Research Report on International Cooperation in the Recovery Process of Disaster-affected Cultural Heritage

March 2010 Japan Consortium for International Cooperation in Cultural Heritage





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Foreword

In recent years, cultural heritage has been affected by a series of natural and man-made disasters so interest in cultural heritage disaster prevention measures and restoration has heightened. It is considered that climate change on a global scale is one of the contributing factors in natural disasters, and irreplaceable cultural heritage damage can lead to an irredeemable loss for people. Therefore, it is important to take measures routinely to prevent disasters affecting cultural heritage as well as to carry out restoration to cultural heritage swiftly and appropriately after a disaster has struck. Appeals to Japan from overseas for cooperation in the recovery process of disaster-affected cultural heritage have increased. Providing swift and effective post-disaster support is difficult so that it has become necessary to grasp what kind of contribution is feasible and to take cooperative action together with the host country.

With a background like that, the Japan Consortium for International Cooperation in Cultural Heritage was commissioned in fiscal year ending March 2010 by the Agency of Cultural Affairs to carry out a study of disaster prevention systems, disaster-time recovery initiatives and the role of international cooperation. Based on consultations in Subcommittee meeting for Planning, five countries centered in Asia (China, Thailand, Indonesia, Iran and Greece) that have been assisted by Japan were chosen as a case study of how cultural heritage has been affected by major natural disasters over the past ten years. The purpose of this report is to compile information relating to these case studies.

We would like to express our gratitude to all those who cooperated while conducting this study

Shin'ichi Shimizu,

Director

Japan Center for International Cooperation in Conservation Independent Administrative Institution, National Research Institute for Cultural Properties, Tokyo

Preface

- This report documents studies on international cooperation in the recovery process of disaster-affected cultural heritage in the countries of China, Thailand, Indonesia, Iran and Greece. It is published as a part of a project carried out by the Japan Consortium for International Cooperation in Cultural Heritage which was commissioned by the Agency of Cultural Affairs.
- Reports and studies carried out in Iran and Greece, which are detailed in Chapter 2, were re-commissioned by the Japan Consortium for International Cooperation in Cultural Heritage to the Kokushikan University and Ritsumeikan-Global Innovation Research Organization, Ritsumeikan University.
- Those responsible for editing and writing this report are listed as follows. In addition, Ms. Yumi Sugahara (Lecturer, Faculty of International Culture Studies, Department of Asian Studies, Tenri University) supervised wording used in the Indonesian case study report included in Chapter 2.

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Chapter 3 Rei Harada

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Chapter 1 Introduction

When considering cultural heritage protection, one of the pressing problems is how to tackle the threat of natural disasters. Disasters such as earthquakes, tsunamis, landslides and fires have caused catastrophes on countless occasions in the past, and on each occasion we are reminded of the diverse dangers by nature. Unfortunately, it is difficult to predict when natural disasters happen, but if one looks at earthquakes, for example, research on earthquake zones has enabled us to respond by identifying measures to be taken for certain regions. This thinking could also extend to formulating measures to protect cultural heritage against earthquake disasters, and could argue that the main consideration should be the locational relationship between the distribution of earthquake zones and cultural heritage sites.



Fig.1 World Heritage Sites (June 2008) Located in the Earthquake Zones by Research Center for Disaster Mitigation of Urban Cultural Heritage, Ritsumeikan University, Kyoto, Japan

Since a large number of World Cultural Heritage and Mixed Heritage are located in earthquake zones, it could be assumed that other cultural heritage might similarly be located in earthquake zones, and which means a large number of them are also potentially vulnerable to earthquake damage. This problem is particularly prominent in regions located in earthquake zones including Southeast Asia, Southwest China, Western Asia, the Mediterranean coast, and Latin America.

The Japan Consortium for International Cooperation in Cultural Heritage has worked to provide active international cooperation for disaster-affected cultural heritage through research and support since its inauguration. Its first workshop held on July, 2007, titled "Emergency Support for Cultural Heritage Affected by Natural Disasters", considered the current status of and issues surrounding emergency international support to preserve cultural heritage affected by natural disasters. Further, it studied extensive damage caused to cultural heritage by flooding that occurred in the Hadhramaut region of the Republic of Yemen in October, 2008, and compiled information in February, 2009, to examine how the Japanese government could cooperate. The report of this study, "Investigation of the Flood Situation in Yemen", was published in February, 2009.

Thus, since its establishment, the Japan Consortium for International Cooperation in Cultural Heritage has consistently focused on issues relating to the restoration of disaster-affected cultural heritage. However, as the number of appeals for cooperation from overseas to Japan and actual cooperation cases provided by Japanese experts continues to rise, deciding what measures are required to ensure swift and appropriate international cooperation responding to disaster-affected cultural heritage is still a major issue. Providing swift and effec-

Chapter 1 Introduction

tive post-disaster support is difficult so it has become necessary to grasp what kind of contribution is feasible and to carry out cooperative action together with the host country. Accordingly, carrying out comprehensive studies of the current status of and issues facing international cooperation in these areas has become increasingly important.

With a background like that, the Japan Consortium for International Cooperation in Cultural Heritage was commissioned by the Agency of Cultural Affairs in fiscal year ending March 2010 to carry out case studies looking at the restoration of disaster-affected cultural heritage. Five countries centered in Asia (China, Thailand, Indonesia, Iran and Greece) that have been assisted by Japan were chosen as actual cases of how cultural heritage has been affected by major natural disasters over the past ten years (Fig. 2).



Fig.2 Case study area

Asia is vulnerable to a wide diversity of disasters such as flooding, landslides and wildfires but the disaster case studies reported here predominately relate to earthquake damage. This could be seen as an indication of the significantly large scale of earthquake related damage over the last few years. Further, although the case studies are centered on earthquake damage, earthquakes simultaneously trigger other disasters such as fires, landslides and tsunamis. Then, it could be argued that as a result our study succeeded in studying the restoration of disaster-affected cultural heritage from multiple angles. This report consolidated these case studies into one book and is published as a comprehensive report document.

With regard to the composition of this report, the field studies of the five aforementioned countries make up Chapter 2. Specifically, these studies examined the characteristics of the countries' natural disasters and cultural heritage, as well as cultural heritage disaster prevention systems and restoration initiatives operated in those countries. Further, using specific examples of disaster-affected cultural heritage, we outlined the disasters experienced in those countries, described the damage incurred and the status of restoration, and discussed future issues. In addition, we shed light on what kind of of international cooperation is required for the above examples. In Chapter 3, we compared examples of international cooperation in relation to cultural heritage restoration carried out in the case study countries, and examined the required contribution of international cooperation. In this regard, we identified what role Japan should play in the realm of cooperation in disaster-affected cultural heritage.

Foreign countries place great hope in the support and cooperation of Japan - a country prone to earthquakes and with an abundance of prior earthquake damage experience - and it would not be an exaggeration to say that Japan has a duty to cooperate in the restoration of disaster-affected cultural heritage. We hope that in this time of persistent disasters, this report will be used widely, and that it will contribute to future systems of international cooperation in cultural heritage.

Chapter 2 Case Study

Chapter 2 Case Study

1. China

(Based on the Sichuan Earthquake Case-Study)

1. Research Overview

1-1 Research Objective

In recent years, ethnic disputes within regions and/or between regions across the globe become has become more prominent and large-scale disasters have been occurring with great frequency. This has led to increased cases of significant damages to cultural heritage. Indeed cultural heritage over a long period has repeatedly suffered man-made disasters and losses brought about by natural changes and natural disasters, the current cultural heritage protection framework is inadequate from a technical, systematic or preventive viewpoint, and we are constantly compelled to feel remorse about this time after time when a large disaster strikes. As a result of the Great Hanshin Awaji Earthquake our country suffered in 1995, we have been able to improve prevention, repair and maintenance strategies relating to the impact of natural disasters on cultural heritage. Also, experiencing this major tragedy has meant that we have increasingly become involved with supporting the cultural heritage restoration activities of other countries inflicted by similar disasters. However, when it comes to cultural heritage, each country is vastly different and has protection philosophies and systems that differ largely to our own country. There is, therefore, a possibility that we could be carrying out support activities without knowing if they are effective or not.

So what kind systems need to be developed to prepare for potential disasters in the future?

What kind of cooperation and support can we give foreign countries suffering natural disasters?

To answer these questions, The Agency for Cultural Affairs decided to carry out research looking at post-disaster circumstances and responses in countries whose cultural heritage has been recently damaged by natural disasters, and assigned this project to the Japan Consortium for International Cooperation in Cultural Heritage in 2009.

Focusing on the experiences of the People's Republic of China (hereinafter referred to as "China") which was carried out by the National Research Institute for Cultural Properties, Tokyo, this report takes up the case study of the Sichuan Earthquake



Figure 1 Research country and overview of regions used for the research

which occurred in May, 2008 (Fig. 1).

This research was mainly conducted by interviews and data collections. To clarify how China's multilayered administrative agencies shown in Fig.2 co-worked on recovery process while distinguishing every party's respective roles, we chose to interview to the organizations below:

- The State Administration of Cultural Heritage, which presides over the administration of cultural heritage protection activities for the whole nation.
- The Cultural Relics Bureau of Sichuan province; the region most affected by the earthquake.
- The Chengdu Municipal Bureau of Culture and the Cultural Relics Bureau of Dujiangyan; agencies operating below the province at municipal and prefectural levels.

Further, to ascertain whether Sichuan's response could be viewed as a standard response method in China, we also interviewed targets from the Shaanxi province that had similarly experienced damages and had provided restoration assistance to Sichuan province.

In the subsequent Section 2, we look at natural disaster damage in China. In Section 3, we will provide an overview of disaster protection and restoration systems in China relating to cultural heritage. In Section 4, as part of our case study analysis, we will focus on Sichuan Earthquake and report the minutes of post disaster recovery process, as well as the situation of international cooperation on cultural heritage. Finally, a general overview of the case study and recommendations are included in Section 5.



Figure 2 Frame format of Chinese administrative organizations engaged in cultural heritage protection

1-2 Members of the Research

The below listed members carried out the research in China OKADA, Ken Head, Resource and Systems Research

Section, Japan Center for International Cooperation in Conservation, National Research Institute for Cultural Properties,

Tokyo, National Institute for Cultural	
Heritage, Independent Administrative	
Institution	

KOSEKI, Hisano Visiting Researcher, Shimane Prefecture

1-3 Research Schedule

July 8 (Weds)	NH905 flight from Narita (10.35) to Beijing
	(13.25)
same day	CA1425 flight from Beijing (17.00) to Chengdu
	(19.30)
July 9 (Thurs.)	The Cultural Relics Bureau of Sichuan Prov-
	ince
July 10 (Fri.)	The Cultural Relics Bureau of Chengdu Prov-
	ince
July 11 (Sat.)	Cultural Relics Bureau of Dujiangyan
July 12 (Sun.)	Chengdu Jinsha Site Museum; visit Chengdu
	city and data collection
July 13 (Mon.)	CA4201 flight from Chengdu (14.50) to Xi'an/
	Xianyang (15:55)
July 14 (Tues.)	The Cultural Relics Bureau of Shaanxi Prov-
	ince
July 15 (Weds.)	MU10:50 flight from Xi'an (10:50) to Beijing
	(12:50)
	Chinese Academy of Cultural Heritage
July 16 (Thurs.)	State Administration of Cultural Heritage
July 17 (Fri.)	NH956 flight from Beijing (08:80) to Narita
	(13:00)

Typical Disaster-affected Cultural Heritage Sites in China Typical Disaster-affected China

Located in the east of the Eurasian Continent, China boasts the fourth largest land area in the world, throughout which it is home to diverse climate zones as well as various geological and topographical conditions. Due to this, natural disasters are wideranging and typical disaster characteristics differ from region to region.

The region extending from the west to the center of China has a dry climate and soil erosion that accompanies drought and bare land as well as eroded sediment which have brought about sediment disasters and river disasters. The Inner Mongolia Autonomous Region located in the Inner Mongolian Plateau has suffered yellow sand sandstorms. In the southeast region, typhoons and heavy rain occur with increasing regularity, bringing with them damage such as sediment disasters and flooding in recent years. Further, China is composed of three crustal blocks and many earthquakes have been caused by active faults scattered in the vicinity of the Tibetan Plateau margin and the Qinling Mountains area which border these blocks.

In addition, some regions are vulnerable to locally-occurring disasters such as landslides and flooding while forest fires caused by lightning and aridity can be witnessed in other locations. In this sense, China very much resembles Japan in that risk is lurking in various places from a wide variety of natural disasters.

With regard to earthquakes, a number of earthquakes causing widespread damage have occurred over the past 100 years. These include the 1920 Haiyuan earthquake, Gangsu Province (8.5 magnitude; 200,000 casualties); the 1927 Gulang earthquake, Gansu Province (8 magnitude; 41,000 casualties); an earthquake in 1975 striking off the Liaoning Province coast (7.5 magnitude); the 1976 Tangshan earthquake, Hebei Province (7.8 magnitude; 240,000 casualties). Examining the distribution of these earthquakes and other large ones in the past, a large proportion is concentrated in the areas bordering the crustal blocks within the Eurasian plate¹.

2-2 Previous Disaster Damage at Cultural Heritage Sites in China

During this research, we were unable to discover data comprehensively documenting past natural disaster damage to cultural heritage sites in China. While Sichuan province is located in an earthquake zone, fortunately there have been no reports of large earthquake damage affecting cultural heritage sites over the last 40 years or so. Instead, reports of damage caused by flooding and landslides are more common. Since then, the building of cultural relic offices and museums has been centered in areas with geographical conditions resistant to flooding and/or landslide disasters. Main natural disasters affecting the Shaanxi province are landslides and flooding, and grottoes located in the north still show traces of flooding. The Chenghuang-miao shrine situated in Ningshaan prefecture had to be relocated to a safer area due to potential exposure to flood damage. It is said that disaster measures, such as site relocation, are extremely rare.

3. Cultural Heritage Disaster Prevention and Restoration -Chinese Systems and Initiatives

3-1 Disaster Prevention Systems and Initiatives

In China, the government of China has formulated plans to address critical situations such as natural disasters and sudden events. This not only applies to cultural heritage protection, but it also aims to devise risk management and emergency plans equipped to encompass problems arising in all administrative branches such as education and transport. The important key point here is the existence of a line of command per division conforming to China's own political make-up. Governmental organizations respond to urgent situations not only at a municipal level as we know in Japan, but they work according to a vertical line of authority operating downwards from the National Government to subordinate provincial, municipal and prefectural related bureaus. Developing emergency systems according to such vertical management is largely stipulated by law and in cultural heritage protection area, concrete measures are to be taken by each administrative level under the direction of the State Administration of Cultural Heritage.

In addition, cultural relic bureaus at each administrative level seek ratification or approval from the responsible people's government - or what we might call a municipal government in Japan - to measures formulated by each branch of command. For example, the Cultural Relics Bureau of Sichuan Province who participated in this research formulated an emergency measures plan in 2000 under a policy aiming to "establish command teams to carry out emergency measures required in the event of a major disaster or incident" and, for this, obtained the ratification of the Sichuan Provincial People's Government. Further, the Cultural Relics Bureau of Dujiangyan has also devised plans for emergency measures based on the approval of the National Disaster Reduction Committee and the office of the Dujiangyan Provincial People's Government. Cultural heritage protection divisions at each administrative level, therefore, devise measures based on the idea of - carry out operations while receiving instructions from the chain of command, gain the approval of people's government offices at various levels, and manage risks.

Following the Sichuan earthquake of May 12th, 2008, which will be examined in Section 4 of this report, a more comprehensive system equipped to address similar sudden disasters and incidents was required, and a new system is being developed under the initiative of the national government. Two laws; namely the "Disaster Prevention and Reduction Law of the People's Republic of China" and the "Emergency Response Law of the People's Republic of China"; and a regulation entitled "The Regulations on the Handling of Destructive Earthquake Emergencies" are currently in place and systems have been developed so that each administrative division acts according to the command system of that division in line with the contents of these laws and regulation. The development of even more concrete action plans under the framework of these laws and regulation is needed in the future, and the command system inherent in cultural heritage protection activities has been strengthened by a system in which requests are passed down from the State Administration of Cultural Heritage to subordinate provincial, municipal and prefectural cultural relic bureaus. Thus, the political make-up of the national government on a normal basis has been exploited in times of crisis. Action taken by each branch of command to combat critical situations is hard to imagine due to the vastly different emergency systems operated in China and Japan but our Sichuan earthquake case study outlined in Section 4 will provide a concrete example of China's post-disaster response methods.

At the present time, central storages enabling the concentrated management of cultural relics are being built in China. Because of the vast geographical expanse of China, storages and museums have not been established in all provinces, cities and prefectures and, it is also difficult for the government to introduce temperature and humidity control features to such facilities. Therefore, the key to establishing efficient and effective cultural heritage protection in the future lies in the development of central storages enabling the comprehensive management of relics from surrounding regions. It is said that the Sichuan earthquake which we are going to discuss here also had an impact on this project. This is said to be evident in antiseismic measures that were considered when deciding where to build these central storages and when setting earthquakeresistance standards and storage methods. Every central storage and museum constructed in the future will be required to have its own standard and Chengdu has built a museum able to withstand earthquakes with a magnitude of up to eight.

While museums and storages are being constructed and modified with anti-seismic features in mind, the next problem lies with the protection of historical buildings. China has a principal to avoid a regular overhaul or an active anti-seismic reinforcement of its historical buildings from an authenticity and integrity perspective and it is said that such repairs are not carried out unless they are completely necessary. Further, historical buildings that permit the entry of sightseers have been protected mainly by cultural relic protection laws rather than construction laws arguably contributing to the complexity of establishing anti-seismic measures for such buildings². Under such circumstances, future studies and research need to examine how to secure the safety of people using historical buildings as well as how to promote anti-seismic measures.

