4	3	2	1			6	6	2	
ยกเว้นค่าธรรมเนียมการเข้าอุทยานฯ เพื่อส่งเสริมการท่องเที่ยวในอุทยานฯ โดยกรมอุทยานฯ	10	9	8	7	6	5	4	3	2	1			2	5	3	
ฟื้นฟูกิจการโรงแรมที่พักใกล้เขตอุทยานฯ โดยเอกชนเอง	10	9	8	7	6	5	4	3	2	1			6	6	2.25	
การรวมตัวเป็นชมรมธุรกิจการท่องเที่ยวของท้องถิ่นเพื่อช่วยเหลือกัน และเพิ่มความสามารถในการต่อรองกับหน่วยงานรัฐ โดยผู้ประกอบการท้องถิ่น	10	9	8	7	6	5	4	3	2	1			7	7	2	

กฎวางกลม X ที่นี้ ☐ หากท่านยืนยันคำตอบเดิมจากรอบที่แล้วทุกข้อ

3.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กฎวางกลมหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่ตัดสินได้รวบรวม และนำเสนอในที่นี้

<ol style="list-style-type: none"> 1. ฤดูมรสุม ทะเลมึลล้นลมแรงทำให้กิจกรรมการฟื้นฟูผลกระทบทำได้ช้า ไม่สะดวก 2. สื่อมวลชนเสนอข่าวความเสียหายของปะการังมากเกินไป ทำให้นักท่องเที่ยวคิดว่าปะการังเสียหายมาก ไม่มีอะไรสวยงามให้อุบัติ 3. ประชาชนมีสภาพจิตใจที่อ่อนแอ มีความหวาดกลัวจากสถานการณ์ และมีความเชื่อเรื่องเหนือธรรมชาติอยู่มาก ทำให้มีผลกระทบต่อการฟื้นฟูสภาพจิตใจโดยรวม และการฟื้นฟูธุรกิจการท่องเที่ยวในพื้นที่ประสบภัยและพื้นที่ใกล้เคียงเป็นไปได้ยาก 4. ประชาชนและนักท่องเที่ยวขาดความรู้ความเข้าใจเกี่ยวกับภัยธรรมชาติ จึงกลัวทะเลอันดามันและไม่มาท่องเที่ยว 5. ระเบียบขั้นตอนทางราชการที่ยุ่งยากซับซ้อน ทำให้เกิดความล่าช้า 6. ระบบการกู้เงินจากสถาบันการเงินไม่ชัดเจน และมีความยุ่งยาก 7. ขาดการจัดการเรื่องเงินช่วยเหลือด้านเครื่องมือทำกิน และที่พักอาศัยอย่างเป็นระบบทำให้เกิดปัญหาทุจริต ชักออกเงิน และเงินไม่ถึงมือผู้เดือดร้อนอย่างแท้จริง 8. ขาดการร่วมมือกันของผู้ประกอบการนำเที่ยวในการฟื้นฟูการท่องเที่ยว เกิดการคิดราคาแข่งกัน เพื่อแย่งชิงนักท่องเที่ยว โดยไม่คำนึงต้นทุนในการประกอบการ ทำให้
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	ไว้ระบบธุรกิจการนำเข้าเพื่อเสียภาษีมากขึ้น โดยเฉพาะผู้ประกอบการรายย่อย
9.	ผู้ประกอบการรายย่อยขาดเงินทุนในการประชาสัมพันธ์เพื่อฟื้นฟูภาพพจน์ของธุรกิจ หรือจัดซื้ออุปกรณ์ใหม่ เนื่องจากการกระจายแหล่งเงินทุนในการฟื้นฟูธุรกิจ ท่องเที่ยวไม่ทั่วถึง และผู้ประกอบการบางรายไม่เข้าหลักเกณฑ์ในการรับความช่วยเหลือทางการเงิน
10.	ขาดความต่อเนื่องทั้งงบประมาณ และแผนการในการฟื้นฟูผลกระทบ
11.	ผู้สูญเสียผลประโยชน์จากการแบ่งเขตกิจกรรม ทั้งเอกชนและชาวบ้านต่อต้านการจัดระเบียบ
12.	ขาดความชัดเจนของภาครัฐในการกำหนดนโยบาย สับสนในกระบวนการคิดและตัดสินใจ ทำให้เกิดปัญหาการประสานงานระหว่างหน่วยงานราชการ เอกชน กลุ่ม องค์กรเอกชน (NGOs) และผู้บริจาคเงิน ที่ไม่มีประสิทธิภาพ เกิดความซ้ำซ้อน หรือความไม่ทั่วถึงของการช่วยเหลือ
13.	กลุ่มเป้าหมายของการประชาสัมพันธ์การท่องเที่ยวไม่ชัดเจน ผิดทิศทาง โดยการส่งเสริมการท่องเที่ยวควรทำกับตลาดยุโรปและออสเตรเลียซึ่งได้ผลมากกว่าตลาด เอเชีย เพราะตลาดเอเชีย มีปัญหาเรื่องทัศนคติและความเชื่อเรื่องวิญญาณอยู่มาก
14.	ขาดการประชาสัมพันธ์จากหน่วยงานกลางในการประกาศแหล่งท่องเที่ยวที่ได้รับผลกระทบและไม่ได้รับผลกระทบอย่างชัดเจน เพื่อเป็นข้อมูลแก่ ผู้ประกอบการและนักท่องเที่ยว
15.	หน่วยงานภาครัฐเน้นประชาสัมพันธ์ฟื้นฟูการท่องเที่ยว แต่ไม่ให้ความสำคัญต่อการฟื้นฟูปัจจัยการท่องเที่ยวทั้งระบบ เช่น ขาดการช่วยเหลือผู้ประกอบการรายย่อย ในท้องถิ่นให้ฟื้นตัวได้ ซึ่งมีผลต่อศักยภาพการรับนักท่องเที่ยวมาก
16.	การยกเว้นค่าธรรมเนียมเข้าอุทยานฯ ขาดการประชาสัมพันธ์อย่างต่อเนื่อง
17.	ผู้ประกอบการบางรายให้บริการที่ไม่ได้มาตรฐาน หรือความไม่เหมาะสม ทำให้นักท่องเที่ยวเสียความไว้วางใจ
18.	ขาดศูนย์กลางในการประสานงานในระดับท้องถิ่น เชื่อมต่อกับส่วนกลาง ทั้งโครงสร้างการทำงานและบุคลากรของหน่วยงาน
19.	.....

ส่วนที่ 4 ด้านสังคม สุขภาพ และความปลอดภัย (Social, health, and safety)

ในที่นี้ผลกระทบทางด้าน**สังคม สุขภาพ และความปลอดภัย** คือผลกระทบที่มีต่อกลุ่มประชากร ทั้งสุขภาพกายและใจ ทั้งภายในเขตอุทยานแห่งชาติทางทะเล และพื้นที่ใกล้เคียง
เช่น การสูญเสียชีวิต และบุคคลอันเป็นที่รัก ความพิการเนื่องจากแรงกระแทกของสึนามิ การตกงาน การสูญเสียเครื่องมือหรือแหล่งทำมาหากิน ความเครียดของ
ครอบครัวอันเนื่องมาจากความสูญเสีย และความขาดแคลน ซึ่งอาจนำไปสู่ปัญหาครอบครัว และ โครงสร้างชุมชนในระยะยาว

4.1 ผลกระทบของสึนามิที่มีต่อ สังคม สุขภาพ และความปลอดภัย

กฎเกณฑ์การพิจารณาหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่จัดกันไว้รวบรวม และนำเสนอในที่นี้

1.	ประชาชนท้องถิ่น และเจ้าหน้าที่อุทยานฯ มีสภาพความเป็นอยู่ไม่ถูกสุขลักษณะ อยู่รวมกันอย่างแออัด ขาดที่พักอาศัยที่เหมาะสม อาหารและน้ำที่มีการปนเปื้อน
2.	เกิดโรคระบาดอันเนื่องมาจากยุง เพราะระบบนิเวศชายฝั่งถูกรบกวน
3.	ขยะติดเชื้อ เช่นซากสัตว์เลี้ยงไม่ได้รับการฝังกลบอย่างถูกวิธี
4.	ประชาชน และเจ้าหน้าที่อุทยานฯ รวมทั้งของบุคคลอันเป็นที่รัก ครอบครัว ผู้ร่วมงานและทรัพย์สิน สูญเสียชีวิต พิการ พลัดพราก
5.	ประชาชนและนักท่องเที่ยวมีปัญหาสุขภาพจิต จิตใจอ่อนแอ ซึมเศร้า สิ้นหวัง เจ็บปวดฝังใจกับเหตุการณ์ความสูญเสียทั้งชีวิตและทรัพย์สิน หวาดกลัววิญญาณคนตาย และสิ่งเหนือธรรมชาติ
6.	ประชาชน ผู้ประกอบการ และเจ้าหน้าที่อุทยานฯ วิดกกังวล หวาดกลัว ระวัง กลัวทะเล ไม่มั่นใจในความปลอดภัย กลัวว่าจะเกิดสึนามิอีก ทำให้เกิดการย้ายถิ่นฐาน เปลี่ยนอาชีพ หรือวิธีชีวิตไป
7.	เครื่องมือประกอบอาชีพเสียหาย ธุรกิจเลิกกิจการ ขาดความมั่นคงในชีวิต เกิดภาวะว่างงาน ไม่มีรายได้เลี้ยงครอบครัว ภาวะหนี้สิน เครียด
8.	การสูญเสียผู้นำครอบครัวและจำนวนสมาชิกในครอบครัว มีผลต่อการเปลี่ยนแปลงโครงสร้างของชุมชน โดยมีคนขาดใจหรือร้อง คนพิการ และเด็กกำพร้ามากขึ้น
9.	ประชาชนคิดหวง ขาดความมั่นใจในระบบการช่วยเหลือจากภาครัฐ ทำให้ที่ทอดอยู่ลึกซึ้งขาดที่พึ่ง
10.	ชาวบ้านหลายครอบครัวขาดที่พึ่งทางใจ มีการเปลี่ยนศาสนาเป็นศาสนาคริสต์ (จากเดิมที่ประชากรส่วนใหญ่นับถือพุทธหรืออิสลาม) เป็นการเปลี่ยนไปตามการชักนำ ของผู้นำเงินและสิ่งของมาบริจาค ซึ่งอาจมีผลต่อโครงสร้างและวิถีชีวิตของชุมชนในอนาคต
11.	เจ้าของกิจการ หรือบุคลากรซึ่งเป็นตัวหลักในการทำงานเสียชีวิต ทำให้กิจการธุรกิจหยุดชะงัก หรือเลิกกิจการ
12.	เด็ก ไม่มีที่เรียนหนังสือ เนื่องจากโรงเรียนเสียหายและครูก็ได้รับผลกระทบ บางโรงเรียนต้องรับภาระสอนเด็กนักเรียนในจำนวนที่มากขึ้น เกิดขาดแคลนครูและเงินทุน เลี้ยงดูเด็ก
13.	.....
14.	.....