3-2 Systems and Initiatives Operated when Disaster-affected affect Cultural Heritage Sites

When the Sichuan earthquake struck, emergency measures were carried out effectively, plans had already been put in place within cultural relic offices at all administrative levels based on a line of command per division reflecting China's own political make-up. An hour and thirty minutes after the earthquake struck, Premier WEN Jiabao headed to his airfield and established the "Wenchuan Earthquake Relief Command Team" while flying to the scene. However, without waiting for the command teams established by the national government, command teams were formed at each site in accordance with their own authorized emergency plans. These teams set about gathering information to report to the nation and taking appropriate emergency measures. With regard to divisions responsible for cultural heritage protection, the State Administration of Cultural Heritage entered the site a mere two days after the disaster and started to give specific instructions but at that time information relating to the post-disaster situation gathered by cultural relic offices was already being distributed to the State Administration of Cultural Heritage. This information greatly contributed to the decision-making processes of the State Administration of Cultural Heritage. It could be argued that this rapid response and information-gathering at the scene enabled the State Administration of Cultural Heritage to take positive and precise action and to distribute information.

However, many cultural relic offices assigned to the dayto-day management of the cultural heritage sites in Chengdu and Dujiangyan were unable to respond fully to the Sichuan disaster in accordance with existing response plans. This was because existing plans had centered on predicted disasters such as flooding, landslides, fire and theft. Of course earthquake measures were included there too, but the size of the earthquake and the extent of the damage caused had surpassed all predictions because this region had not suffered a major earthquake since 1933. Significant problems that arose were that the total destruction of lifestyle related facilities had not been predicted; ensuring the physical safety of staff; and a lack of preparation such as storage of daily essentials. All cultural relic offices are revising emergency measure plans based on the essential lessons learned from this earthquake.

4. Case Study Analysis

4-1 Overview of the Earthquake and Its Damages

The Sichuan earthquake which struck on May 12th, 2008, occurred at the Longmenshan fault zone bordering the Tibetan Plateau and the Sichuan Basin (Fig. 3). The scale of the earthquake was a magnitude of eight (as announced by the China Seismological Bureau), and its hypocenter was situated in the Yingxiu area of Wenchuan Prefecture at a depth of 10 to 14 km. Damage included the loss of approximately 70,000 lives, the disappearance of approximately 18,000 people and the economic loss is estimated to extend to 845.1 billion yuan RMB

(approximately 13 trillion yen) (as announced by the Chinese Government in September, 2008). Because the earthquake hit mountainous regions, characteristics of the damage caused included the collapse of buildings and the destruction of lifelines such as roads as well as landslide, mudflows and the formation of dammed lakes.

Sichuan Province is located on the border of the two Tibetan Plateau and Yangzi crustal blocks. Its terrain rises to the west and lowers to the east, reaching a maximum height difference of approximately 7,000 m. The Qingzang Plateau and Yungui Plateau which cover almost two thirds of the Sichuan area is mainly an orogenic belt that continues to grow even now. Due to this, many active faults flank the Longmenshan Mountains which border these plateaus and the Sichuan basin, and looking back to the 20th century for evidence of two earthquakes exceeding a magnitude of seven occurring at the Longmenshan fault (1933 Maoxian Diexi earthquake and 1976 Songpan earthquake). We



Figure 3 Topography and seismic center of Sichuan province (superimposed on an image obtained from Google earth)



Image 2 The post-disaster condition of Tielong-dian hall and Jidangpu-dian hall (obtained from National Research Institute for Cultural Properties, Tokyo (Ed.), 2009)



Image 3 The post-disaster condition of Yunyan-si temple (obtained from National Research Institute for Cultural Properties, Tokyo (Ed.), 2009)



Image 1 Overlooking the Longmenshan Mountains from Dujiangyan



Image 4 Disaster-affected class one cultural relics in Wenchuan province (obtained from National Research Institute for Cultural Properties, Tokyo (Ed.), 2009)



Image 5 Damaged roof tiles of Wuziguan shrine in Xixiang, Shaanxi province (photograph taken by ZHAO Qiang) (photograph supplied by the Cultural Relics Bureau of Shaanxi Province)



Image 6 Post-disaster condition of Wuyunlou building and Zhangliang-miao shrine in Liuba prefecture, Shaanxi province (photograph taken by ZHAO Qiang) (photograph supplied by the Cultural Relics Bureau of Shaanxi Province)

can also add the 2008 Sichuan earthquake to the list of recent earthquakes centered in this region. Based on this data, it can be said that earthquakes occurring at the Longmenshan fault strike once every 30 years. Further, the frequency of natural disasters is extremely high because gorges crisscross the high mountain range. Looking at Sichuan's history of disasters, including earthquakes, floods, mudflows and landslides, one could call it the disaster capital of China.

4-2 Status of Damages on Cultural Heritage

In Sichuan Province, where the earthquake was centered, there were significant damages to 83 Historical Monuments and Cultural Relics under State Protection³; 174 monuments and cultural relics under provincial protection; and 814 monuments and cultural relics under city and prefectural protection (Images 2 and 3). This not only applied to immovable heritages, 83



Image 8 Part of Erwang-miao Shrine damaged by the disaster



Image 7 Post-disaster condition of Cultural Relics Bureau of Chencang, Baoji, Shaanxi province (photograph taken by Baoji Cultural Relics Bureau) (photograph supplied by the Cultural Relics Bureau of Shaanxi Province)



Image 9 Plastic sheets covering the roof of the disaster-affected Fulongguan Shrine



Image 10 Disaster-affected Wenxing tower, An prefecture



Image 11 Post-disaster condition of Qiang village, Taoping (obtained from National Research Institute for Cultural Properties, Tokyo (Ed.), 2009)

museums and cultural heritage storage facilities were also affected, and 220 important relics stored at these places were damaged (Image 4). Also, not only Sichuan Province, but the earthquake also affected neighboring provinces. A total of 35 Historical Monuments and Cultural Relics under State Protection, 35 monuments and cultural relics under provincial protection and 16 under prefectural protection in Shaanxi Province were affected by damage such as cracks and collapsed walls and 307 relics deposited with museum storages also were damaged (Images 5, 6 and 7). Further, reports were made of damages such as cracked statues in the famous tourist location of Maijishan Grottoes in the Gangsu Province⁴.

At the "Japan-China Workshop on Earthquake Resistance Measures for Cultural Heritage" that was jointly held by the Japanese Agency for Cultural Affairs and the Chinese State Administration of Cultural Heritage in February, 2009, the Cultural Relics Bureau of Sichuan Province Vice Director, WANG Jing, provided a detailed report of the damage affecting Sichuan Province. According to this report, Sichuan's damage, which outweighed that of other provinces, largely included damage to wooden buildings and 186 national and provincial

在地震中全部坍塌的汉源县文管所





Image 12 Post-disaster condition of watchtowers in Taoping Qiang village (obtained from National Research Institute for Cultural Properties, Tokyo (Ed.), 2009)

Image 13 Collapsed cultural relics bureau of Hanyuan prefecture (obtained from National Research Institute for Cultural Properties, Tokyo (Ed.), 2009)



Image 14 Ceramics damaged in cultural relic offices (obtained from National Research Institute for Cultural Properties, Tokyo (Ed.), 2009)

level cultural relic protection units alone were affected. Among these disasters, it is said that the Erwang-miao Shrine and Fulongguan Shrine in Dujiangyan (Images 8 and 9) were most affected. As for masonry, 45 building relics incurred damage particularly the Bi tower in Yanting prefecture and Wenxing tower in An prefecture (Image 10). Ethnic minority buildings were also impacted with damage affecting 12 cultural relic protection units. Traditional masonry construction living residences, particularly Qiangdiao belvedere towers, were heavily damaged (Images 11 and 12).

Damage inflicted on museum collections of cultural relics reached a total of 3,167 cases. Since there were no museums in the districts of Beichuan, Qingchuan and Wenchuan, where the force of the earthquake was strongest, there was no large-scale damage. However, the Cultural Relics Bureau of Beichuan which manages the storage of relics completely collapsed resulting in the loss of Qiang folklore garments, costumes and embroidery. In other regions, the buildings of a number of cultural relic bureaus without anti-seismic measures were damaged and collections were affected, particularly ceramics (Images 13 and 14). The buildings of large-scale museums such as the Sichuan Province Museum, the Jinsha Site Museum and Sanxingdui Museum were fortunately spared any damage and it is said that their collections were mostly unharmed. As stated in Section 3, China is currently building central storages and, as for pilot project in Sichuan, it was built in Mianyang City. Centralized management of important relics including first, second and third class relics had also just got underway in the neighboring prefectures of Jiangyou, Beichuan and Pingwu. Thanks to this operation, these relics fortunately escaped damage. However, due to the collapse of the Tangjiashan dammed lake formed upstream of the Peijian river which flows through Mianyang City, this central storage was threatened by flooding so its relics were urgently sheltered in the Sanxingdui Museum following the earthquake.



Image 15 The Cultural Relics Bureau of Dujiangyan is located in a corner of the Dujiangyan World Heritage Site

4-3 Recovery of Disaster-affected Cultural Heritage Sites 4-3-1 Movements in Sichuan Province

Post-disaster emergency response at the scene

Even though the Cultural Relics Bureau of Sichuan Province⁵ itself did not incur major damage at the time of the earthquake, all staff had moved to the courtyard to escape aftershock damage and they gathered information and continued to work while listening to news updates on the car radio. Then, approximately one hour later, the "Sichuan Wenchuan Earthquake Cultural Heritage Rescue and Protection Command Team" was organized and it started to take practical action the following day. This organization was established in line with emergency measure plans devised by the Cultural Relics Bureau of Sichuan Province in 2000. At the time, both fixed and cellular telephones were disconnected but thankfully cell-phone texting was still functioning so information about cultural heritage damage was obtained by exchanging text messages with staff at the scene of the earthquake. Even so, contact was not made with staff at Mao prefecture - the place most affected - until 5 days after the earthquake on May, 17th.



Image 16 Interviews at the Cultural Relics Bureau of Dujiangyan

One of the regional cultural relic bureaus most affected was the Cultural Relics Bureau of Dujiangyan⁶. There, total staffs of about 20 people were assembled in government buildings and after they were all taken account for, they divided into 3 teams and one moved paintings from the affected relics offices to places of safety. The other two teams spread to east and west,



Image 17 Report of damage status survey compiled by the Cultural Relics Bureau of Sichuan Province (obtained from the website of the State Administration of Cultural Heritage)

and started on identifying the state of damage to all the buildings in the park. Even when the day came to close, the staff did not go home and tightly guarded the cultural relic offices without confirming the safety of their families. Since all of the cultural relic office's ceilings had collapsed, they made a temporary roof with plastic sheets. This action was necessary to protect the relics from rain which started to fall from the night of May 12th. The staff themselves built improvised barracks with plastic sheets on small, level land next to the cultural relic office and kept night watch. At that time in Dujiangyan City, water, gas and electricity were all out of service so night watch had to be carried out by using a torch, and the staff relied on dry instant noodles and mineral water for food and drink.

On the following day of May 13th, three directors from the Cultural Relics Bureau of Sichuan Province took charge and formed ranks of two to three people. Those ranks then entered the disaster-affected areas and got to work. Although they were unable to reach some areas where transport links had been completely cut off, the staff went to cultural relic protection units, cultural relic offices and museums where still accessible, and checked up on people working in cultural heritage protection divisions and confirmed the damage status and collected information. The information these staff walked around and collected themselves was soon submitted to the State Administration of Cultural Heritage enabling that office to compile a dossier of information. Regions that could not be surveyed due to cut-off transport links included Beichuan prefecture, Wenchuan, Mao prefecture and Li prefecture.

Meanwhile, Chengdu Municipal Bureau of Culture⁷ had similarly organized three teams and set about visually inspecting the status of damage to cultural heritage in the city. These teams each contained leaders with specialist knowledge who oversaw emergency measures and cultural heritage protection while carrying out a visual inspection.



Image 18 Interviews at the Chengdu Municipal Bureau of Culture

On May 14th, the Cultural Relics Bureau of Sichuan Province cooperated with staff from cultural relic protection units in Chengdu city and started to deliver necessary living supplies to the affected regions. Specifically, directors from the Chengdu Municipal Bureau of Culture and cultural relic offices delivered gas canisters and stove burners as well as vegetables and other foodstuffs to all affected sites. This enabled workers at the scene to carry out recovery processes while finally being able to have a hot meal. It is claimed that such living assistance within organizational units is not only to cultural heritage protection divisions, but also common for all the divisions in China.

At the same time, the Cultural Relics Bureau of Sichuan Province notified all museums and cultural relic offices of action to be taken for post-earthquake clear-up, shielding, disinfection, reinforcement and so on. Some of the relics under the jurisdiction of the Cultural Relics Bureau of Sichuan Province included places that were tourist destinations. Because many buildings had collapsed in these areas, there were some tourist casualties. On May 15th, once all the dead and wounded had been transported out of all cultural relic protection units, the first job was to organize the site and thoroughly disinfect it. Next, wooden buildings that had collapsed and were in a state of ruin were instructed to be shielded and protected from rain. Further, workers were advised to speedily reinforce buildings that had not collapsed but were leaning and displayed cracks by inserting some kind of support. While delivering such instructions to subordinate offices, the Cultural Relics Bureau of Sichuan Province started working towards to prepare funds to cover the costs of carrying out post-disaster clear-up work, shielding, disinfection and reinforcement incurred by all offices under its jurisdiction, as well as the enforcement of post-disaster reconstruction systems.

The Chengdu Municipal Bureau of Culture, which was closer to the scene, organized two emergency measure teams and made a start on restoration work. One was the "Cultural Relic Disaster Reduction Command Team" established to administratively supervise subordinate municipal, prefectural and district offices. The other was the "Expert Advisory Team", set up to provide technical advice and leadership. The Expert Advisory Team was composed of Sichuan and Chengdu-origin experts in the fields of historical architecture, building construction, economics, geology, historical studies, heritage management, historic site planning and archaeology. In addition to giving advice on emergency measures, they travelled to sites to examine the validity of restoration plans that had been subsequently drawn up, and provided advice and recommendations for these plans.

On the same day these multi-leveled organizations at the

scene were each taking action, the Vice Director of the State Administration of Cultural Heritage, Mr. DONG Mingkang, entered the affected site. After arriving in Chengdu, he visited Dujiangyan and on the following 15th visited with Mianzhu, Shifang and Mianyang while calling on those affected by the disaster. When it was pointed out at a debriefing session conducted after his inspection of Dujiangyan that there were not enough makeshift tents, it was immediately decided that the State Administration of Cultural Heritage would supply 100 tents.

On May 19th, CHAN Jixiang, the Director of the State Administration of Cultural Heritage, inspected Dujiangyan and he also visited some affected sites at Mianyang and Jiangyou. Thus, top-ranking officials in cultural heritage protection administration visited affected sites one after the other within an extremely short time of the disaster, and the interviewees that participated in this research were unanimous in stressing how important it was that people involved at the scene received encouragement and restoration leadership. For example, the interviewees stated that the support of the nation helped keep their spirits up and the leadership provided by the State Administration of Cultural Heritage, while facing the dilemma between saving peoples' lives and carrying out their duty to protect cultural heritage, was extremely instrumental in overcoming the sadness and difficulty of achieving their mission.

On May 16th, 100 tents acquired by the State Administration of Cultural Heritage were delivered to Chengdu city. The Cultural Relics Bureau of Sichuan Province took possession of these tents, loaded them together with makeshift beds and futons onto cars, and distributed them to areas that had incurred extensive damage. This enabled an average of at least 3 tents to be distributed to each cultural relic office.

Cultural heritage restoration movements



Image 19 General earthquake damage restoration plan created by the State Administration of Cultural Heritage (obtained from the website of the State Administration of Cultural Heritage)

On May 19th, one week after the earthquake, the State Administration of Cultural Heritage Director, CHAN Jixiang, visited affected areas, and on the night of the 20th, a Disaster Relief Mobilization Assembly addressing cultural relic matters was held at Wuhouci Shrine in Chengdu city. This was the first meeting regarding the earthquake relief between cultural heritage protection divisions. On the following May 29th, the Sichuan Earthquake Disaster Relief and Protection Technical Research Conference were held again by the State Administration of Cultural Heritage. The conference was attended and conducted by Vice Director Dong, and 19 institutions from scientific research groups and graduate schools within China participated such as the Chinese Academy of Cultural Heritage, China Architecture Design and Research Group, Qinghua University, Beijing Research Institute of Ancient Architecture, Hebei Province Ancient Architecture Protection and Research Institute, and Zhejiang Province Ancient Architecture Design and Research Institute. At this conference, the State Administration of Cultural Heritage made plans to tackle three issues. These were, first, to visually inspect the affected areas firsthand and accurately grasp the status of damage. Second, to promptly instruct workers what emergency measures they should take to protect items in a perilous state, particularly buildings. And Third, to take the initiative and put in place a work system for



Image 20 Erwang-miao Shrine construction signs. Organizations giving donations and carrying out planning, supervising and construction were each different, and organizations selected by the State Administration of Cultural Heritage are in charge.



Image 21 Staff from Guangxi Cultural Relic Protection Center engaged in restoration work of Fulongguan Shrine

disaster site recovery. Of all these issues, the third one was crucial to getting future cultural heritage recovery processes off the ground. This is because it was considered that if a system for creating recovery and budget plans was not in place, then planning work and obtaining funds would be delayed resulting in delayed recovery. Since this disaster had been so extensive and unforeseen by the State Administration of Cultural Heritage and the findings of quick damage estimations showed that many buildings over a wide area were affected, it was decided that it would be impossible for Sichuan province alone to undertake cultural heritage restoration. In response to this difficult situation, the State Administration of Cultural Heritage proposed a plan to select experts from across the nation to take on cultural heritage restoration duties, and actually by pooling their expertise into a support role at this very Conference, a concrete system was instantly established. Thus, a national project to embark on the full-scale restoration of cultural heritage under the leadership of the State Administration of Cultural Heritage was born. The results of the conference were that each institution fulfilled their relief restoration duties towards disaster-affected Historical Monuments and Cultural Relics under State Protection in approximately 20 places located in Sichuan province and cooperated in drawing up design and execution plans for the restoration of these cultural relics. It was also decided that restoration work must be completed within 3 years.

On August 1st, the second Technical Research Conference was held and additional organizations were invited to join the previous conference participants to help with relief restoration work. These organizations included the Guangxi Cultural Relic Protection Center, Beijing University of Civil Engineering at Technology, Shaanxi Research Institute of Ancient Architecture, Henan Research Institute of Ancient Architecture, Jiangxi Cultural Relic Protection Center, Shandong Cultural Relic Protection Center, Liaoning Cultural Relic Protection Center and the Xian Centre for the Conservation and Restoration of Cultural Heritage. Thus, organizations were added to the relief restoration work program in a top-down manner by the state. As of July, 2009, support institutions have submitted planning proposals for 150 out of 250 cultural relics requiring restoration assistance.

Planning proposals submitted by supporting institutions are first reviewed by the Cultural Relics Bureau of Sichuan Province and converted into action after ratification. Priorities for specific tasks were decided according to the importance of the cultural heritage and the operating status of surrounding utilities. For example, Dujiangyan is a world cultural heritage site that as well as being a site of importance and at the same time an important tourist resource so restoration was hurried. Also, Dujiangyan is fortunate enough to be close to a city so it is well-situated to transport materials and machines needed for restoration work. Not only that, under the leadership of the State Administration of Cultural Heritage Sichuan province, Chengdu city and Dujiangyan city received full support in pulling in utilities from the Dujiangyan urban district, such as water and electricity needed for construction. Due to such factors, relief work was able to be started as early as June 30th. Thus, in accordance with such priorities and work conditions, restoration maintenance systems for all regions are established and now underway.

On the other hand, even in some regions with poor transort infrastructure, work was hurried along due to a need to protect and secure the culture heritage of ethnic minority groups. Emergency construction work commenced as soon as July 15th at Taoping Qiang village; the home of the Chinese ethnic minority Qiang group. Some of the buildings of this village; which include traditional Qiang buildings with distinctive stone towers called Diaolou; had been damaged by the earthquake. Damage included the complete collapse of some buildings, cracked walls in others, and some buildings had open walls with collapsed roofs. Considering that ethnic minorities were seen to be the biggest casualties since so many lived in the region most affected by the earthquake, calls to carry out speedy relief work in their areas were made by ethnic group research experts. It could, thus, be argued that such a speedy response was realized because central government leaders were deeply concerned by this situation and prioritized the safety of the Qiang people. Subsequently in October, the restoration work of traditional dwellings also got underway in the Tibetan districts of Maerkang, and Zhibo with its stone watchtowers.

When carrying out restoration work on these Taoping Qiang village and Zhibo watchtower buildings, the construction techniques of local artisans were employed to preserve the authenticity and integrity of ethnic minority cultural heritage. In addition, these local artisans also received training on the philosophy and methods of cultural heritage conservation with the cooperation of ICOMOS China. In the cases of Taoping and Zhibo, for example, training courses were held both for Qiang and Tibetan artisans. These courses aimed to clearly explain the international philosophy behind cultural heritage restoration to local artisans, and were conducted with the participation of Mr. GUO Zhan from ICOMOS China and the China Architecture Design & Research Group who was in charge of the earthquake disaster restoration program for Tapoing.

The above displays cultural heritage restoration movements focusing on Historical Monuments and Cultural Relics under State Protection. With regard to provincial, city and prefectural level relics, staff from each administrative levels began to rank and classify them according to the status of damage immediately after the disaster. Provincial level relics were handled by the Cultural Relics Bureau of Sichuan Province while city level relics were overseen by staff from Chengdu Municipal Bureau of Culture. The classification was essential to the tidy operation of subsequent restoration work. It helped to iron out budget concerns such as the calculation of restoration costs - problems that needed to be dealt with accurately and promptly. These multi-level bureaus were able to complete the work between approximately one and two months.

All management and supervision of actual budgets for national level cultural heritage are actually undertaken by the city and prefectural level cultural relic bureaus. Therefore, as one of the offices at the scene, the Cultural Relics Bureau of Dujiangyan was ceaselessly engaged in post-disaster restoration work.

Movements towards restoration of museum collections



Image 22 Interviews at the Chengdu Jinsha Site Museum

The Cultural Relics Bureau of Sichuan Province grasped the status of earthquake damage to museum collections via subordinate cultural relic bureaus and offices, and categorized the 3,167 damaged relics according to the extent of damage. Level 1 referred to relics beyond repair such as items irretrievably buried under the devastation of a collapsed cultural relics office. Level 2 was items with major damage and level 3 was items with minor damage. The total number of level 2 and level 3 relics was 2,053 items. Sequential restoration plans were drawn up for these restorable 2,053 items and restoration work got underway. For ceramics damaged at Sanxingdui Museum, restoration work had already been completed due to financial aid granted by Beijing and damaged relics at Chengdu Jinsha Site Museum had also been repaired by an independent budget. The next task for the Cultural Relics Bureau of Sichuan Province was to attempt to secure funds to not only restore damaged museum collections but also to build central storages and museums.

Work for this is apparently due to commence according to a set schedule. The Cultural Relics Bureau of Sichuan Province is not carrying out this relic restoration and facility construction work alone. Other provincial governments across the nation including those of Hebei, Beijing, Shaanxi, Shanxi, and Jiangxi are also providing help and, as of now, there are no plans to seek international assistance.

The item receiving the most attention among these restoration plans is the building of central storages. Because the central storage established in Mianyang city contributed greatly to the protection of its relics from the earthquake, the effectiveness of using such buildings as an anti-seismic measure has been reappraised and is now heavily promoted. Further, based on the lessons learned from this earthquake, other anti-seismic measures are also being reviewed. This includes anti-seismic building design as well as the preparation of earthquake-resistant storages helves, and locking away and storing cultural heritage items in storage boxes.

Systems of providing financial aid for restoration support projects

Since it was necessary to take rapid action after the earthquake before it was possible to determine budget figures for restoration support, the Cultural Relics Bureau of Sichuan Province had to take urgent measures such as apply for a loan of 20 million yuan RMB from Dujiangyan city. To gain costs for cultural heritage clear-up, shielding, disinfection and reinforcement work, the Cultural Relics Bureau of Sichuan Province made a direct report to the State Council since the State Administration of Cultural Heritage had been very supportive and was allocated 30 million yuan RMB from a fund provided by the Premier of the State Council of the People's Republic of China.

Costs for the restoration of Historical Monuments and Cultural Relics under State Protection were initially scheduled to be born by the various nationwide institutions providing the design and construction work. However, a cultural heritage restoration budget was later allocated by the State so projects are now being reimbursed by this fund. An example of this can be seen with Erwang-miao Shrine and Fulongguan Shrine in Dujiangyan city. Reconstruction design of these shrines was overseen by the Qinghua University in Beijing and estimated costs for restoration were calculated at approximately 100 million yuan RMB. Costs were initially scheduled to be born by Qinghua University and institutions responsible for construction work but Dujiangyan city was subsequently able to finance all institutions from the 100 million yuan RMB reconstruction budget that was later allocated by the State.



Image 23 Interviews at the Cultural Relics Bureau of Shaanxi Province

Aside from these public funds, a large number of donations were also made by individuals and institutions within China. The calligrapher and director of Cultural Relics Press, SU Shishu, arranged a sale of his own works and he donated the entire two million yuan RMB he made from the sale to the restoration of the Zhibo watchtowers. Also, the GUO group of Guagzhou provided three million yuan RMB for the restoration of Kaishansi Temple in Yaan, Rongjin prefecture and the Macao fund donated 100 million yuan RMB for the reconstruction of the Beichuan Qiang Folk Museum. Individuals and institutions that donate money are esteemed in China so the financial amount they donate is used for the cause of their choice.

For provincial and city level cultural heritage restoration costs, the relevant administrative level of the cultural relic office request funds by each making a report to national, provincial and municipal governments based on their drafted disaster damage reports and restoration costs calculations. Once the damage status of cultural heritage items had been ranked accorded to damage extent, the Chengdu Municipal Bureau of Culture swiftly drew up restoration plans and reported them to the Chengdu Municipal Committee and the municipal government. As a result, cultural heritage restoration was deemed to be extremely important and 51 million yuan RMB was contributed from the 2009 budget. The Chengdu Municipal Bureau of Culture was then able to plan the order of restoration work as well as budget allocation and get on with its work. These funds have been used to restore ancient architecture, improve museums and cultural relic office facilities and restore museum collections.

4-3-2 Movements in Shaanxi Province

Post-disaster emergency measures and restoration process

When the earthquake struck, people at the Cultural Relics Bureau of Shaanxi Province⁸ also felt large tremors, and there was damage such as falling furniture and dropped light fittings. While it was clear that an earthquake had occurred, information relating to the earthquake epicenter could not be obtained, and apparently 30 minutes passed before they learned that a major earthquake had struck the Sichuan province. At that time, bureau staff organized teams to call subordinate bureaus and instructed them to gather basic information about the status of damage in all cities. According to the interview, this system of linkup between province and city often takes place so when urgent matters arise a line of command is already determined, ensuring systematic cooperation between the bureaus.



Image 24 General Shaanxi province cultural relics rescue and protection plan created by The Cultural Relics Bureau of Shaanxi Province (obtained from the State Administration of Cultural Heritage website)

The following day, it was confirmed that up to 20 people from Shaanxi province were lost. The Cultural Relics Bureau of Shaanxi Province organized two teams with experts to survey the status of the damage to cultural heritage and for the next ten days those teams surveyed the extent of damage to cultural heritage items within the province. The experts that took part in the survey were a combination of cultural relic bureau officers and local university specialists in the fields of architecture, engineering, cultural heritage protection and geology. The survey checked off damage to cultural heritage items one-by-one and assessed the urgency of restoration work. The findings showed that 86 cultural relic protected units and 307 museum collection items had been damaged. These results were incorporated into a report document which was then submitted to the State Administration of Cultural Heritage. During this process, the Bureau staff state that it was extremely difficult to assess when to switch their operation from humanitarian relief to cultural heritage relief activities. This difficult situation was alleviated by the State Administration of Cultural Heritage who gave instructions to switch operations which, as far as people at the scene were concerned, was an extremely important directive.

Once the above report had been submitted, the next task was to estimate costs needed to cover restoration of these cultural heritage items. The Cultural Relics Bureau of Shaanxi Province delegated this task to experts who conducted more detailed surveys of the damage status and produced estimates of restoration costs. Damage status was then classified into four categories based on the extent of damage as assessed by these expert groups. Then, based on the report made by the experts, the planning division of the Xian Centre for the Conservation and Restoration of Cultural Heritage estimated costs in accordance with the calculated base amount of restoration costs for each damage level. Based on the amount of work carried out over six months, it was discovered that the amount of damages (combined amount of labor and material costs) for cultural heritage items in Shaanxi province rose to a total amount of 196 million yuan RMB. Costs incurred for cultural heritage restoration were covered in principal by the national government for Historical Monuments and Cultural Relics under State Protection; provincial government for provincial level relics; and the municipal government for city level relics but due to the enormity of this earthquake, exceptions were apparently made such as the province chipping in to cover costs of damage to national level relics.

After such work and budget planning was completed, Cultural Relics Bureau of Shaanxi Province entrusted the Xian Centre for the Conservation and Restoration of Cultural Heritage and the Shaanxi Research Institute of Ancient Architecture to formulate the "Shaanxi Cultural Relic Rescue and Protection Program" (Image 23), which stipulates that all cultural heritage restoration work will completed in a three year period. Restoration work is currently being carried out by the province and city in accordance with this plan.

Movements to support the restoration of cultural heritage in Sichuan province

Shaanxi province's place in history as the cradle of Chinese civilization for thousands of years is illustrated by its inexhaustible supply of cultural heritage items, and the province is also well-known as a beehive of scientific research relating to cultural heritage protection. Due to this background, Shaanxi is home to two of China's most prominent specialist cultural heritage protection institutions - the Xian Centre for the Conservation and Restoration of Cultural Heritage and the Shaanxi Research Institute of Ancient Architecture.

As stated previously, the restoration work of 45 Historical Monuments and Cultural Relics under State Protection affected by the disaster in Sichuan province had been carried out under the initiative of the State Administration of Cultural Heritage who had gained support for this work by exploiting the firstclass skills of cultural heritage protection institutions all over the nation. The two Shaanxi institutions mentioned above were both selected to join the cooperation, which provided restoration assistance with seven sites including Qingcheng-shan hill and six other Historical Monuments and Cultural Relics under State Protection. It is said that both institutions formulated a restoration program over three to four months and are currently carrying out restoration work in line with that program.



Image 25 Lingbaoxiu-yuan before the disaster (obtained from the State Administration of Cultural Heritage website)



Image 26 Lingbaoxiu-yuan before the disaster (obtained from the State Administration of Cultural Heritage website)



Image 27 Lingbaoxiu-yuan after the disaster (obtained from the State Administration of Cultural Heritage website)



Image 28 Lingbaoxiu-yuan after the disaster (obtained from the State Administration of Cultural Heritage website)



Image 29 The workshop between Chinese and Japanese experts regarding anti-seismic measures for cultural property buildings



Image 30 Visual inspection of Dujiangyan conducted during the workshop

In China, because the State Administration of Cultural Heritage has requested provincial cultural relic offices to optimize risk management, all provinces have apparently been developing risk management systems. Further, it is also maintained that it is common for related institutions to provide reciprocal support in times of crisis such as when a disaster strikes in an external province. It is stated that such reciprocity enabled Shaanxi province to swiftly respond to both the emergency situation within its own borders as well as provide support to other provinces

4-4 International Cooperation

Although offers of post-disaster support were obtained from some of overseas countries and international institutions, only the offers of three nations/institutions were actually taken up. These were UNESCO, French governments and Japanese governments.

UNESCO contributed 1.5 million yuan RMB via its Beijing office to the restoration of the world heritage site, Qingchengshan hill. Due to these funds, restoration work on this site has already started.

Further, the French government through its Consulate General in Chengdu offered to provide technical assistance for the reconstruction of Lingbaoxiu-yuan (Figures 25 to 28) in Pengzhou. This building, which is situated in the outskirts of Chengdu city, is a Christian monastery built by a French missionary in 1908, hence the interest of the French Consulate General. However, because the monastery building was a brick and wooden construction, it was severely damaged by the earthquake and mostly collapsed. The French government started by sending their own historical architecture experts and history experts in August and, to date, have carried out a total of three visual inspections. Offers to carry out inspections are always made via the French embassy and a report has been submitted to the relevant staff for each operation. While China itself has ultimately carried out restoration planning work and born costs for the monastery, France has provided technical assistance by way of advice from its experts in relation to restoration plans.

In the case of Japanese cooperation, the Japanese government presented a list of possible items for which it could provide assistance during talks between Japanese Prime Minister Fukuda and the Chinese President HU Jintao who was visiting Japan to attend G8 Hokkaido Toyako Summit on July 9. . This list placed stress on post-earthquake experience, knowledge and technical skills based on an overall plan drawing on knowledge gained from the restoration program of the Hanshin Awaji earthquake. One item included in this comprehensive list included cultural heritage restoration support so the outcome of subsequent deliberations between related parties from both countries was to arrange a workshop for experts based on themes including building protection and restoration and anti-seismic measures as well as anti-seismic measures for museum facilities and their collections. This workshop, entitled "Japan-China Workshop on Earthquake Resistance Measures for Cultural Heritage" was held in February, 2009 and was attended by 76 experts from Japan and China. It was a very worthwhile workshop that covered ground not usually discussed in Japan and, and through presentations and on-site inspections that took place over four days, cross-disciplinary issues relating to cultural heritage and anti-seismic measures were discussed (Images 29 and 30). LI Pei, the Director of the Museum Center of the Cultural Relics Bureau of Sichuan Province and the person who organized Chinese preparations for the workshop, commented that although the workshop fell at a very busy period just before restoration plans were due to get underway, useful opinions were needed on a number of matters at the time so it was opportune that valuable ideas between Chinese and Japanese experts were able to be shared.



Image 31 Interviews at the State Administration of Cultural Heritage

In addition to this, inspection groups few countries visited and pledges of support were made but, apart from the examples noted above, none materialized into definite action. The Chinese State Administration of Cultural Heritage argue that there are two aspects that need to be examined when considering emergency support on cultural heritage from overseas countries and institutions. These two aspects are regulatory restrictions and technical issues. Firstly, in China there exists a "Cultural Relics Protection Law" to protect Chinese cultural heritage and, based on the framework of that law, cultural heritage protection procedures are determined. This law has first and foremost been prescribed for the people of China and, while foreign nationals must also obey this law, if they try to become involved with Chinese cultural heritage, even if it only means to carry out a research study, they will naturally be subject to strict reviews and restrictions, and directly carrying out restoration work on cultural heritage sites is prohibited in principle. Conversely, this can be easily understood considering that we, Japan, also prohibit foreign nations from participating in the restoration of our own cultural heritage. Therefore, it is required for overseas institutions to provide cooperation, even in the event of an emergency, that falls in line with the fundaments of Chinese law. Secondly, the difference between the notion of protection and technology presents an even greater problem. This issue was often raised during the previously introduced February, 2009, "Japan-China Workshop on Earthquake Resistance Measures for Cultural Heritage", and showed that even between neighboring countries with similar cultural heritage, technology and ideas of how to manage cultural heritage greatly differ. When nations bring in their own ideas and technologies without understanding the restoration philosophies and technologies of the other nation, then that can no longer be called "restoration". For Japan to become directly involved in the repair work of Chinese cultural heritage would at the present time be difficult for the reasons stated above but just trying to introduce its ideas and methods alone would in reality invite considerable trouble. Accordingly, irrespective of the urgency of the situation, if both parties are unable to develop a common understanding of the issues at hand or find a solution during normal times, then international cooperation is a problematic issue that requires caution. One could argue that this policy of the State Administration of Cultural Heritage explains why international cooperation for this earthquake was limited to financial aid provision, technological exchange and offers of advice.

5. Conclusion and Recommendations

5-1 Conclusion

A disaster response system based on China's social order

The Sichuan earthquake, which occurred on May 12th 2008, not only claimed irreplaceable lives and property, it also inflicted extensive damage on a considerable number of precious cultural heritage. What was most noticeable from this case study of cultural heritage restoration initiatives responding to this unprecedented disaster was the speed and precision of the response to cultural heritage protection problems shown by cultural relics bureaus within the Chinese government. One could argue this was primarily due to the Chinese social order based emergency response system being equipped to function when faced with an actual cultural heritage protection problem.