4.2 ผลกระทบด้านสังคม สุขภาพ และความปลอดภัยที่มีต่อการท่องเที่ยวในเขตอุทยานฯ

กรุณาวางกลม ○ ค่าคะแนนที่ท่านเห็นสมควร

ผลกระทบของสึนามิในอุทยานฯ	มีผลกระทบต่อการท่องเที่ยวในอุทยานฯ										ไม่ทราบ/ไม่มีความเห็น (NA)	ค่าที่ท่านเลือกในรอบที่แล้ว	ค่าที่ผู้ใช้วิจัยส่วนใหญ่เลือก (Mode)	ค่ากลางของข้อมูล (Median)	ค่าการกระจายของข้อมูล (IQR)
	สูงมาก									น้อยมาก					
คนทั่วไปมีปัญหาสุขภาพจิต ซึมเศร้า จากการพบเห็นการสูญเสีย ทำให้ไม่อยากเดินทางท่องเที่ยว หรือต้อนรับนักท่องเที่ยว	10	9	8	7	6	5	4	3	2	1			8	7	1.5
การขาดขวัญกำลังใจและความปลอดภัยในการทำงานของบุคลากรของอุทยานฯ มีผลต่อคุณภาพการให้บริการนักท่องเที่ยว	10	9	8	7	6	5	4	3	2	1			8	8	2
นักท่องเที่ยวขาดความมั่นใจในความปลอดภัย การเดินทาง และระบบให้การช่วยเหลือกรณีเกิดภัยพิบัติ ทำให้ไม่มาเที่ยวในบริเวณอุทยานฯ ฝั่งทะเลอันดามัน	10	9	8	7	6	5	4	3	2	1			8	8	3.5
นักท่องเที่ยวคิดว่าอุทยานฯ และพื้นที่ใกล้เคียงยังไม่พร้อมให้บริการนักท่องเที่ยว จึงไม่มาเที่ยว	10	9	8	7	6	5	4	3	2	1			8	8	2
นักท่องเที่ยวกลัวข่าวเรื่องการพบเห็นวิญญาณคนตาย	10	9	8	7	6	5	4	3	2	1			7	7	3
นักท่องเที่ยวกลัวทะเล การพักผ่อนบนเกาะ และชายทะเล	10	9	8	7	6	5	4	3	2	1			8	7	3.5
ความกังวลเรื่องความสะอาดของน้ำกิน น้ำใช้ อาหาร และโรคระบาดบริเวณประมง	10	9	8	7	6	5	4	3	2	1			7	7	2
ขาดระบบสาธารณสุข โรงพยาบาลในการรักษาผู้ป่วย	10	9	8	7	6	5	4	3	2	1			7	6	3
ความไม่ปลอดภัยในชีวิตและทรัพย์สิน เนื่องจากโจรไทย และต่างชาติฉวยโอกาสปล้นสะดม	10	9	8	7	6	5	4	3	2	1			3	4	2.5
โครงสร้างของประชากรในชุมชนใกล้เคียงอุทยานฯ เปลี่ยนแปลงไปเนื่องจากสมาชิกในชุมชนเสียชีวิต หรือพิการเป็นจำนวนมาก	10	9	8	7	6	5	4	3	2	1			8	5.5	3.5
ชาวเผ่ามอแกนซึ่งเป็นทรัพยากรการท่องเที่ยวทางวัฒนธรรม เปลี่ยนวิถีชีวิต ลักษณะชุมชนบ้านเรือน ทำให้สูญเสียความเป็นเอกลักษณ์ของชนเผ่า	10	9	8	7	6	5	4	3	2	1			9	6	4

กรุณากากบาท X ที่นี้ ☐ หากท่านยืนยันคำตอบเดิมจากรอบที่แล้วทุกข้อ

4.3 ประสิทธิภาพของกิจกรรมการฟื้นฟูผลกระทบด้านการท่องเที่ยวที่เกี่ยวข้องกับการฟื้นฟูสังคม สุขภาพ และความปลอดภัย ในช่วงเวลาหนึ่งปีที่ผ่านมา (2548)

กรุณาวางกลม ○ ค่าคะแนนประสิทธิภาพของกิจกรรมดังต่อไปนี้ ตามที่ท่านเห็นสมควร

กิจกรรมหรือแนวทางการฟื้นฟู	ประสิทธิภาพของ กิจกรรมในการฟื้นฟู สังคม สุขภาพ และ ความปลอดภัย และ การท่องเที่ยว											ไม่ทราบ / ไม่มีความเห็น (NA)	ค่าที่ท่านเลือกในรอบที่แล้ว	ค่าที่ท่านเลือกส่วนใหญ่เลือก (Mode)	ค่ากลางของข้อมูล (Median)	ค่าการกระจายของข้อมูล (QR)
	สูงมาก										น้อยมาก					
ขุดเจาะน้ำบาดาลและวางระบบน้ำประปาใหม่ โดยกรมน้ำและ กรมน้ำบาดาล	10	9	8	7	6	5	4	3	2	1				4	5	3.75
ทำความสะอาดเก็บขยะในแหล่งน้ำกิน น้ำใช้ โดยกรมอุทยานฯ และอาสาสมัคร	10	9	8	7	6	5	4	3	2	1				7	7	2.25
เก็บขยะทั้งบนบกและในน้ำ โดยกรมอุทยานฯ และอาสาสมัคร	10	9	8	7	6	5	4	3	2	1				7	7.5	1
ให้เงินช่วยเหลือปดอบขวัญเจ้าหน้าที่อุทยานฯ โดยสหกรณ์ กรมป่าไม้	10	9	8	7	6	5	4	3	2	1				5	5	3
มอบเครื่องราชอิสริยาภรณ์พิเศษ แก่เจ้าหน้าที่ผู้ปฏิบัติงาน เพื่อ เป็นกำลังใจ โดยสำนักนายกรัฐมนตรี	10	9	8	7	6	5	4	3	2	1				5	5	3.75
อบรมวางแผนการเดือนกึ่งและหนีภัยสึนามิ โดยเจ้าหน้าที่ อุทยานฯ, ตำรวจ, ทพท.,อาสาสมัคร	10	9	8	7	6	5	4	3	2	1				7	7	3.75
ส่งแพทย์ พยาบาลเข้าดูแลรักษา และตรวจสุขภาพให้ความ ช่วยเหลือด้านจิตเวช และฟื้นฟูสุขภาพจิตแก่เจ้าหน้าที่อุทยานฯ และชาวบ้านทั่วไป โดยกระทรวงสาธารณสุข มหาวิทยาลัย มูลนิธิต่างๆและสภาวิชาชีพไทย	10	9	8	7	6	5	4	3	2	1				5	6.5	2
มอบสิ่งของเครื่องใช้ อาหาร ยารักษาโรคในการดำเนินชีวิต	10	9	8	7	6	5	4	3	2	1				5	5	2
สร้างโรงเรียนใหม่ให้แก่เยาวชนในท้องถิ่นทดแทนโรงเรียนที่ เสียหายไป โดยภาครัฐ เอกชนและมูลนิธิต่างๆ	10	9	8	7	6	5	4	3	2	1				8	7	1.75
ฝึกอบรมและจัดหาเครื่องมือในการประกอบอาชีพให้กลุ่ม ผู้ประสบภัย โดยภาครัฐ เอกชนและมูลนิธิต่างๆ	10	9	8	7	6	5	4	3	2	1				6	7	2
ช่วยเหลือนักเรียนและเด็กกำพร้า โดย กระทรวงศึกษาธิการ และมูลนิธิต่างๆ	10	9	8	7	6	5	4	3	2	1				8	7	1
สร้างอนุสรณ์สถาน โดยหน่วยงานรัฐ	10	9	8	7	6	5	4	3	2	1				4	4	3.25

กรุณากากบาท X ที่นี้ ☐ หากท่านยืนยันคำตอบเดิมจากรอบที่แล้วทุกข้อ

4.4 อุปสรรค หรือข้อขัดขวางในการฟื้นฟูผลกระทบ

กรุณาพิจารณาหรือเขียนเพิ่มเติม คำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 ที่ดิฉันได้รวบรวม และนำเสนอในที่นี้

<ol style="list-style-type: none"> 1. การให้การดูแลผู้ประสบภัยล่าช้า ไม่ทั่วถึง เนื่องจากมีการกระจายตัวในพื้นที่กว้าง 2. บุคลากรทางการแพทย์ และผู้ให้บริการฟื้นฟูด้านสุขภาพในภาคสนาม โดยเฉพาะด้านจิตเวชมีน้อย ไม่เพียงพอ โดยเฉพาะเมื่อเทียบกับจำนวนนักท่องเที่ยว และชาวบ้าน 3. ขาดอุปกรณ์และบุคลากรในการช่วยเหลือและกู้ชีวิต 4. ประชาชนทั่วไป และชาวบ้านในท้องถิ่นมีความหวาดกลัววิญญาณคนตาย และมีความเชื่อเรื่องเหนือธรรมชาติอยู่มาก ทำให้มีผลกระทบต่อการฟื้นฟูสภาพจิตใจโดยรวม 5. การบังคับใช้กฎหมายของอุทยานฯ บางข้อ ขัดแย้งกับวิถีชีวิตดั้งเดิมของชาวมอแกน 6. มีการแอบแฝงเผยแพร่ศาสนาแกมบังคับ มากกับการให้เงินหรือความช่วยเหลือแก่ชาวบ้านท้องถิ่น 7. ขาดเอกภาพในการให้ความช่วยเหลือ ไม่มีหน่วยงานที่ประสานความช่วยเหลือ และการเบิกจ่ายงบประมาณอย่างต่อเนื่องและเป็นระบบ ทำให้การช่วยเหลือไม่ทั่วถึง และไม่ต่อเนื่อง บางแห่งซ้ำซ้อน เช่น บ้าน เครื่องมือประมง เรือ

8.	มีปัญหาด้านงบประมาณและเทคโนโลยีสำหรับการบริหารระบบเตือนภัย
9.	ภาครัฐส่งเสริมการฝึกอาชีพแต่ไม่สร้างตลาดให้แก่แรงงาน
10.	ทัศนคติที่ไม่ถูกต้องของคนทั่วไป ที่คิดว่าการบริจาคเงินเพื่อช่วยเหลือผู้ประสบภัยเป็นเรื่องที่ควรทำ
11.	มีการเลือกปฏิบัติระหว่างเพศ โดยผู้หญิงมักไม่ได้รับการช่วยเหลือเท่าที่ควร แม้ว่าต้องรับภาระปัญหาครอบครัวมากเท่ากับผู้ชาย
12.	ขาดการกำหนดแนวทางการดำเนินงานฟื้นฟูที่ชัดเจน และขาดการประชาสัมพันธ์ความช่วยเหลือให้ถึงกลุ่มเป้าหมาย
13.	การช่วยเหลือชาวอเมริกันเป็นไปอย่างผิดวิธีทำให้โครงสร้างและบทบาททางสังคมของชาวอเมริกันเปลี่ยนไป ซึ่งอาจมีผลเสียต่อวัฒนธรรมของเผ่าพันธุ์ และการใช้ทรัพยากรธรรมชาติในอุทยานฯ
14.	ขาดระบบและแผนจัดการวิกฤตการณ์ (Crisis Management) ในระดับท้องถิ่น ทำให้เกิดความฉุกเฉิน วุ่นวายในการดำเนินงาน
15.	ค่านิยมของชุมชนเปลี่ยนไปจากเดิมที่ช่วยเหลือตัวเองอย่างมาก กลายเป็นรอคอยความช่วยเหลือและรับความช่วยเหลือซ้ำซ้อน เช่น บางครอบครัวได้รับเรือใหม่หลายลำเกินความต้องการจึงนำไปขายต่อ ซึ่งมีผลเสียคือ หน่วยงานหรือองค์กรที่ตั้งใจจะให้ความช่วยเหลือเป็นไปอย่างมีประสิทธิภาพ ต้องใช้เวลาและเพิ่มการตรวจสอบข้อมูลมากขึ้น ทำให้ความช่วยเหลือในบางพื้นที่ล่าช้า
16.	.....