In China, organizations at various levels had formulated response plans to address sudden and critical incidents such as natural disasters, fire and theft and had installed systems encouraging action even before the current disaster occurred. For the current Sichuan earthquake, municipal and prefectural level cultural relic bureaus entrusted with the affected sites, first, arrived at the scene and then fully grasped the situation through initial surveys. In addition, cultural relic bureaus overseeing municipal and prefectural activities provided logistical support to bureaus at the scene in the form of supplying everyday goods, and from the information they gathered, they provided prompt reports to State Administration of Cultural Heritage. These movements had already been swiftly initiated by the cultural relic bureaus even before receiving instructions from the State Administration of Cultural Heritage. Moreover, based on this speedily collected information, the State Administration of Cultural Heritage was able to assess the situation, draw up plans, assemble the required specialists and head to inspect the scene despite the response strategy being in its very early stages. For regional government and central cultural heritage protection divisions to be able to link-up so impressively under one line of command and demonstrate action to speedily restore the situation, is arguably a system that could only be found in China.

Such speedy information gathering and decision-making enabled bureaus to secure the funds and manpower needed to crystallize continuing restoration projects. It can be assumed that this accurate information-gathering is a major reason for cultural heritage restoration being added to budget requirements and dealt with almost as fast as other emergency assistance and restoration for areas such as lifesaving, transport, public facilities, and utilities.

In addition, it could be argued that the State Administration of Cultural Heritage visiting the scene of the earthquake at such an early stage in its capacity as the top administrative organ of Chinese cultural heritage protection and taking charge of restoration was also one of a major feature of these postdisaster activities. Having to buckle down to the task of rescuing cultural heritage while many people are losing their lives and without knowing the whereabouts of their loved ones must have been extremely difficult. Despite this harrowing dilemma, the Director of the State Administration of Cultural Heritage himself visited the scene of the disaster and in addition to providing encouragement took swift action to secure funds and manpower needed for restoration. According to many related workers, such actions inspired them to take action themselves. In addition, one could say that the sight of national leaders leading and cooperating to help a single province struck down by a disaster not only brought related workers in Sichuan together but also strengthened bonds with a diversity of institutions across the nation, and led to a concerted national cultural heritage restoration effort.

The reality of international cooperation

Despite the extensive damage suffered, only three cases of international cooperation on cultural heritage were identified and those three cases, which consisted of financial aid, technical advice and technological exchange, did not include a single example of practical restoration activities.

The reason for this could primarily be attributed to the fact that China had already developed a restoration system under the initiative of the State Administration of Cultural Heritage so there was no need to wait for international support, and it was estimated that restoration efforts could be covered by domestic experts and funds. However, there were also a number of crucial hurdles facing cultural heritage protection between different nations. Such hurdles included legal restrictions relating to cultural heritage protection not to mention differences between philosophies and methods. It could be said that, in this case, none of the countries that provided international cooperation fully comprehended these hurdles and were inadequately prepared to provide active cooperation.

5-2 Recommendations

In conclusion, we will now provide some recommendations based on the findings of this research.

What must be done to establish a solid disaster system?

Needless to say, the subject of this study, the People's Republic of China, is a socialist state built in 1949 that, despite witnessing dramatic social changes in recent years due to its reform and open-door policies, has a vastly different regime to that of Japan's. At the beginning of this report, it was pointed out that one of the objectives of this research was to raise the theme of "what system must be developed to tackle disasters that may occur in the future?" The system shown by the Sichuan example here; which not only encompassed grasping the post-earthquake disaster status through the cultural relic offices' vertical line of command, but also confirming the safety of affiliated staff as well as supplying food, clothing and shelter; very much reflected the social order of China, and for our nation to directly intervene in such activities would be very difficult. While there is often a tendency to place emphasis on "tangible" improvements such as building earthquake proof and resistance structures when discussing anti-seismic measures, the system presented

here in which people's hearts and minds were led strongly and uniformly in the midst of a disaster and, as a result, enabled the development of a system including the deployment of staff to swiftly grasp the post-disaster status and get to work on relief activities, should not be explained away by regime differences but rather it is something we should learn from. The following 4 points are matters that our nation could apply to our own systems.

- Establishment of a communication system for upper-level cultural property divisions from each region
- Clarification of a command system from upper-level to regional institutions
- · Budget allocation system that supports speedy action
- Establishment of a communication system linking specialist state-level institutions and experts that can respond swiftly to disasters

To deal with the introduction and application of new cultural heritage ideas such as how to excavate large amounts of cultural heritage relics while carrying out building work in line with recent economic and urban development, Chinese experts are now discussing culture heritage protection philosophies and methods as well as technological development issues. On this point, Chinese experts are more enthusiastic than their Japanese counterparts. With a social order characterized by top-down communication, it is the vital responsibility of higher-ranking persons to communicate strong ideas about cultural heritage protection to subordinates. Such a system fulfills an effective role in lifting people's spirits deflated by disasters such as earthquake and in providing strong leadership. Daily activities such as communicating the value of cultural heritage and significance of protecting it serve to consolidate such a system. Cultural heritage is a precious thing and, founded on this truth, it is our duty to continue talking about cultural heritage.

Revitalization of routine exchange

It has been pointed out that one of the objectives of this research was to raise the question: "how can we support and help overseas nations when they suffer a disaster?" Help from overseas nations towards the May 12th Sichuan earthquake may have been surprisingly minor but the two results achieved; namely French advice provided for the restoration of a monastery built by a Frenchman in the early twentieth century and the workshop held by the Japanese to encourage debate about technical issues facing cultural heritage rescue and restoration; both provide food for thought about how to support nations that have efficient social orders and are economically strong enough to respond to disasters

This research also showed that despite having a neighboring country like Japan, which originally learned from China and continues to this day to treasure cultural heritage such as traditional wooden houses, China is very distanced from Japan in terms of current philosophies towards wooden building protection as well as technological methods. This makes it very difficult for Japan to participate in protection and restoration processes even if we were inclined to do so. This does not mean of course that China is using such differences as an excuse to spurn exchange with Japan. Rather, it could be that while these differences exist, there is nothing we can introduce into China, and Chinese experts are starting to objectively divert their attention towards this problem. This is exemplified by praise of the February, 2009 workshop by the Dujiangyan restoration planning division of Qinghua University's and that institution's seeking of cooperative research with Japan.

Cultural exchange between Japan and China has been conducted frequently since diplomatic normalization but there have not been many meetings in a true sense in which experts exchange frank technical discussion and ideas. In this respect, also, it will become necessary to engage in discussions to overcome this common distance between Japan and China. If we can learn from each other and pick each other's brains through such measures, maybe this would lead to the creation of a new culture of exchange. Inauspicious happenings such as earthquake disaster could provide a crucial opportunity for this.

This point not only applies to China, it could also be extended to a wide number of nations. If there are groups of experts that fully comprehend the cultural heritage protection procedures of other nations as stipulated by their laws, understand their philosophies about restoration and technology, can plan restoration projects while working together with the responsible people from other countries in times of emergency; then communication between experts can be carried out swiftly when a major disaster occurs in another country or at home, and that can then be developed into international cultural heritage cooperation while undertaking concrete restoration activities.

^{1.} Sasada, Masakatsu. "Geological context for the Wenchuan earthquake in 2008," *Oyo technical report* 28 (2008), 1-14.

^{2.} This is applied to non-registered historic buildings.

^{3.} In China, so-called cultural properties in Japan are called "cultural relics (文物)." "monuments and cultural relics (文 物保護単位)" mean cultural tangible heritage. Moreover, nationally important "monuments and cultural relics" are

"Historical Monuments and Cultural Relics(全国重点文物保 護単位)." However, recently, the idea of "cultural heritage(文 化遺産)" has been widely spilled over since the idea of "World Heritage(世界遺産)" was introduced, especially in a tentative list of the World Heritage and in a Chinese cultural heritage list for that tentative list. Although the registered cultural properties are still called cultural relics, Chinese state administration for cultural properties is the State Administration of Cultural Heritage in English. Chinese Academy of Cultural Heritage changed its name from national research institute for cultural properties, which would be corresponding National Research Institute for Cultural Properties, Tokyo as well as Nara National Research Institute for Cultural Properties in Japan. The way of difference between properties and heritage are same in China and Japan.

⁴ A part of the specific damage was on the State Administration of Cultural Heritage website. http://www.sach.gov.cn/tabid/294/ InfoID/9036/Default.aspx

^{5.} It is a public administration for cultural relics. 15 staff work for administrations for cultural properties in cities and prefectures in Sinshuan Province.

⁶ It is a bureau for preserving cultural properties, located in Dujiangyan in Chengdu, Sinshuan Province. It maintains and manages cultural properties in Dujiangyan, which include the World Heritage Site of Dujiangyan as well as Qingchengshan hill. 107 staff are specialists of archaeology, history and language. Some of them work in the safety management department as well. Another bureau with 500 staff is in charge of tourism as well as organizing and managing cultural properties. It cooperates with the Cultural Relics Bureau of Sichuan province for tourism management and maintenance of cultural properties.

^{7.} An organization for protecting cultural properties in Chengdu in the City of Sinshuan province. It oversees cultural properties in cites and relics in Chengdu with 22 staff.

^{8.} It is a public organization for cultural relics in Shaanxi province. It oversees cultural properties in cites and provinces in Shaanxi province.

Chapter 2 Case Study

2. Thailand

1. Overview of the Study

1-1 Objective

Cultural heritage is an inheritance belonging to all mankind, and safeguarding it to pass onto future generations is said to be the duty of those presently living. However, a great deal of cultural heritage has been damaged and lost due to man-made disasters such as fire, theft and war, or natural disasters such as typhoons and earthquakes. Damage caused by natural disasters in particular occurs despite man's best efforts to protect against it. Ideally measures would be in place that provides the best protection for all cultural heritage, however limits to the budgets and human resources available to public institutions make it necessary to carefully allocate resources in order to maximize efficiency in conducting cultural property disaster prevention activities. Understandably, saving lives and restoring infrastructure are the immediate priorities following a major disaster, so personnel are unlikely to be available to rescue cultural heritage at first; even then, the mental condition of personnel who have survived the disaster needs to be taken into consideration. Consequently it is preferable to focus on measures that can be undertaken to protect and prevent damage to cultural heritage from disasters, reducing the need for action once disaster has struck. On this point, one could argue that many overseas countries are looking to Japan, a country that has witnessed many natural disasters, to share its expertise in such matters.

At the behest of the Japan Consortium for International Cooperation in Cultural Heritage, we have completed a study on the restoration of disaster-affected cultural heritage. Since the 1970s, the National Research Institute for Cultural Properties, Tokyo (NRICPT) has cooperated with other researchers and the Thai Ministry of Culture's Fine Arts Department (FAD), a national organization that primarily concerns itself with the protection of its cultural heritage. After entering into an agreement with other organizations in 1992, the NRICPT has been conducting collaborative fieldwork research on cultural heritage conservation, both in Japan and Thailand. The collaboration between the NRICPT and the FAD has also been responsible for the "Expert Meeting on Cultural Heritage: Restoration and conservation of immovable heritage damaged by natural disasters" in Bangkok. This meeting helped to launch the pooling of information resources on responses to damage from disasters inflicted on cultural heritage sites in Southeast Asian countries, including Thailand.

It is well-known that flood damage frequently occurs in Thailand, caused by heavy rain during the rainy season and by typhoons. However, in the northern regions, cultural heritage is also prone to damage from earthquakes. Adopting as a case study the earthquake damage sustained in May 2007 by the Chom Kitti Pagoda, located in Chiang Saen in the Chiang Rai Province, we conducted interviews and a field study of disaster-response measures undertaken by public institutions, primarily the FAD, as well as a study of actual damage and restoration work. Through such research, we examined what contribution Japan could make in this area.

1-2 Schedule

The study was conducted over three separate occasions between July and November, 2009. The first two studies were funded by NRICPT project grants for Southeast Asian studies, and consisted of interviews, data collection, and meetings in Bangkok. Towards the end of November, we carried out field studies of damage sustained at cultural heritage sites, and conducted interviews with local agencies. In addition to this, for the NRICPT project-funded Southeast Asian studies, we conducted preliminary meetings in early June and met again in mid-December to confirm facts. The study schedule and destinations are shown in the tables, diagrams, and photographs below:

1st Mission (July 2009)

Date	Destination / Mission Details	Interviewees and Field Respondents
29 July	Bangkok: Office of Archaeology, Fine Arts Department (FAD), Thailand Minis- try of Culture / Study explanation; meeting concerning procedures	Mr. Tharapong Surischat (Di- rector, Office of Archaeology, Fine Arts Department)
	As above / Interviews (re: Cultural heritage GIS da- tabase)	Mr. Sitthichai Pooddee (Ar- chaeologist); Ms. Wirayar Chamnanpol (Computer technical officer)
30 July	Bangkok: Office of Archaeology, Fine Arts Department (FAD), Thailand Minis- try of Culture / Interviews (re: web-based Cultural Heri- tage database)	Ms. Wirayar Chamnanpol
	As above / Interviews (re: two case studies - Chom Kitti Pagoda and Wat Phrathat Doi Su- thep); general information flow; progress- ing repair procedures; budget etc.	Mr. Sudchai Phansuwan (Civil engineer); Ms. Manatchaya Wajvisoot (Architect); Mr. Surayoot Wiriyadamrong (Architect); Mr. Patiwat Tul-on (Architect)
		1 2003)
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Date	Destination / Mission Details	Interviewees and Field Respondents
17 Septem- ber	Bangkok: Office of Archaeology, Fine Arts Department (FAD), Thailand Minis- try of Culture / Confirm facts obtained from previous study; meeting concerning next field study	Ms. Manatchaya Wajvisoot
18 Septem- ber	Bangkok: Department of Mineral Re- sources, Ministry of Natural Resources and Environment / Data collection	Ms. Manatchaya Wajvisoot

2nd Mission (September 2009)

3rd Mission (November 2009)

Date	Destination / Mission Details	Interviewees and Field Respondents
22 Novem- ber	Chiang Saen: Chom Kitti Pagoda / Field study (confirmation of damage sta- tus and interviews about situation when disaster occurred; microtremor measure- ment)	Mr. Sudchai Phansuwan; Ms. Manatchaya Wajvisoot
23 Novem- ber	Chiang Mai: Wat Phrathat Doi Suthep / Field study (microtremor measurement)	Mr. Sudchai Phansuwan; Ms. Manatchaya Wajvisoot
24 Novem- ber	Chiang Mai: 8th Regional Office of Fine Arts, Chiang Mai Museum / Interviews (re: regional office response)	Mr. Sahawat Maenna (Di- rector, 8th Regional Office of Fine Arts); Mr. Sudchai Phansuwan; Ms. Manatchaya Wajvisoot
	Chiang Mai / Inspection of Wat Chedi Luang (the upper part collapsed due to a previous earth- quake); Inspection of Wat Phra Singh (an in- scription documenting an earthquake is engraved on the upper part of the of the pagoda)	Mr. Sudchai Phansuwan; Ms. Manatchaya Wajvisoot
25 Novem- ber	Chiang Mai / Inspection of Wiang Kum Kam (affected by flooding and raised groundwater lev- els)	Mr. Sudchai Phansuwan; Ms. Manatchaya Wajvisoot
	Chiang Mai: 8th Regional Office of Fine Arts, Chiang Mai Museum / Data collection	Mr. Sudchai Phansuwan; Ms. Manatchaya Wajvisoot

Supplemental Mission (December 2009) * NRICPT-funded

Date	Destination / Mission Details	Interviewees and Field Respondents
18 D e - cember	Bangkok: Office of Archaeology, Fine Arts Department (FAD), Thailand Minis- try of Culture / Confirming facts in study records	Ms. Manatchaya Wajvisoot; Mr. Vasu Poshyanandana
	Department of Mineral Resources, Ministry of Natural Resources and Environment / Compilation of information concerning disaster (landslide) prevention	Mr. Somjai Yensabai

1-3 Members

Mission members are as follows:

N	A (01)	Missions			
Name	Alimation	1^{st}	2^{nd}	3^{rd}	
Yoko Futagami	Senior Researcher, Japan Center for International Coop- eration in Conservation, National Research Institute for Cultural Properties, Tokyo	~	~	>	
Yutaka Naka- mura	Visiting Professor, Tokyo Institute of Technology			~	
Tomomi Haramoto	Research Fellow, Japan Center for International Coopera- tion in Conservation, National Research Institute for Cul- tural Properties, Tokyo; Japan Consortium for International Cooperation in Cul- tural Heritage	~		>	



Figure 1-1-1: Wide area map of study destinations





Figure 1-1-2: Detailed map of study destinations



Bangkok: Fine Arts Department, Ministry of Culture



Chiang Saen: Chom Kitti Pagoda



Chiang Mai: Wat Chedi Luang



Chiang Mai: 8th Regional Office of Fine Arts



Chiang Mai: Wat Phra Singh



Chiang Mai: Wat Phrathat Doi Suthep

Image 1-1: Photographs of mission destinations

2. Disasters affecting Thailand and its Cultural Heritage

2-1 Typical Disasters affecting Thailand

Thailand has a total area of 513,115km². It lies within the tropical zone, between the geographic coordinates of 5° 37' N - 20° 27' N and 97 ° 22 'E- 105 ° 37' E., The country's 75 provinces (Thai translation: *Changwat*) and the Bangkok metropolitan area are grouped into five regions according to meteorological and climatic conditions, namely the Northern, Northeastern, Central, Eastern and Southern regions. The total population is approximately 65 million people

Table 2-1: Thai geographical divisions

Region	Characteristics
North- ern	15 provinces (Chiang Mai, Chiang Rai, Kamphaeng Phet, Lampang, Lam- phun, Mae Hong Son, Nan, Phayao, Phetchabun, Phichit, Phitsanulok, Phrae, Sukhothai, Tak, and Utaradit). Most regions are mountainous, and are the location of the headwaters of many major rivers. Mountains running north-south divide Chiang Mai, Chiang Rai and Nan from several nearby valleys. Thailand's highest peak, Doi Inthanon (2,595m altitude), is located in Chiang Mai. The border be- tween the Northeastern region and the east of the country is marked by a central plateau. The area that lies between the west-side mountain ranges and the central plateau is a central basin.
North- eastern	19 provinces (Amnat Charoen, Bua Lam Phu, Buri Ram, Chaiyaphum, Kaen, Kalasin, Khon, Loei, Maha Sarakham, Mukdahan, Nakhon Pha- nom, Nakhon Ratchasima, Nong, Nong Khai, Roi Et, Sakon Nakhon, Sri Sa Ket, Surin, Ubon Ratchathani, Udon Thani, and Yasothon). The Northeastern region is mainly plateaux and is indeed known as the northeastern plateau. The Phu Phan mountains, which extend from the northwest to the southeast, divide the region into two basins.
Central	18 provinces (Ang Thong, Ayutthaya, Bangkok Metropolis, Chai Nat, Kanchanaburi, Lop Buri, Nakhon Pathom, Nakhon Sawan, Nonthaburi, Pathum Thani, Ratchaburi, Samut Prakan, Samut Sakhon, Samut Songkh- ram, Sara Buri, Sing Buri, Suphan Buri, and Uthai Thani). This region is formed of vast lowland through which several tributaries flow into the Chao Phraya river. Mountains in the north border the West- ern region.
Eastern	8 provinces (Chachoeng Sao, Chanthaburi, Chon Buri, Nakhon Nayok, Prachin Buri, Rayong, Sra Kaeo, and Trat). The south and south-west areas face the Gulf of Thailand. Most prov- incesconsist of plains and valleys, but there are some small hills to the north and east.
South- ern	East coast: 10 provinces (Chumphon, Khiri Khan, Nakhon Si Thammarat, Narathiwat, Pattani, Phatthalung, Phetchaburi, Prachuap, Songkhla, Surat Thani, and Yala). West coast: 6 provinces (Krabi, Phang Nga, Phuket, Ranong, Satun, and Trang) The region is sandwiched between the Andaman Sea to the west, and the South China Sea to the east. Thailand's western mountain range runs from the north to the south of this region: the Phuket mountains on the west coast, and the Nakhon Si Thammarat mountains in the center, form the region's mountainous backbone.

The most common natural disasters to affect Thailand include weather-related disasters, such as lightning and rainy season flooding and associated landslides. Heavy rain and strong winds caused by tropical cyclones ensure that these occur almost every year to varying degrees. The Northern and Western regions close to the Myanmar and Laos national borders are also susceptible to earthquakes, since they lie on an active fault (Fig. 2-4). The Southern region suffered tsunami damage in December 2004, to the wave triggered by an earthquake centered on the plate below the offshore areas of the Indonesian island of Sumatra and the Andaman Sea.

2-1-1 Floods

Thailand's climate is influenced by seasonal winds, and dominated by the southwest and northeast monsoons. The southwest monsoon (from mid-May to mid-October) carries hot air from the Indian Ocean and generates heavy precipitation, although rainfall during this period is also attributable to typhoons and Thailand's location in the Intertropical Convergence Zone (ITCZ). While the northeast monsoon (from mid-October to mid-February) produces dry, cold air, particularly in the highlatitude areas of the north and east, it also brings heavy rain to the southern east coastal areas.

Table 2-2: Thailand's seasonal divisions
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Season	Period	Overview
Rainy	Mid-May to mid-October	All areas are affected by heavy rain. The wettest period is from August to September, except for the southern east coastal areas, which continue to experi- ence heavy rains from the northeast monsoon until the end of the year.
Winter	Mid-October to mid-February	The climate is generally mild during this period, but it is cold in the north from December to January. There is heavy rain from October to November in the south- ern east coastal areas.
Summer	Mid-February to mid-May	This period falls between the northeast and southwest monsoons. Temperatures peak in April.

The annual precipitation for most regions ranges between 1,200 and 1,600 mm. Nevertheless, some upwind areas, such as Trat in the south, and Ranong on the southern east coast, experience rainfall in excess of 4,000 mm, whilst other areas in the central basin and the uppermost areas of the south receive less than 1,200 mm per annum.

The following table indicates annual precipitation levels according to region and season:

The figures indicate that the annual precipitation levels for all regions are not particularly large compared to Japan. However, the precipitation is not evenly distributed throughout the year: there is a clear distinction between the dry and rainy seasons, and all regions tend to experience flooding during the rainy season due to the concentrated rainfall.

Table 2-3: Seasonal precipitation levels according to region (units are in mm, unless otherwise indicated)

Region	Winter	Summer	Rainy Season	Annual precipita- tion (days)
North	105.5	182.5	952.1	123
Northeast	71.9	214.2	1,085.8	117
Central	124.4	187.1	903.3	113
East	187.9	250.9	1,417.6	131
South	^	^	~	~
East coast	759.3	249.6	707.3	148
West coast	445.9	383.7	1,895.7	176

Average figures from 1971 to 2000 (Source: Thai Meteorological Department)



Figure 2-1: Average monthly precipitation levels from 1971 to 2000 (Source: Thai Meteorological Department)

Tropical cyclones in Thailand usually originate in the North Pacific Ocean to the west, or in the South China Sea. Inland and mountainous areas are affected by tropical depressions (with maximum wind speeds of between 17.2 m/s and 32.7 m/ s), whilst southern areas are heavily exposed to typhoons (with maximum wind speeds of 32.7 m/s and above). Tropical cyclones make landfall in Thailand on average three to four times a year; the season starts in April, although September and October are the peak months for typhoons to make landfall. Figures for January to March are unavailable.

Table 2-4: Tropical cyclone landfall in Thailand over a 54 year period (1951-2004)

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
North	-	-	-	-	5	2	9	17	23	15	1	-	72
Northeast	-	-	-	-	1	6	4	17	28	22	4	-	82
Central	-	-	-	-	2	1	1	-	7	9	2	-	22
East	-	-	-	-	1	1	1	-	3	12	2	-	20
South	-	-	-	1	-	-	-	-	3	14	24	8	50
(Source) Thei Metaorological Department								traant					

(Source. That Meteorological Departmen

Flooding occurs in all regions every year, affecting large numbers of people and causing damage that can run into hundreds of millions of dollars.

Table 2-5: Flood	damage	between	2001	to 2007
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Year	No. of flooding incidents	No. of casualties	No. of people directly affected	Damages (U.S. dollars)
2007	13 (54 provinces)	36	2,326,179	48,224,742
2006	6 (-)	446	6,050,674	475,069,103
2005	12 (57 provinces)	75	2,874,673	1,692,238
2004	6 (48 provinces)	27	_	117,502,500
2003	17 (66 provinces)	53	_	51,652,000
2002	- (72 provinces)	216	—	334,632,750
2001	14 (60 provinces)	244	—	91,657,000
2000	12 (62 provinces)	120	_	250,823,500

(Source: Thai Meteorological Department. Damages prior to 2004 were calculated at a ratio of 40 Thai baht to 1 U.S. dollar)



Image 2-1: Flooding in Sukhothai, Thailand (September 2002)

2-1-2 Earthquakes

The Thai Meteorological Department has been measuring earthquakes in Thailand since 1912. These records do not reveal any earthquakes centered on the country with a magnitude of 6.5 or greater (Table 2-6; Fig. 2-2), nor are there any recorded incidents of ground surface displacement in the past 700 years. Consequently Thailand is not considered to be a tectonically active region, and its largest envisaged earthquake - a MM VIII (JMA intensity scale: 6-lower) - is not particularly large compared to Japan (Fig. 2-4). However, studies carried out over the last 20 years have verified large Holocene displacements. Relatively large-scale, active faults, some exceeding 100 km, are located beneath Thailand's Northern and Western regions (Figs. 2-2 and 2-3), and seismic risk research carried out by the United States Geological Study (Appendix 1) concluded that there are faults with the potential to cause M 7-class earthquakes, with recurrence intervals spanning from thousands of years to hundreds of thousands of years. It is possible, therefore, to argue that an earthquake larger than any previously recorded in Thailand could strike at any time.

In addition, Thailand is also affected by earthquakes generated at the plate boundary that lies between the offshore area of the Indonesian island of Sumatra and the Andaman Sea. The tsunami created by the M 9.0 Indian Ocean earthquake that struck on 26th December, 2004, claimed the lives of over 5,000 Thai citizens (Fig. 2-5), and caused considerable damage to Phuket and Khaolak in the south.

In fact, inscriptions about earthquake damage can be found in chronicles dating back hundreds of years or more. For instance, the Wat Chedi Luang pagoda in Chiang Mai was originally 86 m high, but the upper part is reported to have collapsed due to an earthquake that occurred in 1545, shortening its height to 60 m. Further, there is a legend that the town of No Yot (spelling

unclear), near the Chom Kitti Pagoda in Chiang Saen where we conducted a study for this report, submerged beneath the sea due to an earthquake that struck in the year 460. In recent years, an underwater archaeological study was made at Chiang Saen Lake where the town was believed to have been located. Although no remains were discovered, a study of the sedimentary layers revealed indications of habitation at one time, according to Mr. Sahawat of the 8th Regional Office of Fine Arts.

Table 2-6-1:	Earthquakes felt in 1	hailand (magnitude of five and over*)
Date (Local Time)	Hypocenter	Magni- tude	Regions that felt tremors (Modified mercalli intensity)
23 May 1922 (09:24)	Burma 21.0 N. 97.0 E	7.9	Bangkok (IV)
5 May 1930 (20:46)	Burma 17.0 N, 96.5 E	7.3	Northern and Central parts, Bang- kok (V)
4 Dec. 1930 (01:52)	Burma 18.2 N, 96.5 E	7.3	Northern and Central parts, Bang- kok (V)
16 May 1933 (08:12)	Northern Sumatra Islands 7.0 N 96.5 E	6.5	Surat Thani, Stoon, Phangnga (V)
22 Sep. 1965 (18:25)	Burma 20.75 N, 99.26 E	5.3	Chiang Mai, Chiang Rai, Lampang, Lamphun, Mae Hon Son (V)
14 Feb. 1967 (08:36)	Andaman Sea 13.7 N, 96.5 E	5.6	Bangkok (IV)
12 Apr. 1967 (11:52)	Northern Sumatra Islands 5.16 N, 96.31 E	6.1	Sonkla, Stoon, Phuket (V)
28 Apr. 1971 (22:32)	Burma-China Border 22.98, 101.02	5.6	Chiang Mai (V)
17 Feb. 1975 (10:18)	Ta Song Yang district, Tak 17.6, 97.9	5.6	Northern and Central Parts (V-VI)
2 Aug. 1978 (14:46)	Thai-Laos Border 20.5, 100.7	5.1	Chiang Rai (IV)
4 Apr. 1983 (16:24)	Northern Sumatra Islands 5.7, 94.7	6.6	Bangkok (IV)
15 Apr. 1983 (16:24)	Si Sawat District, Kanchanaburi 14.95, 99.14	5.3	Kanchanaburi and Bangkok
22 Apr. 1983 (07:38)	Sj Sawat District, Kanchanaburi 14.95, 99.07	5.9	Western, Northern and Central parts (V-VII)
22 Apr. 1983 (10:22)	Si Sawat District, Kanchanaburi 14.96, 99.06	5.2	Kanchanaburi and Bangkok
24 Apr. 1984 (05:30)	Burma-China Border 22.1, 99.1	5.9	Chiang Rai (IV)
15 July 1985 (17:39)	Burma	5.0	Chiang Rai (IV)
6 Aug. 1988 (07:36)	Burma-India Border 25.1, 95.1	6.8 Mb 7.2 Ms	Bangkok (in high rise buildings) (III)
6 Nov. 1988 (20:03)	Burma-China 22.79, 99.61	6.1 Mb 7.3 Ms	Chiang Rai, Chiang Mai & Bang- kok (in high-rise buildings) (V-VI)
1 Mar. 1989 (10:25)	Laos 21.73, 97.74	5.1Ml	Upper northern part (V)
8 Apr. 1989 (04:40)	Laos 20.58, 100.48	5.2	Chiang Rai (V)
27 Aug. 1989 (22:21)	Burma-Thai Border 20.30 N, 98.77 E	4.4 Mb 5.0 Ml	Upper northern part (V)
29 Sep. 1989 (04:52)	Burma-Thai Border 20.29 N, 98.77 E	5.4 Mb 5.5 Ml	Upper northern part (VI)
1 Oct. 1989 (01:19)	Burma- Thai Border 20.27 N, 98.85 E	5.3 Mb 6.0 Ml	Upper northern part: Minor dam- age in non-structural brick walls in some taller buildings (VI)
9 Jan. 1990 (22:35)	Andaman sea 11.59 N, 95.02 E	5.2 Mb	Ranong
15 Nov. 1990 (09:34)	Northern Sumatra 3.91 N, 97.46 E	6.1 Mb	Phuket, Songkla and Bangkok (in high-rise buildings)
5 Jan. 1991 (21:57)	Burma 23.61 N,95.90 E	6.2 Mb	Northern part and Bangkok (in high-rise buildings)
1 April 1991 (10:53)	Burma 15.65 N, 95.69 E	6.5 Mb	Bangkok (in high-rise buildings)
12 June 1991 (10:05)	Andaman Sea 14.85 N, 96.31 E	5.0 Mb	Bangkok (in high-rise buildings)
23 April 1992 (21:18)	Burma 22.34 N, 98.84 E	6.0 Ml	Chiang Rai, Chiang Mai & Phayao
15 June 1992 (09:48)	Burma 23.98 N, 95.89 E	5.7 Mb	Bangkok (in high-rise buildings)
28 Oct. 1992 (14:02)	Burma 18.3 N, 96.8 E	6.0 Ml	Chiang Rai, Chiang Mai, Mae Hong Son & Bangkok (in high-rise buildings)

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Time	Hypocenter	Mag- nitude	Regions that felt tremors
13 Dec. 2006 (00:02)	Mae Rim, Chiang Mai 18.91N, 98.93 E	5.1	Shaking felt in Maerim, Sansai, Chiang Mai and Chiang Rai.
21 Dec. 1995 (23:30)	Phrao, Chiang Mai 19.7 N, 99 E	5.2	Shaking felt in Muang, Chiang Mai, Chiang Rai, Lamphun, Lam- pang, Phayao, Mae Hong Son. Slight damage near the epicenter. 1 fatality.
9 Dec. 1995 (20:26)	Rongkwang, Phrae 18.2 N, 99.8 E	5.1	Shaking felt in Chiang Mai, Chiang Rai, Lamphun, Lampang, Phayao, Phrae, Uttaradit, Nan. Slight damage in Phrae.
11 Sep. 1994 (8:31)	Saruai, Phan 19.46 N, 99.6 E	5.1	Shaking felt in Saruai, Phan, Chiang Rai. Buildings had slight damage near epicenter, including the hospital, school, and temple in Phan, Chiang Rai.
20 Jan. 1999 (03:59)	Laos, Hongsawadi, Saiburi 19.90 N 100.78 E	5.9	Shaking felt in Muang, Tawang- pha, Thungchang, Nan, Phrae, Phyao, Chiang Rai. Slight damage in Northern areas, Nan and Phrae.
18 Jul. 2002 (16:50)	Myanmar 20.1 N 97.5 E	5.0	Shaking felt in Chiang Rai
2 Nov. 2002 (08:26)	South Sumatra 3.02 N 96.18 E	7.5	Shaking felt in Hatyai, Sonkhla
22 Jan. 2003 (10:00)	Near Off-shore Suma- tra 5.9 N 95.6 E	7.0	Shaking felt on upper floor in some high rise buildings in Bah- gkok and almost all parts of the south.
14 Sep. 2003	Sumatra North Sumatra area	5.0	Phuket
18 Sep. 2003	Laos-Myanmar border; according to measure- ments by Earthquake Department, 130 km northeast of Chiang Mai 20.50 N 100.9 E	5.5	Chiang Rai
22 Sep. 2003 (01:21)	Myanmar 345 km north of Yangon 19.91 N 95.75 E	6.7	Chiang Dao, Chiang Mai. High- rise buildings in Bangkok were slightly damaged.

Table 2-6-2: Earthquakes felt in Thailand (magnitude of five and over**)

**Data relating to earthquakes with a magnitude of 5 and over was extracted from the Department of Mineral Resources' website (<u>http://www.dmr.go.th/main.</u> php?filename=Thaifelt and <u>http://www.dmr.go.th/dmr_data/geohazard/earthquake/</u> Homep/Thaifelt.htm)

* Compiled by Sumalee Prachuab, Geophysical Sub-division, Meteorological Department

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Figure 2-2: Active faults, and the hypocenter and scale of past earthquakes in Thailand (Source: Department of Mineral Resources)



Figure 2-3: Map of active faults in Thailand (Source: Department of Mineral Resources)



Figure 2-4: Seismic hazard map of Thailand (Source: Department of Mineral Resources). The 4 zones are divided according to estimates of modified mercalli (MM) intensity.



Figure 2-5: Past interplate earthquakes occurring in the vicinity of Thailand (Source: Department of Mineral Resources)

2-2 Previous Disaster Damage sustained by Cultural Heritage Sites

According to the Act on Ancient Monuments, Antiques, Objects of Art and National Museums B.E. (Buddhist Era) 2504 (1961) (Appendix 4), " 'ancient monuments' refer to tangible property belonging to the fields of art, history or archaeology which have architectural traits or historical proof of that era, and includes places such as archaeological sites, historic sites and historical parks." Approximately 2,000 registered monuments are afforded national protection. At the present time, monuments built up to 50 years previously are eligible for registration, but this criterion is apparently under review. Approximately 95 % of currently existing traditional buildings are temple buildings. While there are differences between regions, Khmer and Lopburi era buildings used sandstone and laterite while Sukhothai and Ayutthaya era buildings used brick and laterite. In the Sukhothai and Ayutthaya eras, plaster was used not only as mortar, but also for decorative purposes to cover building surfaces, and some of the decorations still exist today. It is believed that wood and tiles were also used, however most evidence of this has been lost. In the case of more recently-built temples, wooden elements, tiles and mural wall paintings can still be found.

In addition to this, village ruins, building foundations, graves and kilns have all been discovered by archaeological excavations after years buried below the earth's surface.

There are three World Heritage sites in Thailand: the historic town of Sukhothai and associated historic towns, recognised in 1991, are mainly composed of buildings built from brick and laterite; the historic city of Ayutthaya and associated historic towns, recognised in 1991; and the Ban Chiang archaeological site, recognised in 1992, which contains prehistoric age remains.