ส่วนที่ 5 ข้อเสนอแนะเพิ่มเติม เพื่อฟื้นฟูสภาพการท่องเที่ยวในเขตอุทยานอย่างยั่งยืน ภายหลังภัยธรรมชาติ

ดิฉันได้รวบรวมและสรุปคำตอบของท่านผู้เชี่ยวชาญทุกท่านจากแบบสอบถามรอบที่ 1 และนำเสนอในที่นี้ กรุณาพิจารณาหรือเขียนเพิ่มเติม ความจำเป็นเร่งด่วนของกิจกรรมหรือแนวทางการฟื้นฟูผลกระทบทั้ง 4 ด้าน

- ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ (Natural resource and ecosystem)
- ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น (Built environment)
- ด้านธุรกิจ (Business community)
- ด้านสังคม สุขภาพ และความปลอดภัย (Social, health, and safety)

ที่ยังไม่ได้รับการตอบสนอง ทั้งที่ควรทำในช่วงเวลาหนึ่งปีที่ผ่านมา และที่ควรทำในอนาคต เพื่อฟื้นฟูสภาพการจัดการการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเล ภายหลังภัยธรรมชาติ

รายการข้อเสนอแนะ และ ความต้องการ	ควรจะดำเนินการโดยใคร หรือหน่วยงานใด	ระดับความเร่งด่วน เมื่อเปรียบเทียบกับทุกรายการในที่นี้			ไม่มีกำหนด หรือไม่เห็นด้วย (NA)	ค่าที่ผู้เชี่ยวชาญส่วนใหญ่เลือก (Mode)	ค่าที่ท่านเลือกไว้ใน รอบที่แล้ว
		มากที่สุด	มาก	น้อย			
จัดวางระบบการเตือนภัยจากภัยธรรมชาติ โดยเฉพาะสึนามิอย่างเต็มรูปแบบ ทั้งทางด้านเทคโนโลยีและเครือข่ายการเตือนภัย การให้การศึกษาในทุกระดับเพื่อการปฏิบัติตัวที่ถูกต้องหากมีสึนามิเกิดขึ้นอีก การวางแผนหนีภัยในพื้นที่เสี่ยงภัย โดยเฉพาะในเขตอุทยานฯ และ การศึกษาวิจัยเพื่อการฟื้นฟูผลกระทบและลดความเสี่ยงในอนาคต	ผู้เชี่ยวชาญเฉพาะด้าน, กรมอุทยานฯ, องค์การบริหารท้องถิ่น					มากที่สุด	
สำรวจการเปลี่ยนแปลงสิ่งแวดล้อมชายฝั่งและใต้ทะเล	กรมอุทกศาสตร์, ท.ช.					มาก	
จัดทำระบบข้อมูลทรัพยากรภายในอุทยานฯ ทั้งในด้านปริมาณและคุณภาพ เพื่อใช้เป็นข้อมูลพื้นฐานและตัวชี้เทียบ การฟื้นตัวของสภาพธรรมชาติ	กรมอุทยานฯ, นักวิชาการ, ทช.					มากที่สุด	
จัดทำรายงานความก้าวหน้าการฟื้นตัวของสภาพทรัพยากรเผยแพร่แก่คนทั่วไปอย่างต่อเนื่อง เป็นระยะ เพื่อเป็นข้อมูลแก่ผู้ประกอบการและนักท่องเที่ยว และนักดำน้ำ	สถาบันการศึกษา และ กรมอุทยานฯ					มาก	
ติดตามประเมินผลกระทบด้านสังคม สุขภาพ และความปลอดภัย	ผู้เชี่ยวชาญเฉพาะด้าน					มาก	
ติดตามประเมินผลกระทบด้านสิ่งแวดล้อม	ผู้เชี่ยวชาญเฉพาะด้าน					มาก	
พัฒนาแหล่งน้ำจืดทดแทนแหล่งที่เสียหาย เพื่อให้เพียงพอต่อความต้องการ และการติดตั้งระบบบำบัดน้ำเสียภายในอุทยานฯ	กรมอุทยานฯ					มากที่สุด	
ลดการก่อสร้างสิ่งก่อสร้างใหม่ในบริเวณชายฝั่ง และวางแผนการก่อสร้างสิ่งปลูกสร้างอย่างรอบคอบ โดยคำนึงถึงสภาพธรรมชาติ และความปลอดภัยจากภัยธรรมชาติ	กรมอุทยานฯ					มากที่สุด	

รายการข้อเสนอแนะ และ ความต้องการ	ควรดำเนินการโดยใคร หรือหน่วยงานใด	ระดับความเร่งด่วน เมื่อ เปรียบเทียบกับทุกรายการในที่นี้			ไม่มีความเห็น หรือ ไม่เห็นด้วย (NA)	คำที่ผู้เชี่ยวชาญส่วนใหญ่เลือก (Mode)	ค่าที่ผ่านเลือกไว้ รวมที่แล้ว
		มากที่สุด	มาก	น้อย			
จัดแบ่งเขตกิจกรรม (zoning) ในอุทยานฯแต่ละแห่งอย่างชัดเจน	กรมอุทยานฯ					มากที่สุด	
พัฒนาทรัพยากรบุคคลของอุทยานฯให้เพียงพอต่อการจัดการอุทยานฯ ทั้งด้านจำนวนคนและคุณภาพ	กรมอุทยานฯ					มาก	
กำหนดแผนแม่บทการจัดการอุทยานแห่งชาติในการจัดแบ่งเขตการใช้ ประโยชน์ของแต่ละอุทยานฯให้ชัดเจน และดำเนินการตามอย่างเคร่งครัด	กรมอุทยานฯ และ อุทยานฯต่างๆ					มากที่สุด	
ศึกษาความสามารถในการรองรับนักท่องเที่ยวในแต่ละพื้นที่อุทยานฯ เพื่อให้การควบคุมจำนวนเรือ และนักท่องเที่ยวสอดคล้องกับพื้นที่และ ทรัพยากรที่มี เพื่อไม่ให้มีจำนวนนักท่องเที่ยวมากเกินไปจนเกิดการรองรับของ อุทยานฯ และเพื่อความปลอดภัยของนักท่องเที่ยวเอง	กรมอุทยานฯ, ท.ช., มหาวิทยาลัย					มาก	
ใช้ระบบสัมปทานที่พักนักท่องเที่ยวโดยให้ออกขนบริหาร และอุทยานฯ ควบคุม เพื่อลดการค่าใช้จ่ายของอุทยานฯ	กรมอุทยานฯ					น้อย	
จัดทำแผนป้องกันภัย ค้นหาภัยกรณีฉุกเฉิน และจัดเตรียมเครื่องมือ ช่วยชีวิตต่างๆ เช่น เรือ วิทยุสื่อสาร อาหารและน้ำสำรอง ภายในอุทยาน แห่งชาติทางทะเล	กรมอุทยานฯ					มากที่สุด	
ฟื้นฟูปะการัง และการวางปะการังเทียมในบริเวณที่เหมาะสม	ท.ช.					มาก	
สร้างเครือข่าย ประสานความร่วมมือระหว่างหน่วยงานภาครัฐ สถาบันการศึกษา และเอกชน เพื่อสนับสนุนการศึกษาวิจัย พัฒนาองค์ ความรู้ที่เกี่ยวข้องกับการจัดการอุทยานฯ	สถาบันการศึกษา กรม อุทยานฯ และท.ช.					มาก	
สำรวจแหล่งน้ำใหม่เพื่อทดแทนแหล่งน้ำเดิม และเพื่อให้แหล่งน้ำ ใหม่ที่เสียหายมีโอกาสฟื้นตัว	สถาบันการศึกษา กรม อุทยานฯ และท.ช.					มาก	
ส่งเสริมการมีส่วนร่วมของชุมชนใกล้เคียงอุทยานฯให้มีส่วนร่วมในการ วางแผนจัดการอุทยานฯ และโครงการอนุรักษ์รูปแบบต่างๆ เช่น การ ปลูกป่าชายเลน กิจกรรมรักษาความสะอาดในชุมชนชายฝั่ง และการให้ ความรู้เกี่ยวกับทะเลและภัยธรรมชาติ	สถาบันการศึกษา อ.บ.ค. องค์กรเอกชน กรม อุทยานฯ และท.ช.					มาก	
ดูแลนักท่องเที่ยวให้ปฏิบัติตามกฎข้อบังคับของอุทยานฯ อย่างเคร่งครัด โดยเฉพาะบริเวณแหล่งน้ำ	ผู้ประกอบการ และกรม อุทยานฯ					มากที่สุด	
ประชาสัมพันธ์และปลูกจิตสำนึกให้นักท่องเที่ยวคำนึงถึงคุณค่าของ ทรัพยากร เพื่อระมัดระวังถึงผลกระทบจากการท่องเที่ยว	สถาบันการศึกษา ผู้ประกอบการ และกรม อุทยานฯ					มากที่สุด	
มาตรการส่งเสริมความปลอดภัยในการเดินทางท่องเที่ยว	ส.พ.ท., ท.ท.ท.					มากที่สุด	
ประชาสัมพันธ์ส่งเสริมการท่องเที่ยวต่อเนื่องอย่างรอบคอบ โดยคำนึงถึง การฟื้นฟูทรัพยากรการท่องเที่ยวอย่างยั่งยืน	ส.พ.ท., ท.ท.ท.					มากที่สุด	
รณรงค์ให้ผู้ประกอบการท่องเที่ยวดำเนินธุรกิจที่แข่งขันด้านคุณภาพการ บริการมากกว่าการคิดราคาแข่งขัน	ท.ท.ท.					มากที่สุด	
ติดตามประเมินผลกระทบความเสียหายทางธุรกิจ และจัดหาแหล่งทุน เพื่อการฟื้นฟูธุรกิจ	ผู้เชี่ยวชาญเฉพาะด้าน, กรมส่งเสริมธุรกิจราย ย่อย, ธนาคารพาณิชย์					มาก	

รายการข้อเสนอแนะ และ ความต้องการ	ควรจะดำเนินการโดยใคร หรือหน่วยงานใด	ระดับความเร่งด่วน เมื่อ เปรียบเทียบกับทุกรายการในที่นี้			ไม่มีความเห็น หรือไม่เห็นด้วย (NA)	คำที่ผู้เชี่ยวชาญส่วนใหญ่เลือก (Mode)	ค่าที่ท่านเลือกไว้ใน รอบที่แล้ว
		มากที่สุด	มาก	น้อย			
จัดตั้งหน่วยงานกลางที่ประสานรับเรื่องร้องทุกข์เพื่อลดขั้นตอนการ ติดต่อกับหน่วยงานรัฐต่างๆ และให้การช่วยเหลือแก่ผู้ประสบภัยที่ยัง ต้องการความช่วยเหลือ โดยให้การช่วยเหลือที่ต่อเนื่องในระยะยาว รวมทั้งประชาสัมพันธ์ให้ชาวบ้านรับรู้ช่องทางรับความช่วยเหลือ เพื่อลด ความเครียดที่เกิดจากการขาดที่พึ่ง	หน่วยงานเฉพาะกิจของ ภาครัฐ					มาก	
ให้ความช่วยเหลือโดยถามถึงความต้องการที่แท้จริงของผู้รับ เพื่อให้การ ช่วยเหลือเป็นไปอย่างมีประสิทธิภาพ เป็นที่พอใจของผู้รับ และไม่ขัดกับ วิถีชีวิตและวัฒนธรรมดั้งเดิมของท้องถิ่น เช่น ชนเผ่ามอแกน ชาวประมง พื้นบ้าน	หน่วยงานเฉพาะกิจของ ภาครัฐ และองค์กร เอกชน					มาก	
รณรงค์รักษาความสะอาดบริเวณชายฝั่งให้มากขึ้น เพื่อลดปริมาณขยะ	ทุกคน					มาก	

กรุณาเกะบาท X ที่ ☐ หากท่านต้องการ ยืนยันคำตอบเดิม จารอบที่แล้วทุกข้อ

หมายเหตุ : กรมอุทยานฯ คือ กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช
ท.ช. คือ กรมทรัพยากรทางทะเลและชายฝั่ง
ส.พ.ท. คือ สำนักพัฒนาการท่องเที่ยว
ท.ท.ท. คือ การท่องเที่ยวแห่งประเทศไทย

ส่วนที่ 6 ผลกระทบในแง่ที่เกิดจากเหตุการณ์สึนามิที่ท่านได้พบเห็นหรือรับรู้

- ก. หาดทรายและน้ำทะเลบางแห่งสะอาดขึ้น
- ข. เหลือพื้นที่ช่วยเปิดเผยความไม่โปร่งใส และการทุจริตในระบบกรรมสิทธิ์ที่ดินบริเวณชายฝั่งของรัฐ
- ค. พฤติกรรมการช่วยเหลือฟื้นฟูที่ไม่ต่อเนื่อง ไม่เป็นระบบ ช่วยเปิดเผยระดับความจริงจังในการแก้ปัญหาของรัฐบาล ว่าเน้นสร้างภาพในช่วงแรกของวิกฤตการณ์ มากกว่าการจัดการปัญหาอย่างจริงจัง
- ง. เกิดการรวมกลุ่มของกลุ่มองค์กรเอกชน เช่น ชมรมนักดำน้ำในการทำกิจกรรมการอนุรักษ์ทรัพยากร
- จ. เกิดความสามัคคีร่วมมือกันทั้งภายในและระหว่างกลุ่มต่างๆ เช่นภาครัฐ กลุ่มองค์กรเอกชน นักวิชาการ (โดยเฉพาะนักวิทยาศาสตร์ทางทะเลต่างสถาบัน) และประชาชนหลากหลายสาขาอาชีพ ในการช่วยเหลือผู้ประสบภัย และการทำกิจกรรมฟื้นฟูทรัพยากร
- ฉ. เป็นโอกาสดีของภาครัฐในการกำหนดแนวทางการจัดการทรัพยากร เช่น การกำหนดความสามารถในการรองรับ (Carrying Capacity) หรือการรื้อสิ่งปลูกสร้างที่รูก้ำกึ่งชายหาด หรือวางผังพื้นที่ชายฝั่งใหม่
- ช. หน่วยงานรัฐ และประชาชนตระหนักถึงผลกระทบจากการกระทำของมนุษย์ที่มีต่อธรรมชาติ มากขึ้น สนใจห่วงใยสิ่งแวดล้อมทางทะเลมากขึ้น
- ซ. ทำให้เกิดแรงกระตุ้นในหน่วยงานรัฐ และประชาชนให้มีการวางแผนและการพัฒนาพื้นที่ชายฝั่งที่คำนึงถึงความปลอดภัยจากภัยธรรมชาติมากขึ้น
- ฌ. บทเรียนจากเหตุการณ์สึนามิทำให้การปรับปรุงกฎหมาย พัฒนางค์ความรู้ แนวคิดใหม่ๆ ทั้งในด้านวิชาการและการจัดการทรัพยากรชายฝั่งทะเล
- ฎ. มีโอกาสได้รับความช่วยเหลือจากต่างประเทศ ทั้งในรูปเงินสนับสนุน บุคลากร และเทคโนโลยี
- ฏ. จำนวนนักท่องเที่ยวที่ลดน้อยลงในช่วงเวลาหนึ่งปีที่ผ่านมา ทำให้ทรัพยากรถูกรบกวนน้อยลง ได้พักฟื้นตัว
- ฎ. ผู้ประกอบการ ผู้เกี่ยวข้องกับการส่งเสริมท่องเที่ยว และประชาชนทั่วไปได้ตระหนักถึงความเปราะบางของการท่องเที่ยว ซึ่งจำเป็นต้องมีการวางแผนอย่างรอบคอบ เพื่อพัฒนาอย่างยั่งยืน
- ฐ. บางหน่วยงานได้รับงบประมาณพิเศษเพิ่มเติมจากงบประมาณปกติในการฟื้นฟูทรัพยากร ทำให้สามารถดำเนินการในโครงการพัฒนาพิเศษ
- จ. เกิดความประทับใจในน้ำใจของคนไทยที่มีต่อเพื่อนมนุษย์ ในการให้ความช่วยเหลือนักท่องเที่ยวและผู้ประสบภัย
- ฉ.
- ฌ.

ข้อเสนอแนะหรือความคิดเห็นอื่นๆ

- ก. การดำเนินงานด้านศูนย์เตือนภัยให้สามารถปฏิบัติงานได้จริงและมีประสิทธิภาพในพื้นที่ เป็นความเร่งด่วนสูงสุด
- ข. ควรกำหนดนโยบาย ยุทธศาสตร์ และแผนปฏิบัติการในการจัดการทรัพยากรชายฝั่ง และภาคธุรกิจการท่องเที่ยวที่ชัดเจน
- ค. อุทยานฯควรเปลี่ยนวิธีการบริหารจัดการ ให้เน้นทรัพยากรและสิ่งแวดล้อม มากกว่าเน้นด้านรายได้ อย่างที่เป็นในปัจจุบัน รวมทั้งควรมีความโปร่งใส ชี้แจงแนวทางการใช้ประโยชน์จากรายได้ที่เก็บจากค่าธรรมเนียมเข้าอุทยานฯ เพื่อให้เกิดประโยชน์อย่างเป็นรูปธรรม
- ง. ส.พ.ท. ควรมีบทบาทจัดทำแผนแม่บทด้านการท่องเที่ยว และความรู้แก่นักท่องเที่ยว จังหวัด และชุมชน
- จ. ท.ท.ท. ควรส่งเสริมการตลาดโดยเน้นกลุ่มนักท่องเที่ยวที่มีคุณภาพ ดำเนินสิ่งสิ่งแวดล้อม มากกว่าเน้นแต่จำนวนนักท่องเที่ยวเป็นหลัก
- ฉ. ควรมีหน่วยงานที่ติดตามประเมินผลกระทบและการฟื้นฟูในทุกๆด้านที่ต่อเนื่องในระยะยาว เพราะคนไทยมักจะลืมง่าย
- ช. หน่วยงานที่เป็นศูนย์ติดต่อเชื่อม โยงความช่วยเหลือ (Contact center) ของภาครัฐ เช่น ท.ช. ควรจัดตั้งคณะกรรมการจากสถาบันการศึกษาต่างๆ เพื่อช่วยกันพิจารณาความช่วยเหลือต่างๆ ทั้งจากในประเทศและต่างประเทศ เป็นกระจายงานให้สถาบันการศึกษาจากทั้งส่วนกลางและภูมิภาค เพื่อให้การช่วยเหลือและงานวิจัยครอบคลุมทุกพื้นที่
- ซ.

ข้อเสนอแนะหรือความคิดเห็นอื่นๆ (ต่อ)

- ณ.
- ญ.
- ฉ.

ส่วนที่ 7 ข้อเสนอแนะหรือความคิดเห็นที่เกี่ยวข้องกับวิธีวิจัยครั้งนี้ เช่น ความเห็นเกี่ยวกับการออกแบบสอบถามแบบเดลฟาย (Delphi)—3 รอบแบบสอบถาม ซึ่งแตกต่างจากแบบสอบถามทั่วไป หรือข้อเสนอแนะอื่นๆ

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รหัสประจำตัวของท่าน

(กรณูดูจากหน้า ที่ 1)

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Appendix J Invitation email for moderator to recruit participants for the supplemental interviews (English version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

<Date>

Dear <name>,

My name is Somrudee Meprasert. I am a doctoral student in the Geography Program at Oregon State University, USA. I am conducting a study of the impacts of 2004 Indian Ocean Tsunami on coastal and marine tourism and recovery responses in affected marine national parks, Thailand. The primary goal of this research is to document the impact of the December 26, 2004 Indian Ocean tsunami on tourism in marine national parks in Thailand, including how these impacts are being addressed in the year following the disaster (2005) to recover this tourism sector. Additionally, the study will result in a risk and vulnerability assessment technique for marine parks to evaluate their degree of risk and vulnerability and to promote more resilient marine parks which led to more rapid and effective recovery. The research will make a variety of contributions and benefits to our understanding of linkage of natural-coastal hazards and tourism in tropical marine national parks.

I would like to invite you to take part in this study, a supplemental interview. Only a small group of 2004 tsunami-impact relievers have received this invitation, so your participation is integral to the study. The interview should take about one hour to complete. Hand written notes will be used to transcribe your information and you will be given the opportunity to review the notes for completeness. There will be NO tape recording.

The answers you provide will be kept confidential to the extent permitted by law. Special precautions have been established to protect the confidentiality of your responses. There are no foreseeable risks to you as a participant in this project. All participants in the project will receive a copy of the compiled results by email upon completion of the project.

I will conduct the interviews between late April and June 2006. Please let me know as soon as you can if you are willing to participate in the interview. Once I hear from you, I will make an appointment to conduct the in-person or telephone interview at your convenience.