Some of the main causes of natural disaster damage to cultural heritage sites can be attributed to water seepage, caused by rainy season flooding, losses arising from strong winds such as typhoons, and landslides. Water seeps from rising groundwater during the rainy season, or flows into remains or foundations that exist below ground level, as shown by an excavation study. The water, often mixed with sediment and wood, causes surface erosion. Water penetration can also be an indirect cause of damage: accompanying outbreaks of moss and algae generate harmful dirt and biodeterioration, whilst the elution and recrystallization of the constituent elements of cement (used in bricks, plaster and restoration materials) that can occur when materials are left for a long time in wet conditions, can lead to salt weathering. The Wiang Kum Kam site in Chiang Mai is a good example: the site is located close to a river, and when remains previously covered by sediment are excavated, water can flow into plots that are below

ground level, whilst seepage also stems from the relatively high water table, estimated to be approximately 2 m below ground level (Mr. Sahawat) (Image 2-2).

In another example, a river lies on the periphery of the World Heritage-inscribed Ayutthaya National Historical Park, leading to frequent flooding and subsequent water seepage. As shown in the Wat Chaiwattanaram photograph below, a waterproof barrier



Image 2-2-1: The Ku Pa Dom site. The roof is set up to protect the plaster covered on the floor of the remains.



Image 2-2-2: The Ku Pa Dom site. The soil is wet and muddy because the rainy season has just finished. Those portions of the roof pillars that were submerged in water are discolored, and algae are clearly thriving in the remains of the brick wall. Efflorescence is evident near the boundary of the water seepage areas.



Image 2-3-1: Ayutthaya: Wat Chaiwattanaram



Image 2-3-2: Ayutthaya: Wat Chaiwattanaram. The difference in elevation, between the river on the right and the grounds of the temple, is evident. A laterite fence has been built as a flood-prevention measure.



Image 2-3-3: Ayutthaya: Wat Chaiwattanaram. Flood-prevention measures under construction.



Image 2-3-4: Ayutthaya: Wat Chaiwattanaram. Waterproof barrier made from concrete.



Image 2-3-5: Ayutthaya: Wat Chaiwattanaram. A mobile, shield-like waterproof apparatus. It can be folded-up when not in use.

to prevent water seepage from the nearby river was being built when we visited in January 2009, as well as shield-like, mobile waterproof apparatus that blend in with the surroundings (Fig. 2-3).

Records of past earthquakes describe the damage done by these natural disasters, and the physical effects are still visible in many buildings today. As noted previously, for example, the upper part of Wat Chedi Luang collapsed in an earthquake in 1545, yet traces of the damage can still be seen post-restoration (Image 2-4). Another report, this time documented on a plant leaf and still in existence today, states that the finial from the upper tier of the Wat Phra Singh Pagoda fell due to an earthquake in 1801 (Mr. Sahawat).

To maintain up-to-date records on the status of cultural heritage sites that have incurred damage in natural disasters, the GIS database was created by the FAD; this is intended to correlate disaster history information from various sources (explained below), however it is yet to be fully realized and some statistical information remains elusive. Due to recent organizational reform, the Regional Office, which was once a subdivision of the FAD's Office of Archaeology, now operates at the same organizational level (see organizational chart in Fig. 3-8), with the result that it has become more time-consuming to accumulate disaster-related information. The Regional Offices now only transmits disaster damage information to the Office of Archaeol-



Image 2-4: Chiang Mai: Wat Chedi Luang. The upper part has largely collapsed as a result of earthquake damage, and was not reconstructed during restoration work in 1992.

ogy when they decide that it is necessary to bill for repair expenses or to assign specialists. Owing to this, we were only able to obtain flood damage information for 2007 (Table 2-7) on this occasion.



Image 2-5: Ayutthaya: Pom Phet Fort. .repair, including the introduction of anti-flood measures (January 2009).

Location	Name	Assigned l	oudget (baht)	Implementation Details	
		Allow- ance to staff	Equipment, s u p p l i e s , service fees	Total amount	
		4,289,000	111,614,000	115,903,000	
Office (Centr	of Archaeology al)	150,000	21,832,000	21,982,000	
1	Pon-Petch Fort, Ayutthaya	150,000	21,832,000	21,982,000	Repairs to the east side of the main fort building. Maintenance to the surroundings. Development of flood prevention system.
2nd Re Fine A	egional Office of arts (Suphanburi)	360,000			
2-11					
3rd Re Fine A	egional Office of arts (Ayutthaya)	1,630,000	13,675,000	15,305,000	
12-14					
Ayutt Histor	haya National ical Park	1,050,000	38,521,000	39,571,000	
15-35					
Sukho Histor	othai National ical Park	-	3,599,000	3,599,000	
36					
Si Sa tional	tchanalai Na- Historical Park	16,000	1,484,000	1,500,000	
37					
7th Re Fine A	egional Office of arts (Nan)	280,000	4,540,000	4,820,000	
38-40					
8th R of Fin Mai)	egional Office e Arts (Chiang	619,000	9,081,000	9,700,000	
41					
11th F of Fin Ratcha	Regional Office ne Arts (Ubon athani)	184,000	2,336,000	2,520,000	
42					

Table 2-7-1: List of Cultural Heritage sites in all regions affected by flooding in 2007 (Source: Office of Archaeology)

Table 2-7-2: List of Cultural Heritage sites in all regions affected by flooding in 2007 (Source: Office of Archaeology) (Original document: 3 pages)

		31	บประมาณที่ได้รับจัดเ		
ń	ชื่อรายการ	ค่าตอบแทน ใช้สอย	ค่าที่ดินและ สิ่งก่อสร้าง	ราม	เป้าหมายการดำเห็นงาน
		4,289,000	111,614,000	115,903,000	
สำนัก	้าโบราณดดี(ส่วนกลาง)	150,000	21,832,000	21,982,000	
*1	ป้อมเพชร จ.พระนครครื่อยุธยา	150,000	21,832,000	21,982,000	 บูรณะตัวป้อมด้านทิศตะวันออก ปรับปรุงภูมิทัศน์ ก่อสร้างระบบป้องกันน้ำท่วม
สำนัก	 าศิลปากรที่ ๒ สุพรรณบุรี	360,000	16,546,000	16,906,000	
2	วัดใก่เตี้ย อ.เมือง จ.สุพรรณบุรี		259,000	259,000	- บูรณะเจดีย์ และภูมิทัศน์
3	วัดเกาะพระยาเจ๋ง อ.ปากเกร็ด จ.นนทบุรี	10,000	330,000	340,000	- บูรณะอุโบสถ
4	วัดพระลอย อ.เมือง จ.สุพรรณบุรี	30,000	1,003,000	1,033,000	- บูรณะเจดีย์ - สร้างเขื่อนป้องกันการพังทลาย
5	วัดราษฏร์สามัคคี อ.เมือง จ.สุพรรณบุรี	50,000	1,320,000	1,370,000	- บูรณะเจดีย์
6	วัดน้อย อ.เมือง จ.สุพรรณบุรี	50,000	1,780,000	1,830,000	- บูรณะวิหาร
7	พระบรมราชานุสรณ์ดอนเจดีย์ อ.ดอนเจดีย์ จ.สุพรรณบุรี	30,000	794,000	824,000	- บูรณะสานประทักษิณ - ปรับปรุงภูมิทัศน์
8	วัดหน่อพุทธางกูร อ.เมือง จ.สุพรรณบุรี	40,000	3,500,000	3,540,000	- บูรณะอุโบสถ
9	วัดสนามชัย อ.เมือง จ.สุพรรณบุรี	50,000	3,835,000	3,885,000	- บูรณะเจดีย์ และวิหาร
10	วัดโฟธิ์บางโอ อ.บางกรวย จ.นนทบุรี	50,000	1,946,000	1,996,000	- บูรณะอุโบสถ - บูรณะกำแพงแก้ว - บูรณะเจดีย์ - บูรณะหอระขัง
11	เจดีย์จุลประโทน อ.เมือง จ.นครปฐม	50,000	1,779,000	1,829,000	 บูรณะเจดีย์จุลประโทน ปรับปรุงภูมิทัศน์และจัดทำแผน ระบบระบายน้ำ
สำนั	ทศิลปากรที่ ๓ พระนครศรีอยุธยา	1,630,000	13,675,000	15,305,000	
12	วัดโหญ่เทพนิมิตร อ.นครหลวง จ.พระนครศรีอยุธยา	500,000	5,980,000	6,480,000	- บูรณะพระอุโบสถ - บูรณะเจดีย์ราย - บูรณะกำแพงแก้ว

รายชื่อโบราณสถานที่ได้รับความเสียหายเนื่องจากเหตุอุทกภัยและฝนตกหนัก สำนักโบราณคดี กรมศิลปากร กระทรวงวัฒนธรรม

หน้าที่ 1

ų	ชื่อรายการ	31	บประมาณที่ได้รับจัดเ		
		ค่าตอบแทน ใช้สอย	ค่าที่ดินและ สิ่งก่อสร้าง	รวม	เป้าหมายการดำเหินงาน
13	วัดสว่างอารมณ์ อ.เมือง จ.สิงท์บุรี	565,000	6,122,000	8,687,000	- บูรณะมณฑป - บูรณะพระอุโบสถ - บูรณะพระวิหาร
14	วัดสมุหประดิษฐาราม อ.เมือง จ.สระบุรี	565,000	1,573,000	2,138,000	- ก่อสร้างศาลา
ุทย	หประวัติศาสตร์พระนครศรีอยุธยา	1,050,000	38,521,000	39,571,000	
15	วัดมเหยงค์ จ.พระนครศรีอยุธยา	50,000	1,930,000	1,980,000	- บูรณะเสริมความมั่นคงแนว กำแพงแก้ว - ปรับปรุงภูมิทัศน์
16	วัดข้าง จ.พระนครครือยุธยา	50,000	1,867,000	1,917,000	 บูรณะเสริมความมั่นคงแนว กำแพงแก้ว บูรณะเจดีย์ประชาน ปรับปรุงภูมิทัคน์
17	วัดสีกาลมุด จ.พระนครศรีอยุชยา	50,000	1,254,000	1,304,000	 บูรณะเสริมความมั่นคงเจตีย์ ประธาน บูรณะเสริมความมั่นคงแนว ทำแพงแก้ว ปรับปรุงภูมิทัศน์
18	วัดนางกำ จ,พระนครศรีอยู่ธยา	50,000	1,024,000	1,074,000	 บูรณะเสริมความมั่นคงเจดีย์ ประธาน บูรณะเสริมความมั่นคงวิหาร ปรับปรุงภูมิทัศน์
19	เจดีย์ภูเขาทอง จ.พระนครศรีอยุธยา	50,000	3,882,000	3,932,000	- บูรณะเสริมความมั่นคงเจดีย์ราย 5 องค์ - ปรับปรุงภูมิทัศน์
20	วัดพระยาแมน จ.พระนครศรีอยุธยา	50,000	1,852,000	1,902,000	- ก่อสร้างคันดินกันน้ำ - ปรับปรุงภูมิทัศน์
21	วัดเชิงท่า จ.พระนครศรีอยุชยา	50,000	1,390,000	1,440,000	 บูรณะเสริมความมั่นคงเจดีย์ ประธาน บูรณะเสริมความมั่นคงอุโบสถ บูรณะเสริมความมั่นคงกำแพง ปรับปรุงภูมิทัศน์

หน้าที่ 2

		งบประมาณที่ได้รับจัดสรร			
ที่	ชื่อรายการ	ค่าดอบแทน ใช้สอย	ค่าที่ดินและ สิ่งก่อสร้าง	ราม	เป้าหมายการดำเนินงาน
22	วัดหัสดาวาส จ.พระนครศรีอยุธยา	50,000	1,980,000	2,030,000	 บูรณะเสริมความมั่นคงเจดีย์ ประธาน บูรณะเสริมความมั่นคงอุโบสถ บูรณะเสริมความมั่นคงกำแพง ปรับปรุงภูมิทัศน์
23	วัดพุทไธสวรรย์ จ.พระนครศรีอยุธยา	50,000	1,991,000	2,041,000	 บูรณะเสริมความมั่นคงวิหาร บูรณะเสริมความมั่นคงกำแพง ปรับปรุงภูมิทัศน์ริมแม่น้ำ
24	วัดตะไกร จ.พระนครศรีอยุธยา	50,000	1,946,000	1,996,000	 บูรณะเสริมความมั่นคงเจดีย์ ประธาน บูรณะเสริมความมั่นคงกำแพง ปรับปรุงภูมิทัศน์
25	วัดพระงาม จ.พระนครศรีอยุธยา	50,000	1,663,000	1,713,000	 - บูรณะเสริมความมั่นคงเจดีย์ ประธาน - บูรณะเสริมความมั่นคงกำแพง ปรับปรุงภูมิทัศน์
26	วัดจงกรม จ.พระนครศรีอยุธยา 	50,000	1,880,000	1,930,000	 บูรณะเสริมความมั่นคงเจดีย์ ประธาน บูรณะเสริมความมั่นคงกำแพง ปรับปรุงภูมิทัศน์
27	วัดกุฏีดาว จ.พระนครศรีอยุธยา	50,000	1,486,000	1,536,000	- บูรณะเสริมความมั่นคงอุโบสถ - ปรับปรุงภูมิทัศน์
28	หมู่บ้านโปรตุเกส จ.พระนครศรีอยุธยา	50,000	1,978,900	2,028,900	- ก่อสร้างระบบป้องกันน้ำท่วม - ปรับปรุงภูมิทัศน์
29	วัดมหาธาตุ จ.พระนครศรีอยุธยา	50,000	1,905,000	1,955,000	- บูรณะเสริมความมั่นคงกำแพง
30	วัดโพธิ์(ร้าง) จ.พระนครศรีอยุธยา	50,000	2,688,000	2,738,000	- ปรับปรุงภูมิทัศน์
31	วัดไหม่คลองสระบัว จ.พระนครศรีอยุธยา	50,000	1,919,100	1,969,100	- ปรับปรุงภูมิทัศน์
32	วัดแค จ.พระนครศรีอยุธยา	50,000	1,875,000	1,925,000	- ปรับปรุงภูมิทัศน์
33	วัดจักรวรรดิ์ จ.พระนครศรีอยุธยา	50,000	1,203,000	1,253,000	- ปรับปรุงภูมิทัศน์
34	วัดเจ้าย่า จ.พระนกรศรีอยุธยา	50,000	1,841,000	1,891,000	- ปรับปรุงภูมิทัศน์
35	วัดโคกพระยา จ.พระนครศรีอยุธยา	50,000	966,000	1,016,000	- ปรับปรุงภูมิทัศน์
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หน้าที่ 3

41

	31	บประมาณที่ได้รับจัดส		
ที่ ชื่อรามการ	ค่าตอบแทน ใช้สอบ	ด่าที่ดินและ สิ่งก่อสร้าง	37N	เป้าหมายการดำเหินงาน
อุทยาพประวัติศาสตร์สุโขทัย		3,599,000	3,599,000	
36 ถนนและลานจอดรถบริเวณร้านค้า อุทยานประวัติศาสตร์สุไขทัย	-	3,599,000	3,599,000	- ปรับปรุงถนนและลานจอตรถ
อุทยา่นประวัติศาสตร์ศรีสัชนาลัย	16,000	1,484,000	1,500,000	
37 วัดเขาสุวรรณคีรี จ.สุโขทัย	16,000	1,484,000	1,500,000	- บูรณะเจดีย์
สำนักศิลปากรที่ 🖬 น่าน	280,000	4,540,000	4,820,000	
38 พระธาตุวัดบ้านร้อง อ.นาน้อย จ.น่าน	30,000	200,000	230,000	- บูรณะพระธาตุ
39 วีหารวัดคอนมูล อ.ท่าวังผา จ.น่าน	134,000	2,456,000	2,590,000	- บูรณะวิหาร
40 วัดดันแหลง อ.เซียงกลาง จ.น่าน	116,000	1,884,000	2,000,000	- บูรณะวิหาร
ล่าพักศิลปากรที่ 8 เซียงใหม่	619,000	9,081,000	9,700,000	
41 โบราณสถานเวียงทำกาน อ.สันป่าตอง จ.เชียงใหม่	619,000	9,081,000	9,700,000	- บูรณะเจดีย์และวิหาร
สำนักติลปากรที่ 11 อุบลราชธานี	184,000	2,336,000	2,520,000	
42 ศาลาการเปรียญวัดมโนภีรมย์ อ.หว้านใหญ่ จ. มุกดาหาร	184,000	2,336,000	2,520,000	- บูรณะศาลาการเปรียญ

หน้าที่ 4

3. Cultural Heritage Disaster Prevention and Damage Restoration: Thai Systems and Initiatives

3-1 Disaster Prevention Systems and Initiatives

3-1-1 Disaster Prevention Systems

3-1-1-1 Disaster Manegement System

Thailand Country Report 2008 on Asian Disaster Reduction Center (ADRC) website has good resource to understand Thailand's comprehensive effort on disaster prevention (Appendix 2)



Figure 3-1: The disaster-period system of command (Asian Disaster Reduction Center (ADRC))

3-1-1-2 Actual disaster response examples

In this section, we will briefly introduce examples of landslide disaster responses implemented by the Department of Mineral Resources, based on interviews with the Department's geologist, Mr. Somjai Yensabai.

The Department of Mineral Resources carries out research studies such as the organization of national and provincial landslide hazard maps, as well as disaster prevention activities within the community. The landslide hazard maps indicate that hazard levels vary according to vegetation, geological conditions, topography, and precipitation levels. Hazard levels increase significantly in regions with notable granite deposits and heavy rainfall (Figs. 3-3 and 3-4).

Local disaster prevention measures include the development of response manuals (Fig. 3-2) aimed at local authorities and local residents, as well as educational seminars on how regions should respond when a disaster is imminent. Literature and presentation materials are tailored to each region. Another initiative has seen precipitation gauges installed in volunteer households; when the precipitation reaches a certain level, they are instructed to notify the village chief, who then visits the residents of regions in danger by car, informing them of what action to take. Different levels of precipitation are linked to particular courses of action. For instance, guidelines state that when the accumulated amount of precipitation reaches 100 mm, preparations must be made for evacuation, and if it reaches 150 mm, then people must be evacuated. Similar information initiatives, including brochures and seminars, have been introduced to approximately 26 provinces that are particularly vulnerable to landslides, and about 3,000 precipitation gauges have been distributed.

The Department of Mineral Resources continues to seek ways to improve these region-based observation and communication systems. Selected personnel in the department monitor a rain cloud radar every day, and when a region is expected to receive heavy rainfall, they telephone volunteers there who have precipitation gauges to warn them of impending rain.



Figure 3-2: Landslide-response materials aimed at local authorities in Phetchaburi ស្រាវត្បារី province (Source: Department of Mineral Resources).