If you have any questions or comments about this study, please do not hesitate to contact me. My telephone number is 02-579-9645, or you can write to me at the email addresses (somdeem@yahoo.com or mepraserts@geo.orst.edu).

I greatly appreciate your cooperation and thank you for your help.

Sincerely,
Somrudee Meprasert

Appendix K Invitation email for moderator to recruit participants for the supplemental interviews (Thai version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

<วันที่>

เรียน ...<ชื่อ>.....

ดิฉันชื่อ สมฤดี มีประเสริฐ เป็นนักศึกษาระดับปริญญาเอก ในสาขาภูมิศาสตร์ ของมหาวิทยาลัยแห่งรัฐโอเรกอน (Oregon State University) ประเทศสหรัฐอเมริกา ดิฉันกำลังศึกษาผลกระทบของคลื่นสึนามิที่ต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเล จุดประสงค์หลักประการแรกของการวิจัยนี้คือ เพื่อบันทึกผลกระทบของคลื่นสึนามิที่มีต่อระบบการจัดการการท่องเที่ยวในเขตอุทยานทางทะเล และบันทึกแนวทางการฟื้นฟูผลกระทบในระยะเวลาหนึ่งปีที่ผ่านมา จุดประสงค์หลักประการที่สองคือ เพื่อพัฒนาเทคนิคการประเมินผลกระทบจากภัยธรรมชาติที่มีต่ออุทยานแห่งชาติทางทะเล ผลการศึกษาจากงานวิจัยนี้จะช่วยเพิ่มความเข้าใจในผลกระทบของภัยธรรมชาติที่มีต่อการท่องเที่ยว โดยเฉพาะการท่องเที่ยวในเขตอุทยานทางทะเล และนำไปสู่การฟื้นฟูผลกระทบที่รวดเร็วและมีประสิทธิภาพในอนาคต

ดิฉันขอเชิญท่านเข้าร่วมในการสัมภาษณ์ซึ่งเป็นส่วนสำคัญในการวิจัยครั้งนี้ เนื่องจากท่านเป็นผู้มีความเข้าใจในผลกระทบของภัยธรรมชาติที่เกิดขึ้น การตัดสินใจของท่านในการเข้าร่วมในการสัมภาษณ์นี้มีความสำคัญเป็นอย่างยิ่งต่อการวิจัย การสัมภาษณ์นี้คาดว่าจะใช้เวลาประมาณ ๑ ชั่วโมง ดิฉันจะทำการจดบันทึกด้วยลายมือ แต่จะไม่มีการบันทึกเสียง ข้อมูลที่ได้รับจากท่านระหว่างการสัมภาษณ์จะถูกเก็บเป็นความลับ และท่านจะได้รับรายงานผลการศึกษามื่องานวิจัยเสร็จสมบูรณ์

ดิฉันจะดำเนินการสัมภาษณ์ระหว่างเดือนมกราคม ถึงเดือนมีนาคม ๒๕๕๕ ขอความกรุณาท่านตอบความสมัครใจในการถูกสัมภาษณ์มาซึ่งดิฉัน เพื่อทำการนัดหมายวันเวลาสัมภาษณ์ตามความสะดวกของท่านต่อไป หากท่านมีข้อสงสัยหรือข้องใจเกี่ยวกับการวิจัยครั้งนี้ กรุณาส่งอีเมลถึงดิฉันได้ที่ mepraserts@geo.orst.edu หรือ somdeem@yahoo.com หรือทางโทรศัพท์ที่ (๐๒) ๕๙๕-๘๖๔๕ ท่านสามารถฝากข้อความของท่านได้ที่หมายเลขโทรศัพท์ดังกล่าว และดิฉันสัญญาว่าจะติดต่อกลับโดยเร็วที่สุด

ความร่วมมือจากท่านมีความสำคัญเป็นอย่างยิ่งต่อการวิจัยครั้งนี้ ดิฉันเชื่อว่าผลจากการศึกษานี้นอกจากจะมีประโยชน์เป็นอย่างยิ่งต่อประเทศไทยอันเป็นที่รักของเราแล้ว ยังสามารถช่วยลดความเสี่ยงของชีวิตและทรัพย์สินอันเนื่องมาจากภัยธรรมชาติในประเทศต่างๆทั่วโลกได้ในอนาคต ดิฉันจึงขอขอบพระคุณล่วงหน้าในความร่วมมือของท่าน

ขอแสดงความเคารพเป็นอย่างสูง

นางสาว สมฤดี มีประเสริฐ

Appendix L Informed consent form for supplemental interviews with international participants (English version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

Project Title: The 2004 Indian Ocean tsunami: Coastal and marine tourism impacts and recovery progress in marine national parks, Andaman Coast, Thailand

Principal Investigator: James W. Good, Marine Resource Management (Student Advisor)

Student Researcher: Somrudee Meprasert

PURPOSE

The primary goal of this research is to document the impact of the December 26, 2004 Indian Ocean tsunami on tourism in marine national parks in Thailand, including how these impacts are being addressed in the year following the disaster (2005) to recover this tourism sector. Based on this study, a secondary goal is to develop a risk and vulnerability assessment technique for marine parks to evaluate their degree of risk and vulnerability and to promote more resilient marine parks which led to more rapid and effective recovery.

The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read the form carefully. You may ask any questions about the research, what you will be asked to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When all of your questions have been answered, you can decide if you want to be in this study or not. This process is called “informed consent”. You will be given a copy of this form for your records.

We are inviting you to participate in this research study because you are knowledgeable in the impacts of the 2004 tsunami on marine national parks. You also have involved in recovery projects in the tsunami affected areas. Only 10 knowledgeable persons like you are expected to participate in the study.

PROCEDURES

If you agree to participate, your involvement will last for about one hour during April-June 2006. The researcher will interview you using objectives of the study and preliminary results from the Delphi survey regarding the impacts of the 2004 tsunami as guidelines. Hand-written notes, post-interview word-processed will be used to record your response—NO tape recorder. The following step-by-step procedures are involved in this study.

1. Introduction to research & Consent Form (take about 5 minutes)

The interviewer will tell you about the research questions and objectives and expected outcomes. She will ask if you have any question regarding the study. Then, she will ask you to consider the consent form and to sign the form. If the interview happens on the phone, the interviewer will discuss with you in how to send the form to the researcher. You will keep one copy of the signed form for further references. If it is an in-person interview, you will receive a copy of the sign consent form right away.

2. Informant's personal background (take about 15 minutes)

After the interviewer obtains your signed consent form, she will ask you about the following topics.

- 2.1 History of your involvement with the 2004 tsunami relief and recovery efforts within marine national park boundaries and/or adjacent areas
- 2.2 How and why have you involved?

2.3 You personal background

2.4 How long have you worked in this current field or this position?

During the interview, please feel free to refuse to answer any question(s) that you feel uncomfortable.

3. Introduction to questions (take about 20 minutes)

The interviewer will use preliminary results from the Delphi questionnaire survey to start the conversation and probe for in-depth information. Followings are four main questions that will be asked.

3.1 What are the impacts of the 2004 tsunami on marine national parks?

Categorizing damages or impacts in four aspects:

- natural environment,
- built environment,
- social system and human safety, and
- business community

3.2 What are the impacts of the tsunami on tourism sector in marine parks?

Measuring degree of influence of each impact/damage category

- natural environment,
- built environment,
- social system and human safety, and
- business community

3.3 What are recovery efforts that had been done during the year 2005?

- Identifying those efforts
- Measuring level of effectiveness
- Exploring general constraints and/or limitation of each effort

3.4 What are all possible recovery efforts that should be done during the year after the disaster and following years?

- Identifying all possible efforts
- Prioritizing each effort

4. Personal opinion on related topic(s) (take about 10 minutes)

After you answer all questions in section 3, the interviewer will ask if you have personal opinion that related to the topic(s). Your in-depth information will enrich the set of results that already gathered.

5. Interview Conclusion and Additional Resources (take about 10 minutes)

The interviewer will conclude the interview and ask if you have additional resources that should be useful for the study. Additional information the research should seek out such as annual reports of key organizations, newsletters, other published and unpublished data that might be available, and other related information. Finally, the interviewer will thank you for interview and promise to provide study results when published.

RISKS

There are no significant foreseeable risks associated with the study.

BENEFITS

One potential benefit of participating in this study is that you will be given the opportunity to express your views and provide information about a subject that is important to the society and to yourself (e.g. impacts of the 2004 on your business, obstacles that you have faced during the recovery efforts, etc.). In addition, a summary of results will be made available to all participants in this research. Moreover, the researchers anticipate that society will benefit from this study as lesson learned. Information from the study will help reduce impacts of natural hazards in the future.

COSTS AND COMPENSATION

You will not be compensated for participating in this research project.

CONFIDENTIALITY

Records of participation in this research project will be kept confidential to the extent permitted by law. However, federal government regulatory agencies and the Oregon State University's Institutional Review Board (a committee that reviews and approves research studies involving human subjects) may inspect and copy records pertaining to this research. It is possible that these records could contain information that personally identifies you. In the event of any report or publication from this study, your identity will not be disclosed. Results will be reported in a summarized manner in such a way that you cannot be identified.

VOLUNTARY PARTICIPATION

Taking part in this research study is voluntary. You may choose not to take part at all. If you agree to participate in this study, you may stop participating at any time. If you decide not to take part, or if you stop participating at any time, your decision will not result in any penalty or loss of benefits to which you may otherwise be entitled. Any data collected from you prior to withdrawal will be destroyed in the study results.

QUESTIONS

Questions are encouraged. If you have any questions or comments about this study, please do not hesitate to contact me at 02-579-9645, or you can write to me at the email addresses (somdeem@yahoo.com or mepraserts@geo.orst.edu). Please also feel free contact my advisor, Dr. James Good, if you have any questions at the email address good@coas.oregonstate.edu.

If you have questions about your rights as a participant, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator, at (541) 737-3437 or by e-mail at IRB@oregonstate.edu.

Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

Participant's Name (printed): _____

(Signature of Participant)

(Date)

RESEARCHER STATEMENT

I have discussed the above points with the participant or, where appropriate, with the participant's legally authorized representative, using a translator when necessary. It is my opinion that the participant understands the risks, benefits, and procedures involved with participation in this research study.

(Signature of Researcher)

(Date)

Appendix M Informed consent form for supplemental interviews with Thai participants (Thai version)



Department of Geosciences

Oregon State University

104 Wilkinson Hall • Corvallis, Oregon 97331-5506

Tel: (541) 737-1201 • Fax: (541) 737-1200 • www.geo.oregonstate.edu

ชื่องานวิจัย: สีนามิแห่งปี ๒๕๔๗: ผลกระทบที่มีต่อการท่องเที่ยวทางทะเล และการฟื้นฟูผลกระทบในอุทยานแห่งชาติทางทะเลเลนชายฝั่งทะเลอันดามัน ประเทศไทย

ผู้วิจัยหลัก: ดร. เจมส์ คัมเบลล์ กูด, สาขาวิชาการจัดการทรัพยากรชายฝั่ง (อาจารย์ที่ปรึกษา)

นักศึกษาผู้ทำการวิจัย: น.ส. สมฤดี มีประเสริฐ

วัตถุประสงค์

จุดประสงค์หลักประการแรกของการวิจัยนี้คือ เพื่อบันทึกผลกระทบของคลื่นสึนามิที่มีต่อระบบการจัดการการท่องเที่ยวในเขตอุทยานทางทะเล และบันทึกแนวทางการฟื้นฟูผลกระทบในระยะเวลาหนึ่งปีที่ผ่านมา จุดประสงค์หลักประการที่สองคือ เพื่อพัฒนาเทคนิคการประเมินผลกระทบจากภัยธรรมชาติที่มีต่ออุทยานแห่งชาติทางทะเล ผลการศึกษาจากงานวิจัยนี้จะช่วยเพิ่มความเข้าใจในผลกระทบของภัยธรรมชาติที่มีต่อการท่องเที่ยว โดยเฉพาะการท่องเที่ยวในเขตอุทยานทางทะเล และนำไปสู่การฟื้นฟูผลกระทบที่รวดเร็วและมีประสิทธิภาพในอนาคต

จุดประสงค์ของหนังสือแสดงความยินยอมนี้ คือ เพื่อให้ข้อมูลแก่ท่านเพื่อประกอบการตัดสินใจว่าจะเข้าร่วมการวิจัยหรือไม่ กรุณาอ่านเอกสารฉบับนี้ด้วยความรอบคอบ ท่านสามารถถามคำถามเกี่ยวกับการวิจัยนี้ เช่น กิจกรรมที่ท่านต้องทำ ความเสี่ยงและผลประโยชน์ สิทธิของท่านในฐานะผู้สมัครใจ หรือข้อข้องใจอื่นๆ และเมื่อผู้วิจัยตอบข้อซักถามของท่านจนชัดเจนแล้ว ท่านก็สามารถตัดสินใจว่าจะเข้าร่วมงานวิจัยหรือไม่ ขั้นตอนนี้เรียกว่า “หนังสือแสดงความยินยอม” ท่านจะได้รับสำเนาเอกสารฉบับนี้หนึ่งชุดเพื่อเป็นหลักฐานอ้างอิงต่อไป

คณะผู้วิจัยขอเรียนเชิญท่านเข้าร่วมการวิจัยนี้ เนื่องจากท่านเป็นผู้มีความรู้ความเชี่ยวชาญเกี่ยวกับผลกระทบของสึนามิแห่งปี ๒๕๔๗ ที่มีต่ออุทยานแห่งชาติทางทะเล นอกจากนั้นท่านยังมีส่วนร่วมในการฟื้นฟูผลกระทบดังกล่าวอีกด้วย ในงานวิจัยในขั้นนี้ประกอบด้วย ผู้ทรงคุณวุฒิเช่นท่านเพียง ๑๐ ท่านเท่านั้น

ขั้นตอนการวิจัย

หากท่านตัดสินใจเข้าร่วมงานวิจัยนี้ การเข้าร่วมงานของท่านจะใช้เวลาเพียงหนึ่งชั่วโมง ในช่วงเดือนเมษายนถึงมิถุนายน ๒๕๔๘ ผู้วิจัยจะสัมภาษณ์ท่านโดยใช้ข้อมูลเบื้องต้นจากแบบสอบถามเกี่ยวกับผลกระทบของสึนามิ การเก็บข้อมูลจะใช้การจดด้วยมือ และการพิมพ์บันทึกไว้ในคอมพิวเตอร์ โดยจะไม่มีการบันทึกเสียง ต่อไปนี้คือขั้นตอนการศึกษาของงานวิจัยนี้

๑. บทนำเข้าสู่การวิจัย และหนังสือแสดงความยินยอม (ใช้เวลาประมาณ ๕ นาที)

ผู้สัมภาษณ์จะให้ข้อมูลแก่ท่าน ซึ่งเกี่ยวกับคำถามของการวิจัย วัตถุประสงค์ และผลงานที่คาดหวัง ผู้สัมภาษณ์จะให้โอกาสท่านถามคำถาม และขอให้ท่านลงนามในเอกสารยินยอม หากขั้นตอนเหล่านี้กระทำผ่านทางโทรศัพท์ ผู้สัมภาษณ์จะขอให้ท่านส่งเอกสารยินยอมนี้ให้ผู้วิจัยต่อไป หากการสัมภาษณ์กระทำโดยการนัดพบรายบุคคล ท่านจะได้รับสำเนาเอกสารหนึ่งชุดเก็บไว้เป็นหลักฐานในทันที

๒. ข้อมูลพื้นฐานของผู้ร่วมงานวิจัย (ใช้เวลาประมาณ ๑๕ นาที)

หลังจากที่ท่านลงนามในเอกสารยินยอมแล้ว ผู้สัมภาษณ์จะถามคำถามท่านในหัวข้อต่อไปนี้

๒.๑ ประวัติของท่านในการเข้าร่วมการฟื้นฟูผลกระทบจากสึนามิ

๒.๒ ท่านเข้าร่วมในกิจกรรมเหล่านั้นได้อย่างไร และเพราะอะไร

๒.๓ ข้อมูลเบื้องต้นเกี่ยวกับตัวท่าน

๒.๔ ระยะเวลาที่ท่านทำงานในสาขานี้หรือตำแหน่งนี้

ในระหว่างการสัมภาษณ์นี้ ท่านสามารถถามคำถามที่ท่านข้องใจได้ หรือเลือกที่จะไม่ตอบคำถามใดๆที่ท่านไม่สบายใจได้ตลอดเวลา

๓. การนำเข้าสู่คำถาม (ใช้เวลาประมาณ ๒๐ นาที)

ผู้สัมภาษณ์จะใช้ข้อมูลเบื้องต้นที่ได้มาจากการออกแบบสอบถาม นำท่านเข้าสู่การสนทนา คำถามหลัก ๔ คำถามคือ

๓.๑ ผลกระทบของสึนามิแห่งปี ๒๕๔๗ ที่มีต่ออุทยานแห่งชาติทางทะเลมีอะไรบ้าง ใน ๔ หัวข้อต่อไปนี้

- ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ
- ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น
- ด้านธุรกิจ
- ด้านสังคม สุขภาพ และความปลอดภัย

๓.๒ ผลกระทบของสึนามิแห่งปี ๒๕๔๗ ที่มีต่อการท่องเที่ยวในเขตอุทยานแห่งชาติทางทะเลมีอะไรบ้าง ใน ๔ หัวข้อต่อไปนี้

- ด้านทรัพยากรและสิ่งแวดล้อมทางธรรมชาติ
- ด้านสิ่งแวดล้อมที่มนุษย์สร้างขึ้น
- ด้านธุรกิจ
- ด้านสังคม สุขภาพ และความปลอดภัย

๓.๓ กิจกรรมหรือแนวทางฟื้นฟูผลกระทบมีอะไรบ้างในช่วงปี ๒๕๔๘

- กรณาระบุกิจกรรมหรือแนวทาง
- กรณาระบุระดับประสิทธิภาพของกิจกรรมหรือแนวทาง
- กรณาระบุอุปสรรคหรือข้อจำกัดของแต่ละกิจกรรมหรือแนวทางการฟื้นฟู

๓.๔ แนวทางหรือกิจกรรมที่สมควรกระทำในช่วงปีแรกและปีต่อไปหลังเหตุพิบัติภัย

- กรณาระบุแนวทางที่เป็นไปได้ทั้งหมด
- กรณาระบุลำดับความเร่งด่วน

๔. ความคิดเห็นส่วนตัวที่เกี่ยวข้อง (ใช้เวลาประมาณ ๒๐ นาที)

หลังจากที่ท่านตอบคำถามทุกข้อในหัวข้อที่ ๓ แล้ว ผู้สัมภาษณ์จะถามความคิดเห็นของท่านที่มีต่อหัวข้อคำถาม ความคิดเห็นของท่านจะช่วยขยายความคำตอบเบื้องต้นและช่วยให้คำตอบมีความสมบูรณ์มากขึ้น

๕. การสรุปการสัมภาษณ์และแหล่งข้อมูลอื่นๆ

ผู้สัมภาษณ์จะสรุปผลการสัมภาษณ์ และถามหาว่าท่านทราบแหล่งข้อมูลเพิ่มเติมที่เป็นประโยชน์ต่อการวิจัย เช่น รายงานประจำปีของหน่วยงานที่เกี่ยวข้อง หรือเอกสารที่มีประโยชน์อื่นๆ และสุดท้ายผู้สัมภาษณ์จะกล่าวขอบคุณและสัญญาว่าท่านจะส่งผลการวิจัยมาให้ท่านเมื่องานวิจัยเสร็จสิ้น

ความเสี่ยง

การเข้าร่วมงานวิจัยนี้ ไม่มีความเสี่ยงที่มีนัยสำคัญ

ผลประโยชน์

ผลประโยชน์ของงานวิจัยนี้คือ ท่านจะได้มีโอกาสแสดงความคิดเห็นและให้ข้อมูลที่เกี่ยวข้องกับสังคมและตัวท่านเอง เช่น ผลกระทบของสินค้าที่มีต่อธุรกิจของท่าน อุปสรรคที่ท่านประสบในการฟื้นฟูผลกระทบ เป็นต้น ผู้วิจัยหวังเป็นอย่างยิ่งว่าบทเรียนที่ได้รับทราบจากงานวิจัยนี้จะก่อให้เกิดประโยชน์ต่อสังคม และช่วยลดผลกระทบของภัยธรรมชาติที่จะเกิดขึ้นในอนาคต

ค่าใช้จ่ายและค่าตอบแทน

ท่านจะไม่ได้รับค่าตอบแทนในการเข้าร่วมงานวิจัยนี้

การเก็บรักษาข้อมูลของการวิจัยเป็นความลับ

ผลการศึกษาและข้อมูลของผู้เข้าร่วมวิจัยจะถูกเก็บเป็นความลับที่เหมาะสมตามกฎหมาย อย่างไรก็ตามกฎหมายแห่งรัฐบาลกลางสหรัฐอเมริกาให้กรรมการตรวจสอบการวิจัยเกี่ยวกับมนุษย์สามารถตรวจสอบเอกสารบันทึกหรือเอกสารใดๆ ที่เกี่ยวข้องกับงานวิจัยได้ ในกรณีที่มีการตีพิมพ์ผลการวิจัย ชื่อหรือข้อมูลส่วนตัวของท่านจะไม่ถูกเปิดเผย ผลของการศึกษาจะถูกรายงานในลักษณะที่ไม่สามารถชี้ชื่อนามยังตัวท่านได้

การเข้าร่วมงานวิจัยโดยสมัครใจ

การเข้าร่วมงานวิจัยนี้เป็นไปอย่างสมัครใจ ท่านสามารถปฏิเสธการเข้าร่วมงานวิจัยหรือเลิกสละการร่วมงานวิจัยได้ตลอดเวลา ท่านจะไม่เสียค่าปรับหรือโดนลงโทษไม่ว่ากรณีใดๆ ก็ตาม ข้อมูลที่ท่านให้ไว้ก่อนที่จะยกเลิกการเข้าร่วมงานวิจัยจะถูกทำลายโดยไม่มีการเก็บไว้

คำถาม

หากท่านมีข้อสงสัยหรือข้อข้องใจเกี่ยวกับการวิจัยขึ้นนี้ กรุณาส่งอีเมลถึงผู้วิจัยได้ที่ meprasersts@geo.orst.edu หรือ somdeem@yahoo.com หรือทางโทรศัพท์ที่ (๐๒) ๕๑๕-๕๖๔๕ ท่านสามารถฝากข้อความของท่านได้ที่หมายเลขโทรศัพท์ดังกล่าว หรือหากท่านต้องการถามคำถามมายังอาจารย์ที่ปรึกษาของผู้วิจัย ท่านสามารถส่งอีเมลได้ที่ good@coas.oregonstate.edu หากท่านมีคำถามเกี่ยวกับสิทธิในการร่วมงานวิจัยนี้ ขอความกรุณาติดต่อ Oregon State University Institutional Review Board (IRB) Human Protections Administrator ที่ (๕๔๑) ๗๓๗-๓๔๓๗ หรือ อีเมลล์ IRB@oregonstate.edu.