In addition, the Department of Mineral Resources has created a general brochure (distributed in printed form, and available as a PDF file via the internet) urging caution about dangers other than landslides.



Figure 3-3: Nationwide landslide hazard map of Thailand (Source: Department of Mineral Resources, 2004). Lower hazard levels are indicated in green; red are the highest.



Figure 3-4: Landslide hazard map (Nan Province, Northern Region) (Source: Department of Mineral Resources, 2005)



Figure 3-5: Regional communication system and response when a landslide hazard is anticipated (Source: Department of Mineral Resources)



Figure 3-6: Brochure about tsunamis (Source: Department of Mineral Resources)



Figure 3-7: Brochure about natural disasters (Source: Department of Mineral Resources)

3-1-2 Organizations and systems involved in cultural heritage disaster prevention

The national body responsible for administering cultural heritage conservation in Thailand is the Fine Arts Department (FAD). The FAD was established in 1911 and currently falls under the jurisdiction of the Ministry of Culture. In addition to overseeing historical monuments and structures, the FAD is also involved in the conservation, protection, management, promotion and study of other tangible and intangible, movable and immovable



cultural properties, such as museums, archives, libraries, history, literature and the performing arts. The diagram below illustrates

Figure 3-8: Ministry of Culture, Fine Arts Department organizational chart. (Produced by Mr. Surayoot Wiriyadamrong, Fine Arts Department, Office of Archaeology.

the organizational structure of the FAD.

Whilst cultural heritage conservation, protection and management is officially under the jurisdiction of the FAD, a significant amount of general day-to-day management is actually handled by a sub-department, the Office of Archaeology. The Regional Office of Fine Arts is another FAD organization (one might call it a local agency), with 15 offices located across the country that directly handle cultural heritage affairs in the provinces. In terms of general management, one could say that the protection of national registered monuments is carried out jointly by the Office of Archaeology and the Regional Office of Fine Arts. Specialists also play a role, including university researchers affiliated to ICOMOS Thailand, whilst conservation work is also carried out through funding from other organizations such as the Crown Property Bureau.

Only registered monuments are afforded national protection. The day-to-day management of these monuments is generally undertaken by the owners (in many cases, the temples). When repair work is necessary, the Regional Office of Fine Arts devises a repair plan for submission to the FAD Director. A committee organized by the Office of Archaeology assesses the plan's validity. Those approved by the committee and the FAD Director are then allocated a repair budget. If the repairs are not large enough to warrant national funding, the regional office may coordinate the work without the need for a committee review. Whilst the Regional Office of Fine Arts does have experts in archaeology and architecture, their number and their fields of specialization are limited (for example, there are no engineering specialists). It is therefore sometimes necessary for the Regional Office of Fine Arts to apply for specialist help from the FAD when planning and conducting repairs and construction work.

The department does not have a team dedicated to disaster response, nor are there specific provisions in the budget for investment in disaster prevention. However, the repairs budget includes a category entitled "landscape management", which actually includes work carried out to prevent disasters, such as anti-flooding measures.

3-1-2-2 Cultural heritage disaster prevention initiatives: Hazard anticipation efforts utilizing GIS

Efforts are under way to use GIS to anticipate hazards facing Thailand's cultural heritage (Fig. 3-9). This has been achieved by updating a cultural heritage database, originally developed by FAD, with current disaster-related information

The FAD cultural heritage database contains two systems – GIS (Geographical Information System) and MIS (Management Information System). At the time of the July interviews, a total of approximately 8,800 entries had been loaded into the database, including 2,098 registered monuments and roughly 6,700 non-registered monuments. Movable cultural properties are also registered in the MIS.

The database was first created using Microsoft Access in 1999, but at the time there was limited understanding of how the database would be used or developed in the future. The database has since been transferred to the SQL Server platform. After the database was uploaded and tested via an intranet in 2006, it was made available for general use from 2008. Even members of the general public can access the database via the Internet as a guest user (without editing privileges) from a portal on the FAD website (http://www.finearts.go.th/).

Monument attributes recorded in the databse include: name; location (regional division, latitudinal and longitudinal coordinates, UTM and location acquisition methods); construction period (periodization, era, history); type; usage; materials used; and repair history (period, repairer, details). Where available, photographs, maps and diagrams have also been included.

Maps and satellite images used in the database were provided



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Figure 3-9-1: Monument GIS database screen. It is possible to search for and display a monument from the map by selecting the monument type.



Figure 3-9-2: Monument GIS database screen. Here, Wat Phrathat Doi Suthep has been selected. It is also possible to display the attributes of a monument in list form, and to download visual data such as photographs.



Image 3-1: Database training session for Regional Office of Fine Arts' representatives, carried out at the FAD.

by the government organization, GISTDA

(สำนักงานพัฒนาเทคโนโลยีอวกาศและูภมิสารสนเทศ, the Geo-Informatics and Space Technology Development Agency). The FAD is doing its utmost to secure data at no additional cost, but flood maps must be obtained for a fee from the Royal Irrigation Department (กรมชลประทาน). Other maps relating to earthquakes, active faults and landslides, are provided free of charge by the Department of Mineral Resources (กระ ทรวงทรพยากรธรรมชาติและสิ่งแวดัลอม) within the Ministry of Natural Resources and Environment (กรมทรัพยากรธรณี). The free, mutually beneficial sharing of information has been made possible because the Department of Mineral Resources needs cultural heritage spatial information to regulate mine development in cultural heritage locations.

The user account available to representatives of the FAD's 15 regional offices only permits users to edit information relating to their own region. It is also possible to enter data offline. FAD representatives monitor the data entries from the relevant department's inventory room, and if any pieces of data are missing, the director of the affected Regional Office of Fine Arts is notified by telephone or other means of communication. Once the director has confirmed and approved the details, the data is formally registered. Notebook computers and ArcGIS software are provided to the regional office, although some of their own computers do not meet the specifications needed to use the program. Reports suggest that the FAD representative responsible for the scheme is considering ways to improve this situation. A database training session for participating regional office personnel was carried out at the FAD during our first study visit in July. Two representatives from each regional office participated (Image 3-1).

Overlays illustrating earthquakes, active faults, landslides, and floods are used with the disaster map. Although the webbased database allows online data input, certain analytical tasks must be done using the ArcGIS stand-alone program; these tasks include buffer creation and using overlays with satellite images and other thematic maps, including disaster maps.

3-1-2-3 Disaster response committee

Following the 16th May, 2007 earthquake, which inflicted damage in northern Thailand, a disaster response committee was set up by the FAD, and in June 2009, it held its inaugural meeting. Its membership is composed of 7 or 8 civil engineers belonging to the Office of Archaeology and the Office of Architecture; the Head of the Registration Section, Ms. Manatchaya; and also former Office Directors, Mr. Arak and Mr. Suwitt, who participate as engineering advisors. In addition, representatives from three or four regional offices located in Zone 2 (Fig. 2-4) - the zone shown by the earthquake hazard map to be most vulnerable to earthquakes - also took part in the first meeting. The meeting focused on data relating to the overlay of the monument GIS database on the natural disaster map (Fig. 3-10). In particular, the group reviewed the number of monuments per province located within 5, 10 and 20 km of active faults, as well as all of the names and locations of monuments within 5 and 10 km of active faults. Incidentally, the number of monuments located within 5 km of active faults is 44, spread over 8 provinces; the number within 10 km is 75, spread over 10 provinces.

After its first and only meeting on 1st June, 2009, this organization was dissolved to make way for a new committee. The committee's goals now are to provide information about required disaster-time action and to focus on disasters aside from earthquakes, such as landslides, heavy rainfall, storms and floods. Since the committee will be focusing on other disasters, it has been decided that the participation of representatives from all of the Regional Offices of Fine Arts will be necessary, although details such as specific personnel selection are apparently yet to be decided.



Figure 3-10: Map showing overlay of active fault information on monument locations (produced by FAD).

3-2 Systems and Initiatives employed when Disasters affect Cultural Heritage Sites

When a disaster that could impact a cultural heritage site is anticipated, representatives from the Office of Archaeology gather information from media sources and then, if required, immediately make contact with Regional Office of Fine Arts offices by telephone or other means to ascertain the situation. If a study is deemed necessary, it is carried out within 2 to 3 days of the disaster. Urgent repairs are financed from the "Archaeological Fund." This is a reserve fund set aside by the FAD for emergency action, and it is made up of cultural heritage site entrance fees and contributions from private institutions. The purpose of the Fund is defined under Article 28 of the "Act on Ancient Monuments, Antiques, Objects of Art and Nations Museums B.E. 2504 (1961)" (Appendix 4).

Action is iniated when a director from one of the Regional Offices of Fine Arts requests assistance from the FAD, whose Director then instructs the Office of Archaeology Director to send the appropriate specialists.

Full-scale repairs are generally planned in advance and budgeted for. In such cases, the Regional Office of Fine Arts devises a repair plan, which is reviewed by the FAD committee and, if approved, is allocated a budget. This process is a generalized version of the response to the Chiang Saen earthquake (detailed below), which the FAD indicates is typical of the action taken in response to disasters.

3-3 International Cooperation

While this may not represent a concrete example of international cooperation during periods of disaster, there have been international movements to promote preventative measures to protect cultural heritage. One such movement is the *Forum on Risk Preparedness for the Preservation of Cultural Heritage*, held in Laos and Thailand by ASEAN+3 (Japan, South Korea, and China), between 12th to 19th January, 2009. Country report presentations were given and inspection tours were made to sites such as Ayutthaya, Chiang Mai, Champasak and Wat Phou. Forum participants included Brunei, Cambodia, Laos, Malaysia, Myanmar, the Philippines, Thailand, Vietnam, China and the international institution, SPAFA.

Conclusions and recommendations made at the Forum are detailed below.

The delegates discussed and agreed on the following recommendations for future cooperation among East Asian countries, including the ASEAN member states as well as the People's Republic of China, Korea and Japan: 1. Following this forum, East Asian countries should organize national workshops and apply the concept of risk preparedness to their own measures for the conservation of cultural heritage.

2. East Asian countries should promote and exploit their network of ties to improve cooperation on risk preparedness in the East Asian region.

3. East Asian countries should promote certain documents produced by countries that have particular experience and expertise in certain types of disaster. For example, Thailand could do a case study of risk preparedness for flooding, whilst Myanmar and Indonesia could jointly produce a case study on earthquakes. Each country could volunteer to prepare a document on the type of disaster situation that it has been working on, and that it has some experience of conservation in.

4. East Asian countries should consider establishing a common communication channel, such as a website, in order to disseminate the documents prepared in accordance with recommendation no.3, as well as to exchange and share experiences among participating states.

It has been proposed that, since the Ministry of Culture represented Thailand at this Forum, it could become a contact point for such matters. At the current time, however, Ms. Manatchaya Wajvisoot from the FAD's Office of Archeology reports that they have yet to see any concrete results in response to the recommendations of the Forum.

4. Case Study

4-1 Overview of Sustained Damage

This case study will review the Chiang Saen earthquake, also called the Nam Ma Earthquake after the name of the fault. The United States Geological Study (USGS) event ID is us2007ckan.

At 8.56 GMT (15.56 local time) on 16th May, 2007, a 6.3 (Mw) magnitude earthquake occurred, centered on a location 13.2 km east-south-east of Laos' western region of Ban Mone (20.483 degrees north latitude; 100.763 degrees east latitude). The hypocenter depth was 38 km (USGS). At the epicenter, four foreshocks were observed the day before the earthquake, and up until July 31st, 2007, 88 aftershocks at magnitudes of 2.5 to 4.5 were recorded. This earthquake is presumed to have been caused by Nam Ma fault activity.

Tremors were particularly strong in western Laos, and that four temples and two stupas were reported to have sustained damage.



Figure 4-1-1: The 16th May 2007 earthquake hypocenter, and instrumental seismic intensity (modified mercalli intensity) (USGS).

The epicenter was 61 km from the Thai border. The size of tremors in Chiang Saen were measured at VII, according to modified mercalli intensity. (This is equivalent to approximately five on the JMA intensity scale.) Large tremors were felt in Chiang Rai, Chiang Mai and Nan, and items placed on walls in Chiang Rai were knocked to the ground, whilst unsecured articles fell from shelves in Mae Rim. Although exact figures are not known, further damage such as cracks in walls and falling roof tiles also occurred in these northern Thailand regions. On 27th May 2007, a two-storey building in Mae Rim being used as a tourist information office collapsed, due to suspected damage sustained in the earthquake. Fortunately the building had been declared off-limits, so there were no casualties. Tremors were felt as far as 800 km away in the capital Bangkok, causing the upper parts of high-rise buildings such as office blocks and shops to shake, and some panic as people ran out into the streets. Even though Bangkok was far from the hypocenter, the soft ground amplified the tremors. Tremors were similarly felt in the Vietnam capital, Hanoi, reportedly provoking people to flee buildings and run out into the street there too.

Fortunately no casualties were reported as a result of this earthquake.



Figure 4-1-2: The 16th May 2007 earthquake epicenter and tremors. Figures show modified mercalli intensity and supplementary data. (Map created by the United States Geological Study KML file).

4-2 Reports of Damage inflicted on Cultural Heritage by Disasters

The following earthquake damage was sustained by Chom Kitti Pagoda, located in the Laos border town of Chiang Saen. The earthquake caused the metallic finial attached to the upper part of the pagoda building to fall to the ground, and to lose two embedded jewels. In addition, the base and plaster surface of the southeast corner of the building were cracked.

At first, it appeared that the pagoda's upper level, which has a core of brick and cement and is covered with plaster and metal plate, had also collapsed (Image 4-1-3). However, since it was necessary to remove this in order to reset the finial after it had fallen (the finial's stem had to be deeply embedded in the pagoda's upper level, and this could not be achieved with what remained), it transpired that the upper level had been removed after, rather than fallen because of, the earthquake.

According to Director Sahawat of the 8th Regional Office of

Fine Arts in Chiang Mai, the office responsible for this region, the Chom Kitti Pagoda was the only cultural heritage site apparently affected by this earthquake. Although one other temple claimed for repair expenses due to losses sustained in the earthquake, it was not clear whether this damage actually pre-dated the earthquake. Damage repair costs were allocated, nevertheless, because of the temple's high profile.

4-2-1 Chom Kitti Pagoda

Chom Kitti Pagoda belongs to the Chom Kitti Temple, located at coordinates of 100.08 $^{\circ}$ E, 20.28 $^{\circ}$ N in Wieng, Chiang Saen City, Chian Rai Province. Legend says that it was built in B.E. 1483 (940). According to the FAD database, it was constructed in B.E. 2030 (1487), and belongs to the Lanna Period. It became a national registered monument on 8th March, B.E. 2478 (1935). The physical area of this cultural property is 2,800 km². It is currently managed by the Chom Kitti Temple, and is still used as a temple and an object of worship. It has a brick structure, and its surface is covered by plaster and metal plates.

Chom Kitti is located on low hills (Figs. 4-2 and 4-3) that slope gently towards the river from the southeast side of the pagoda (Images 4-1-2 and 4-1-3). The soil's movement has caused the pagoda to lean ever since it was newly-built.

The temple maintains a record of repairs, with some records dating back to B.E. (1684). Repairs have continuously been carried out by the FAD, and in 1957 and 1968 relatively small-



Figure 4-2: Location of the Chom Kitti Pagoda, marked by an encircled triangle. It lies on a hill overlooking the river. (Source: FAD's GIS database of monuments)

scale work, such as defects repairs, was undertaken. Some comparatively small-scale repairs were also carried out in 1976 and 2006, prior to the earthquake. The 1976 repairs included using a hydraulic jack to prevent the leaning building from collapsing. Since the upper part had not deviated more than 1/3 from centre, work to correct the pagoda's lean was postponed in favor of measures to prevent the building from tilting any further. In addition, the apex was covered with concrete, some metal plates were attached, and the finial was fitted.

The pagoda has sustained repeated damage from past earthquakes (refer to Image 4-1-4). Legend also says that this region has suffered earthquakes in the past. Although no earthquake observation records exist for this region before observations commenced approximately 20 years ago, it is known that repairs for earthquake damage have been carried out in the past: evidence is available through historical records claiming that eathquakes had occurred, and from signs of earthquake-related damage to the pagoda.

A study carried out by the FAD in 1995 clarified that the main pagoda building had amplified cracks due to earthquakes; that parts of the upper pagoda building and plaster have fallen away; and that the building's tilt was deteriorating. An further analysis of the pagoda's construction and damage sustained was carried out by the FAD in 1995. As well as studying the quality and behavior of the surrounding area's soil, the analysis sought to clarify the cause of the damage.

Based on these results, and because repairs to secure the safety of the pagoda's base were previously postponed, the integrity of the base area was improved, and large-scale repairs were undertaken in 2006 to prevent soil fluidization (Figs. 4-4 and 4-5). This repair work required drilling a cylindrical hole in the soil at a distanced of 1.5 m from the outer edge of the terrace, filling it with concrete to create a concrete pile, and then reinforcing the soil around the pagoda with Portland cement after ensuring that it was tightly packed with no gaps. Deep cracks in the main pagoda building were filled with epoxy resin, while the surface was covered with plaster. The repair costs were funded by a government contribution of 7,000,000 baht, and the decoration repair costs of 4,000,000 baht were covered by contributions from private institutions.

This cultural heritage site only represents one example of measures being taken against earthquakes damage in Thailand. A drilling survey is currently being carried out at the other site we visited for this study - Wat Phrathat Doi Suthep at Chiang Mai - as a measure against anticipated landslides caused by earthquakes and other disasters.



Figure 4-3: A two-dimensional diagram of Chom Kitti (Source: Mr. Sudchai).



Image 4-1-1: Chom Kitti Pagoda



Image 4-1-3: The apex of the pagoda was removed for repairs in 2007. It now decorates the front face of the east side.



Image 4-1-2: The south face of the pagoda. This photograph was taken after confirming the horizontal level. The large tilt to the east is evident.



Image 4-1-4: The pagoda terrace. This picture illustrates the structure's tilt due to past earthquakes and soil movement, as well as repeated repairs.



3.

Figure 4-4: Repair plan drawing for Chom Kitti pagoda in 2006 (elevational view).