ลายมือชื่อของท่านบนเอกสารฉบับนี้แสดงว่าท่านเข้าใจหลักการและแนวทางของงานวิจัยนี้ และยินดีเข้าร่วมในงานวิจัยนี้ ท่านจะได้รับสำเนาเอกสารนี้หนึ่งชุดเพื่อเก็บไว้เป็นหลักฐานต่อไป

ผู้เข้าร่วมงานวิจัย (ตัวบรรจง) _____

(ลงนามผู้เข้าร่วมงานวิจัย)

(วันที่)

คำยืนยันของผู้วิจัย

ข้าพเจ้าได้ทำความเข้าใจกับผู้เข้าร่วมงานวิจัย และเป็นความเข้าใจของข้าพเจ้าว่าผู้เข้าร่วมงานวิจัยเข้าใจความเสี่ยง ผลประโยชน์ และขั้นตอนที่เกี่ยวข้องในการเข้าร่วมในงานวิจัยนี้

(ลงนามผู้วิจัย)

(วันที่)

Appendix N Model for increasing marine park resiliency to natural hazards: a hypothetical Andaman coast park---Sudara Marine National Park

Vulnerability assessment guidelines for marine parks

This study proposes a general guideline for conducting a comprehensive marine park vulnerability assessment. It is directed toward the goal of more disaster-resilient marine parks. This guideline was adapted mainly from the community vulnerability assessment tool established by the NOAA, Coastal Services Center (1999) and vulnerability assessment guideline of port and harbor community developed by Wood (2002). The focus of this proposed guideline is to encourage multidisciplinary and local participants that compose a park community to get involved in the process since the beginning stage of hazard mitigation and preparedness planning.

This proposed guideline can be used to determine vulnerability of the park to one specific type of hazards or to all possible coastal hazards depending on the users' purpose, budget, inventory constraints or their need to answer very specific questions. Due to its flexible structure, this set of guidelines is not only applicable for marine parks in the tropic, but it also adaptable for other types of marine protected areas in other parts of the world. Based on the principles mentioned earlier in Chapter 5, the following section demonstrates an application of the guideline for the hypothetical-tropical marine park, 'Sudara' marine national park. Implications of the research findings are also incorporated into this demonstration.

Step 1--Design and Start Planning Process

Since having multidisciplinary participation is major focus of this model, designing and recruiting team work is an important foundation. Four small steps are included in this initial process.

- **Organize core planning team**

The project advocates meet with the Sudara MNP staff, coastal resource managers and other potential stakeholders to outline the proposed planning effort, identify

concerns, and recruit leadership. According to the research implications, the core planning team members should be representatives of the following professions academic researchers, coastal resource managers, park managers, NGO staff, tourism promoters and tour operators. The core members should be knowledgeable about local information regarding the park and nearby areas as well as national regulations and policies. The primary responsibilities of the core team are coordinating the planning process, facilitating public meetings, procuring financial assistance, and developing thematic maps or GIS.

- **Identify core planning area (MNP) and key peripheral areas**

Once, the core team is formed. Core planning areas and important nearby areas are identified. The 2004 tsunami clearly provided the lesson learned that vulnerability of the marine park not only depends on the park itself but it is also contributed by vulnerability of the nearby areas. The local core team members who are familiar with the park location and tradition would play important role for this task. Basic maps or aerial photos may be useful for this process. Figure N-1 illustrates the location of the Sudara MNP and its vicinity.

- **Identify and recruit stakeholders and technical advisors**

The core team members identify and recruit potential team advisors from local organizations with provincial jurisdictions, local universities and consulting companies. In this case, since the hazard preparedness and mitigation planning is a new subject for local institutions and the core team, the experienced technical advisors may be recruited internationally.

- **Hold a “getting started” community workshop to identify issues and goals**

A kick-off park community workshop is arranged by the core team in order to identify key issues and set up goals of the project. Local media and heads of nearby-marine park villages should be invited to participate.

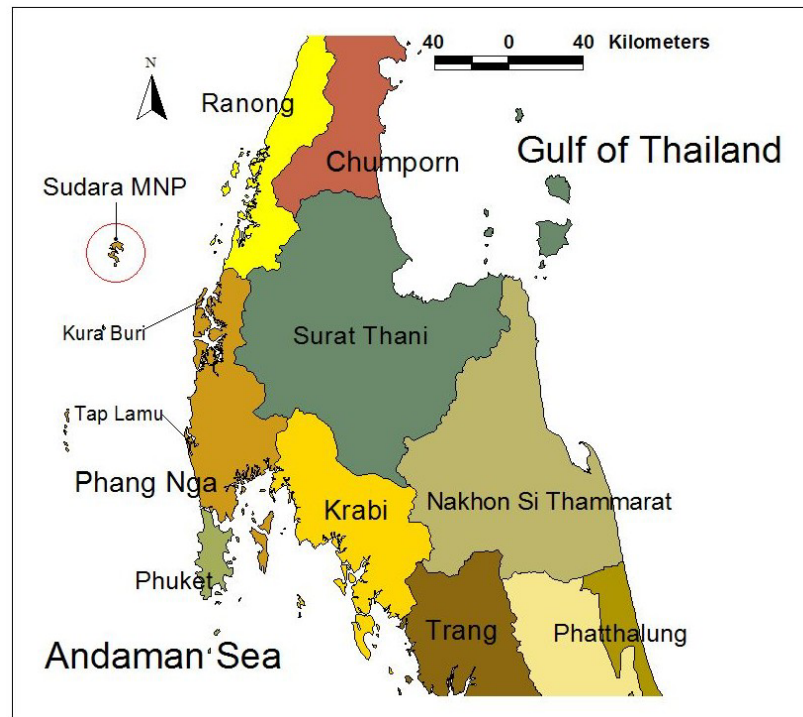


Figure N-1. Geography of the hypothetical Sudara MNP.

Step 2--Identify and Assess Hazards, and Develop Scenarios

In this step, potential hazards and scenarios are identified and developed through the technical workshop.

- **Identify priority hazards to be addressed in planning process**

The core team works with technical advisors to identify hazards that potentially take place in the Sudara MNP and to prioritize them.

- **Inventory and collect available hazards data**

The team collects scientific and technical data related to the potential hazards and constructs local area maps. The team also prepares a series of presentations that will guide the workshop. The presentations would refer only to the physical attributes of the event, such as run-up height and inundation distance potential, in the case of tsunami.

- **Hold technical workshop to identify hazard scenarios: frequency, range, worst-case**

The core team arranges a one-day technical workshop to develop planning scenarios and to examine the various hazards associated with each. The series of presentations and the following discussions help the workshop participants to decide upon frequency, worst-case magnitude, most likely source area, and severity of associated hazards for each viable planning scenario. Additional sources for data are also solicited. It is noteworthy that local historians or native people should be invited to participate, especially in this particular step, because some oral history regarding natural hazards may be passed along generations and might not be documented.

To help prioritize the significance of the hazards, a simple 5-scale number ranging from 1 to 5, where 1 = low and 5 = high, may be used during the brainstorming process. Table N-1 demonstrates hazard scoring system used for the Surada MNP project.

Table N-1. An example of hazard scoring system for the Sudara MNP (modified from NOAA, Coastal Service Center (1999)).

Hazard	Frequency (+)	Area potentially affected (x)	potential damage Magnitude	Total score
1. Tsunamis	1	5	5	30
2. Tropical storms	5	5	3	30
3. Chemical/oil spill	1	4	5	25
4. Earthquakes	1	4	4	20

Note: 1 = low and 5 = high

Step 3--Assess Marine Park Vulnerability

A key step in the process is to qualitatively or quantitatively examine the exposure of some component of society or the environment to the hazards (The Heinz Center 2000). Inputs from multidisciplinary participants during an interactive workshop enrich this assessment process. A set of vulnerability issues founded on the best available science and shaped by local values, perceptions, and priorities is an outcome

of this process. According to the research findings, this process not only provides the anticipated outcome but it is also part of an ice-breaking process to link among marine park stakeholders.

- **Develop preliminary vulnerability assessment using scenarios/associated hazards**

The core team prepares a preliminary assessment to present at the second workshop using information gathered from the previous meeting. The assessment examines how the hazards would interface with the following elements in the Sudara MNP:

- Built environment (e.g., infrastructure, critical facilities)
- Social environment (e.g., local and visitor populations, social services)
- Business community (e.g. tour operators, charter boats)
- Natural resources and ecosystems (e.g. beaches, mangrove forest, coral reefs)

Thematic maps (or GIS) are prepared. The maps are important tools in providing the big picture for the participants. Figure N-2, Figure N-3 and Figure N-4 are examples of maps and information that may be used for this purpose.

- **Present preliminary assessment to stakeholders/technical experts**

A preliminary vulnerability assessment is presented to stakeholders and technical experts.

- **Hold interactive stakeholder-technical expert vulnerability assessment workshop**

The preliminary assessment presented by the core team members helps guide the direction of the workshop and generate the discussions. Marine park stakeholders and technical participants are encouraged to share their experiences and opinions with one another through the meeting room exercises and field visits to key sites. Thematic maps and information are also provided.

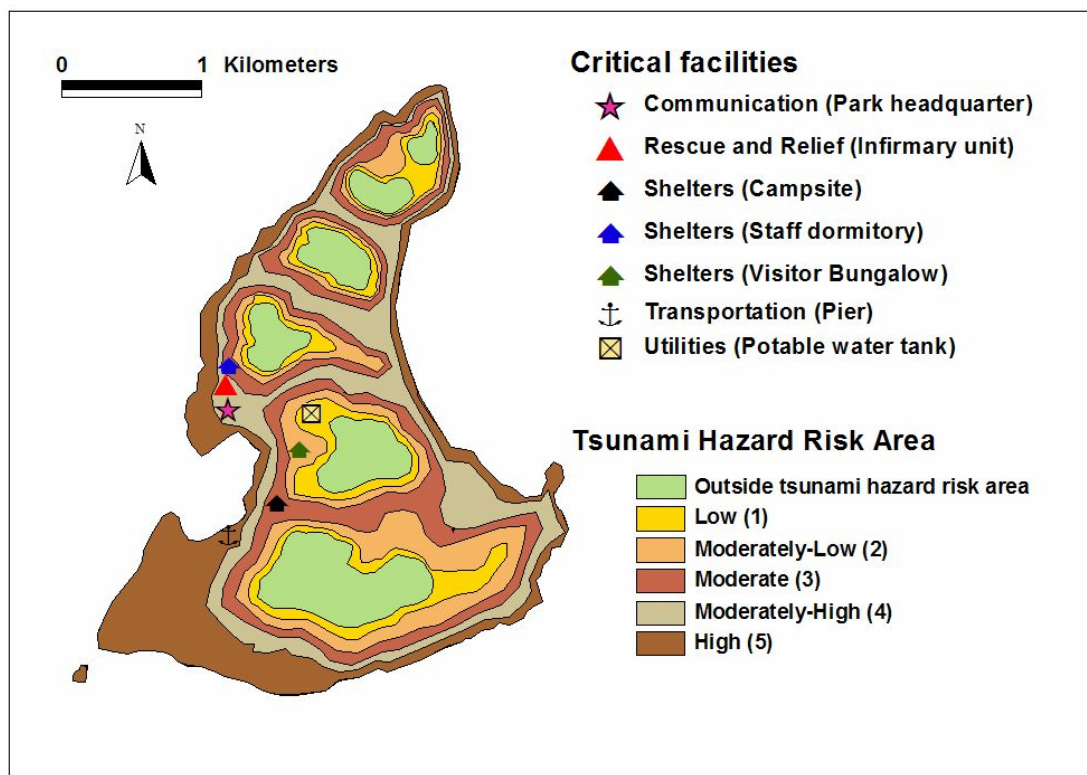


Figure N-2. The intersections of critical facilities with high-risk areas on an island in the Sudara MNP.

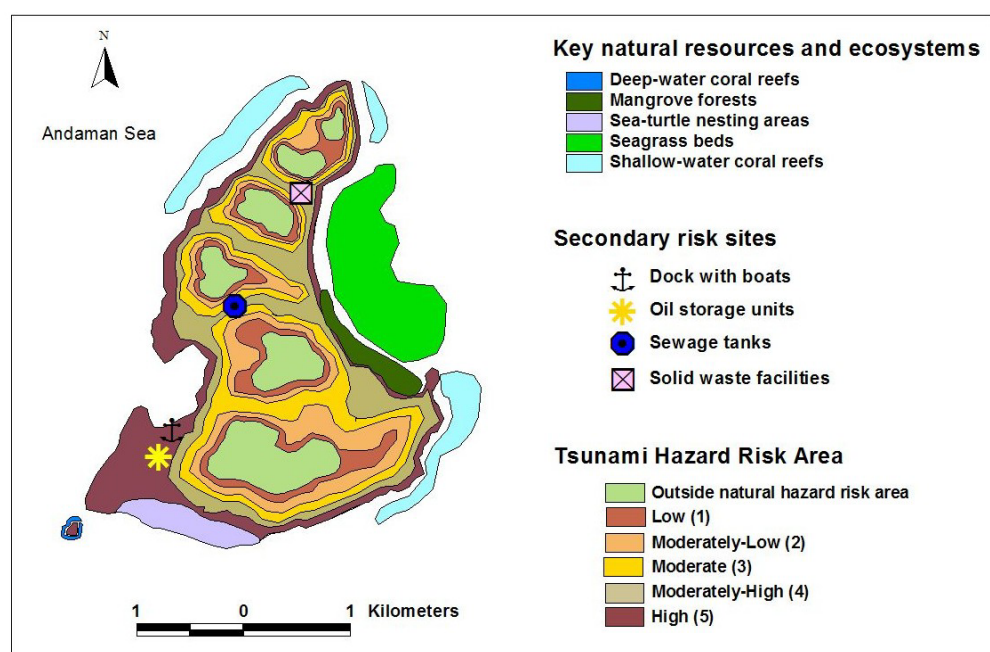


Figure N-3. Proximity of significant ecosystems to secondary risk sites.

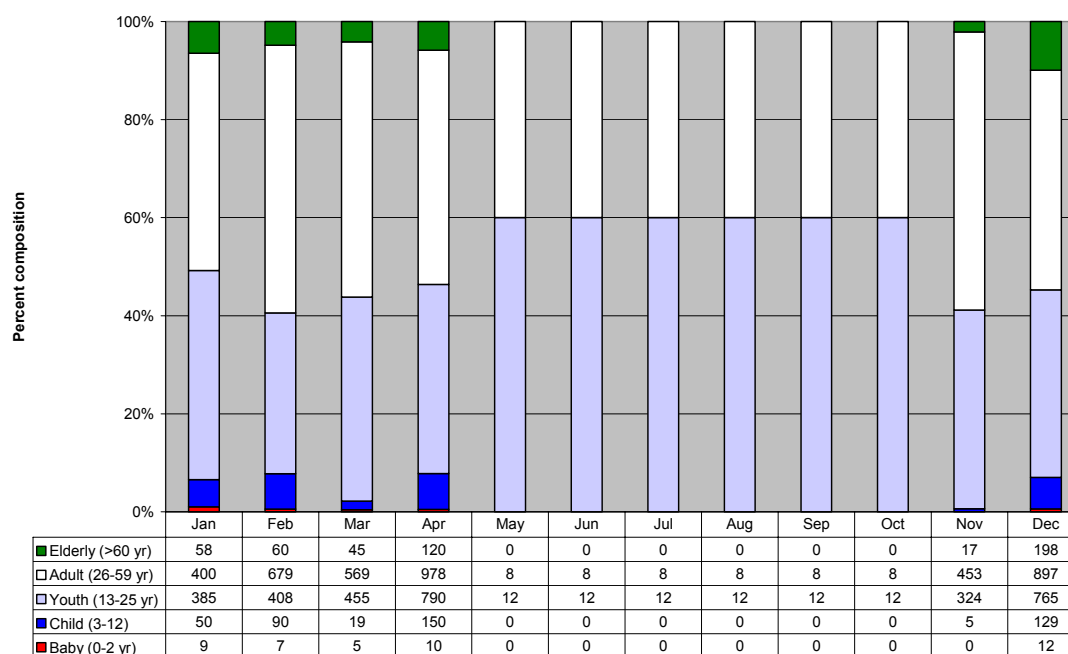


Figure N-4. Average demographic characteristics of a park community that varied by months and the seasons of year in the Sudara MNP (hypothetical data).

Step 4--Develop Mitigation Options

This step aims to compile all information gathered from previous meetings and to brainstorm all possible mitigation options among the Sudara MNP stakeholders. The following processes are carried out.

- **Identify and compile potential mitigation actions**

Based on information gathered from the previous workshop and field trips, the core team identifies and compiles potential mitigation action.

- **Hold mitigation workshop to develop mitigation strategies and options**

The follow-up meeting is arranged. The participants are asked to provide their experiences in developing mitigation action and strategy options for the primary marine park vulnerability issues. Through the interactive exercise in the workshop the mitigation options are classified into three categories (see also Table N-2):

- Existing or planned mitigation
- Short-term mitigation that might be completed in five years

- Long-term mitigation that could be undertaken over longer time

In some cases, priority of each mitigation option can be identified as low, moderate, and high. Table N-2 presents mitigation options for the Sudara MNP.

- **Evaluate mitigation options**

After the participants proposed the list of mitigation options, each options is evaluated. The evaluation takes the following factors into account: public and private costs, political feasibility, potential effectiveness of the measure in reducing loss of life, property damage, social impacts, and natural resource and environmental damage.

For example, one mitigation option is to build a dyke to protect a boat docking area from high wave. However, this option potentially causes damage and environmental degradation in the MNP. So, the alternative option that the participants came up with is an installation of a portable dock. This specially designed dock has low cost and can be removed to a safe zone before hazards hit the area (also depending on length of warning period).

Step 5--Prepare Mitigation Action Plan

Based on information from previous workshops, the stakeholders and the core team project develop a Sudara MNP mitigation action plan to increase park resiliency to natural hazards.

- **Stakeholders and the project planning team develop a mitigation action plan**

Based on the mitigation options identified in Step 4, the planning and stakeholders get together to develop a mitigation action plan. This process might not satisfy every participants but the development process is focus on mitigation and preparedness strategies that benefit multiple users within the marine park.

Table N-2. Mitigation actions for the Sudara MNP proposed by the workshop participants.

Existing or planned mitigation	Responsibility for action
<ul style="list-style-type: none"> • Clarify activity zone in park and strictly enforce the plan. • Enforce park regulations among tourists and tour operators especially in and around diving sites. • Promote tourism safety measures. • Promote clean beach campaigns to reduce debris in coastal areas. 	<ul style="list-style-type: none"> • Marine Park Division • Tour operators, Marine Park Division • TAT¹ • Marine Park Division
Short-term mitigation that might be completed in five years	
<ul style="list-style-type: none"> • Study tourism carrying capacity in each marine park in order to control number of boats and tourists not to exceed capacity of parks and to insure tourism safety. • Create tsunami warning network (and all-hazards) and preparedness system, including a multi-level communication network, evacuation plans, hazard/disaster preparedness education and outreach, and related research. • Prepare emergency response and disaster mitigation plan for each park; include rescue tools such as boats, emergency communications, emergency food and water supply to be used in parks following a disaster. 	<ul style="list-style-type: none"> • Marine Park Division • Experts in specific fields, Marine Park Division. • Marine Park Division
Long-term mitigation that could be undertaken over longer time	
<ul style="list-style-type: none"> • Minimize the construction of new buildings in marine parks and use caution in the new development, especially close to shore. • Inventory natural resource quantity and quality in marine parks to serve as a baseline. • Build professional capacity for marine park management, including enhanced training and increased numbers. • Establish collaborative network to develop knowledge and conduct research needed for enhanced park management. The network should consist of government agencies, universities and educational institutes, and the private sector. • Encourage communities located near park boundaries to get involved in designing park management plans and conservation projects such as mangrove reforestation, beach cleaning projects and education & outreach projects regarding marine environment and coastal disaster. 	<ul style="list-style-type: none"> • Marine Park Division • Marine Park Division or universities • Marine Park Division • Educational institutes, Marine Park Division, and DMCR² • Educational institutes, local governments, NGOs, Marine Park Division, and DMCR²

¹TAT = Tourism Authority of Thailand

²DMCR. = Department of Marine and Coastal Resources

- **Identify necessary implementation actions**

Stakeholders and the project team also identify necessary actions, responsible parties, public and/or private costs and sources, and potential plan obstacles (see Table N-1).

- **Establish monitoring process to review progress, consequences, and barriers**

Once actions are implemented, the marine park establishes a monitoring process to review progress, consequences of adopted plans, and barriers to carrying out actions.