- Drawing Detail Design 1. Fixing by stainless steel pin and grouting with lime mortar
 - Soil improvement with cement column (cohesion requirement >6 ksc.) 2.
 - Reinforce concrete retaining wall and gutter
 Hard surface and direction of drainage

Figure 4-5: Repair plan drawing for Chom Kitti pagoda in 2006 (two-dimensional diagram).

4-3 Restoration of Disaster-Stricken Cultural Heritage Sites

Information about jewels falling from the finial of the Chom Kitti Pagoda was gathered from reports submitted by those personnel from the 8th Regional Office of Fine Arts who had headed to the scene straight after the earthquake. According to the office, the site was immediately sealed off with the cooperation of local police whilst personnel searched for the jewels. The 8th Regional Office of Fine Arts then asked the FAD to send their construction expert, Mr. Sudchai, who carried out a postdisaster field study 2 to 3 days later. Photographs taken show the post-earthquake scene (Image 4-1-2 - provided by Mr. Sudchai, 8th Regional Office of Fine Arts).

Repairs carried out included recreating the finial. To support the finial, the pagoda's upper section was removed and rebuilt, and epoxy resin and plaster was used to fill in cracks in the base area (Figs. 4-7 and 4-8). The time taken to create the damage report was about 3 to 4 months, whilst restoration work took about 8 months. It should be noted, however, that this timeframe was intended to coincide with the scheduled visit of Princess Sirindhorn in February, 2008.

As previously noted, the FAD carried out work in 2006 to prevent subsidence by reinforcing the surrounding soil embedding a concrete pile nearby. This was done in consideration of the fact that this particular cultural heritage site had experienced earthquake damage previously, and that the building was tilting due to soil fluidization. The FAD believes these measures to be effective in restricting damage caused by earthquakes, something that seems to be confirmed by a microtremor study of the soil surrounding Chom Kitti Pagoda and of the pagoda itself. A theodolite study is currently being carried out once a year to monitor the building's tilt.



Figure 4-6: Features photographed in Images 4-2-1 to 4.2.6, below.



Image 4-2-1: This photograph shows that the finial part of the pagoda's upper section is missing, after it was toppled by an earthquake (No.1 of Fig. 4-6).



Image 4-2-3: Severed surface of the finial's stem (No.1 of Fig. 4-6).



Image 4-2-2: The fallen finial (No.1 of Fig. 4-6).



Image 4-2-4: Severed surface of the finial's stem (No.1 of Fig. 4-6).



Image 4-2-5: Cracks in the surface of the pagoda wall, caused by earthquakes (southeast corner) (No.2 of Fig. 4-6).

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Image 4-2-6: Cracks close to the southeast corner terrace (No.3 of Fig. 4-6).



Image 4-2-8: Cracks in the plastered coving.



Image 4-2-7: Cracks in the surface of the pagoda wall, caused by earthquakes (plastered area).



Image 4-2-9: Cracks in the plaster.



Figure 4-7: Post-earthquake repair areas and details (Source: Mr. Sudchai Phansuwan).



Figure 4-8: Specification of repairs to pagoda's apical parts (Source: Mr. Sudchai Phansuwan).

4-4 Microtremor Survey of Chom Kitti Pagoda and Wat Phrathat Doi Suthep

4-4-1 Overview

The third study carried out in November 2009 examined microtremor activity at the two locations stated above. This study aimed to clarify the effect of repairs and current problems by measuring microtremors at the two sites. For Chom Kitti Pagoda, this study was undertaken after soil reinforcement and repairs as well as post-earthquake repair work had been carried out. In the case of Wat Phrathat Doi Suthep, it was undertaken before fullscale soil improvement work had been carried out at cliff face and surrounding areas

Chom Kitti pagoda has already been introduced so now we will provide an outline of Wat Phrathat Doi Suthep details. Wat Phrathat Doi Suthep is located at 98.92 ° E,18.8 ° N in the Suthep district, Chiang Mai City, Chiang Mai Province, and sits on Suthep mountain at an altitude of 1,053m. According to the FAD database, it was built in the B.E. 20th century (sometime between the 14-15th centuries), and belongs to Chiang Saen / Lanna Period. The structure is made from brick and covered with plaster, and the surface is covered with metal plates with added gold leaf. The the day-to-day management is undertaken by Phrathat Doi Suthep Temple.

Because this temple sustained damage due to seismic tremors and, as stated above, is located on a mountain top as well as being surrounded by cliffs, there are fears of landslide damage being caused by earthquakes. Ground improvement work at the areas surrounding temple and cliffs is, therefore, currently being planned and implemented.

This study was carried out by Yutaka Nakamura, a Visiting Professor at the Tokyo Institute of Technology. Professor Nakamura's report is published below.



Image 4-3-1: Wat Phrathat Doi Suthep.



Image 4-3-2: Looking out over an urban area from Wat Phrathat Doi Suthep. It is evident from this photograph that Wat Phrathat Doi Suthep sits on a clifftop.



Figure 4-9: Location of Wat Phrathat Doi Suthep (Source: FAD GIS database of monuments). Its position at the top of a mountain is evident.



Figure 4-10: Two-dimensional diagram of Wat Phrathat Doi Suthep (Source: FAD GIS database of monuments).

4-4-2 Report of a Microtremor Survey conducted at the Thai Cultural Properties of Chom Kitti Pagoda and Wat Phrathat Doi Suthep

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1. Introduction

This report outlines results of a microtremor survey carried out for two cultural properties located in Thailand.

The two cultural properties are listed as follows.

- ① Chom Kitti
- ⁽²⁾ Wat Phrathat Doi Suthep

Both sites have a history of earthquake damage and it is considered that they have a high possible of sustaining earthquake damage sometime in the future. It is also thought that they are highly exposed to landslide damage. Particularly with regard to the former, the 2007 earthquake caused the finial of the pagoda apex to fall, and damaged the southern end of the earth retaining wall in the southeast side causing the discharge of sediment. With regard to the latter, soil improvement work is currently being carried out to prevent landslides. The locations of the cultural properties where the microtremor surveys were carried out are shown in Figure 0.

This report is based on a microtremor measurement survey (measurement dates: 22nd and 23rd November, 2009) of the ground surrounding the cultural properties, and states the results of the estimated ground motion characteristics of the surrounding ground.

2. Microtremor measurement and analytical methods

A microtremor is an extremely small vibration measurable anywhere and at any time, and possible causes can be attributed to natural activities (weather and ocean waves etc.) and the social activities of humans (roads, railroads and construction work etc.). The idea of using this micro vibration to estimate the ground motion characteristics of surface layers and structures is not a new one. However, microtremors reflect a diversity of possible causes and their micro vibrations contain a wide range of information so extracting the information necessary for our purposes will become crucial.

Here, our analysis aims to estimate the ground motion characteristics (natural frequency and amplification factor etc.) of soil deposits occurring due to multiple reflections of shear waves within the surface layers. In other words, the horizontal spectrum will be divided by a vertical spectrum where the frequency spectrum of the three-direction component microtremor is measured at a certain point, and try to estimate the ground motion amplification factor of each component. This is commonly known as the H/V method, and has become the standard method to estimate the ground motion characteristics of surface layers.

Specific microtremor measurement and analytical methods are detailed as follows.

Measurement method: microtremor was observed three times for 40.96 seconds at each measuring site.

Analytical method: frequency analysis is performed per measurement and per directional component, and the spectral ratio between horizontal and vertical components is calculated. Taking the average of each directional spectrum and H/V spectral ratio calculated from the three measurements, and then after calculating predominant frequency F and amplification factor A as the measurement amount of each measuring site, analysis is carried out. However, when calculating the average, items that appear to be heavily influenced by adjacent noise, such as passers-by, were omitted so for several locations the analysis results are for the one-time 40.96 second measurements. Assuming that the shear wave velocity of the base Vb is 600 m/s based on the estimated predominant frequency F and amplification factor A, the base depth h taken from formula (1) is estimated and surface layer fragility index Kg is calculated according to (2).

$$h = Vb/(4AF)$$
(1)
$$Kg = A^2/F$$
(2)

3. Measurement results and analysis 3.1 Distribution of measuring sites

Distribution of measuring sites per location is shown in both Figures 1 and 2.

For Chom Kitti, microtremors were measured at a total of 30 places including 29 places within the area centered on the pagoda and within the pagoda terrace together with one groundbased place outside the area. Measuring sites were placed taking into account the direction the pagoda is tilting and the parts that had collapsed within the area.

In the case of Doi Suthep, we distributed measuring sites across the length and breadth of the region centering on the area where ground improvement work has been carried out. We measured microtremors at a total of 15 places including 4 places within the pagoda grounds and 5 places within the ground improvement work area, and then 6 places around the periphery of those areas.

3.2 Measurement results

Both regions have a lot of tourists so people passing nearby the measuring sites were unavoidable. The locations influenced by disturbances, such as passers-by, during measurement time are as follows.

Chom Kitti: Compared to measurements taken within the terrace (B measuring site group) where people do not pass nearby, measurements taken outside the terrace were heavily influenced by disturbances such as passers-by, and G3 and G9 measurements were particularly noticeable. At G3, in addition to passersby, particularly large vertical motion was measured, and it is feared that air gaps have formed between the nearby pavement and ground. A more detailed survey is recommended.

Doi Suthep: The influence of people circling and saying prayers within the terrace area was strikingly evident in G4 measurements. Aside from that, influences on G8, G14 and G3 measurements were also noticeable. G9 to G13 were within the ground improvement work area but this had no influence considering that work was temporarily halted for us while measurements were being taken.

The influence of noise created by people passing-by, as noted above, was evidenced by the peak section of the H/V spectral ratio being shifted downward, which could have lead to an underestimated amplification factor. At measuring sites where the influence of traffic noise was acknowledged (Chom Kitti: G3 and G9; Doi Suthep: G3, G4, G8 and G14), noise influence was adjusted by estimating the amplification factor using pre-peak trough as a criteria when the shift was large.

3.3 Analytical results and analysis

A spectral analysis of the measured microtremor waveform was performed, and the Fourier spectrum per directional component (X, Y, Z) of each measuring site and H/V spectral ratio (X/ Z, Y/Z) are shown in Figures 3 to 6 per location. The analysis results of measured microtremor waveform for each location will be stated below.

3.3.1 Chom Kitti

Here we will show the spectrum and spectral ratio for locations divided between the terrace area (B measuring site group) and its periphery area (G measuring site group). As shown by the diagrams, little variation can be seen per measuring site within the terrace area for both the spectrum and spectral ratio. This shows that there were no vibration sources caused by nearby disturbances so microtremor conditions were stable. Further, it showed that low-frequency H/V converges to a value slightly higher than one at many measuring sites and vertical motion is relatively small. It is believed this shows the influence of the surface pavement, and suggests that the amplification factor is slightly overestimated. Looking at H/V, the predominant frequency is in the 2.5 Hz range and the amplification factor is around 10 times. It was acknowledged that two predominant frequencies were clearly adjacent in the X-direction. There was generally only one Y-direction predominant frequency. Further, the trough decline acknowledged after the H/V peak was not as large. This shows that the influence of surface waves is not large.

Reading the predominant frequency and amplification factor from the H/V spectral ratio, the frequency and amplification factor of directional components with a large Kg value and the Kg value then calculated together with the estimate value of sedimentary layers are shown in Table 1 and the mapped version is shown in Figure 7. The diagrams visually display the measurement results in a two-dimensional form centering on the pagoda building, and they show graphs, compiled per survey line, of measuring site groups placed on the grid around the pagoda.

Looking at these diagrams, while the predominant frequency is generally constant between 2.5 Hz to 2.8 Hz, the amplification factor fluctuates greatly between 3 to 15 times depending on the measuring site. Together with this, sedimentary layer estimated results also fluctuate greatly according to location, and results show that the layer becomes shallow at the area outside the corner of the pagoda side where it is tilting. It is considered that because it is concrete coated, the ground motion at the surface would not change greatly according to place. Thus, it is presumed that shear strain occurring in soil deposits will greatly increase where sedimentary layers are thin so the Kg value increases at the southern area around the corner. When above 45 $(10^{-6} / \text{Gal}, \text{Gal}=\text{cm/s}^2)$ the Kg value is large so it is considered that some form of ground displacement will occur at a ground motion of about 20 Gal and over (just able to withstand an earthquake measuring four or above on the Japanese intensity scale, or seven or above on the MMI, Modified Mercalli Intensity).

3.3.2 Doi Suthep

Perhaps attributable to the large amount of tourists, compared to Chom Kitti, H/V spectral ratio variations estimated from the measurement results are large. Their H/V peak, which is less than 10 times and in the range of 3 Hz, is smaller than Chom
Kitti's. The post-peak trough is slightly predominant, showing the existence of surface waves. Although the low-frequency H/V here also is slightly large, it is around the one Hz, and it is presumed that valid estimate values have been given for predominant frequency and amplification factor.

Reading the peak frequency and amplification factor from the spectral ratio, directional components with a large Kg value are shown as a predominant frequency and their amplification factors are shown in Table 2. The Kg value estimated from these values and the basement depth as a reference value (sedimentary layer) are also shown in this Table. Figure 8 relates these values to each survey point and is a visual display of these values centered on the pagoda building. The diagram also provides a graphical rendering of horizontal and vertical survey lines around the periphery of this area.

According to these diagrams, the predominant frequency barely fluctuates at around the 3 Hz mark. The amplification factor fluctuation between 3 and 6.5 is minor. Places where sedimentary layers are thin or the Kg value is small corresponds with places where soil improvement work was carried out, meaning it will correspond to places judged to be highly-exposed to landslide hazards. However, the Kg value was small when below the 9 mark so it is presumed that ground displacement will occur at a ground motion of well in excess of 100 Gal (able to withstand an earthquake measuring five or above on the Japanese intensity scale, or eight on MMI).

3.4 Summary

The results of the survey of microtremors in Chom Kitti and Doi Suthep revealed the following.

1) Chom Kitti

1. It is estimated that the natural frequency of surface layers is about 2.5 Hz and an amplification factor of approximately 10 times

2. While predominant frequency fluctuations within the temple grounds are not as large as that, amplification factor variations are large. And sedimentary layer and Kg value estimated results vary according to the site.

3. A tendency for Kg values at the circumference of the corner of the leaning pagoda to increase when above approximately 50 (10^{-6} / Gal) was shown, and if the pagoda's tilt is due to an earthquake, it is presumed that this is attributable to foundation ground fluidization.

4. It is presumed that fluidization occurred at ground motion greatly exceeding 20 Gal (just able to withstand an earthquake measuring four or above on the Japanese intensity scale, or seven on MMI).

Currently, it is considered that since ground piles have been continuously formed to surround the terrace and the ground surface have been covered by concrete pavement as a countermeasure, the possibility of the pagoda subsiding despite soil fluidization is small. However, it is thought that an examination is required in the event of soil liquefaction occurring due to large ground motion and the soil surface's concrete coating becoming damaged. At the G3 measuring site, because abnormal vertical motion was observed and air gaps may have formed under the concrete coating surface, it is considered that a survey is necessary.

2) Doi Suthep

1. The natural frequency of surface layers is an amplification factor of approximately 3 to 6.5 times at about 3 Hz.

2. Predominant frequency fluctuations are minor and amplification factor only fluctuated to around the two times mark.

3. Estimated sedimentary layers became thinner on the west side, and estimated Kg value results increased at the periphery of this area.

4. The Kg value was approximately 9 and below, and becomes smaller than Chom Kitti, which had a considerable number of measuring sites exceeding 10.

5. Places with larger Kg values largely correspond to places which are carrying out landslide measures, and it is presumed that large level ground motions far exceeding 100 Gal (able to withstand a earthquake measuring five or above on the Japanese intensity scale, or eight on MMI) could cause some form of transformation.

4. Conclusion

The above outlined the results of our mictrotremor survey. Although the results reviewed here do not touch on nonlinear characteristics at all, gaining results consistent with physical inspections of deformities and hazards, showed that microtremor research greatly contributes to securing the seismic and health assessment of cultural properties.

In the event of a large earthquake exceeding five on the Japanese intensity scale, the physical properties of surface layers change greatly due to strain, causing phenomena such as reduced natural frequency. This may be a nonlinear characteristic but such changes generally cause greater soil displacement, leading to increased ground hazards. We would be very pleased if sufficient attention was paid to such issues.

There were several other interesting phenomena thrown up

by this microtremor survey but these issues should be examined further in future research.

Lastly, when carrying out the measurement work, I received the cooperation and support of Yoko Futagami, Senior Researcher, and Tomomi Haramoto, Research Fellow, both of the National Research Institute for Cultural Properties, Tokyo; and Mr. Sudchai Phansuwan, civil engineer, and Ms. Manatchaya Wajvisoot, architect, both of the Thailand Ministry of Culture. I would like to express my gratitude here in writing.



Figure 0. Locations of the Investigation Sites



Distribution of Measurement Sites (Chom Kitti_1)

Figure 1 (a) Distribution of Monsuring Sites for Chem Kitti (Area II: inner Pageda)



Distribution of Measurement Sites (Chom Kitti_2)



Figure 1 (c) Distribution of Measuring Sitos for Chom Kitti (Area G: out of Area 10



Figure 2 Distribution of Measuring Sites for Dei Suthep







Figure 4 H/V Spectral Ratio of Microtromov for Chom Kitti







Frequency in Hz.

Figure 6 H/V Spectral Ratio of Microtremor for Liek Sathep

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Otom Kitt	H/V	√p=600m/s			
site	E	A	Depth	Ké	direction
-01	2.64	47	12.2	8.2	N
G2	2.56	0.9	14,8	6.0	N
G3	2.54	5.4	11.0	11.4	N
G4	2.59	3.7	15.5	5.4	E
G5	2.44	3.0	20,5	3,7	N
G6	2.69	4.3	13.1	6.7	N
G7	2.50	4.7	12,4	8.8	E
G8	2.78	5.0	10,0	8.9	N
G9	2.47	6.0	10.2	14.6	E
Giff	2.49	5,9	10.2	14.1	N
G11	2.54	4.0	14.6	6.4	N
G1z	241	7.6	8.0	23.1	E
G13	2.71	8.1	6.8	24.2	N
614	2.56	112	5.2	48.8	E
G15	2.76	15.4	3.5	88.3	E
G16	2.61	10.8	5.3	44,7	04
G17	2.39	6.2	10.0	18.3	E
G18	Z.44	4.8	12.9	9.3	e
-91	2.78	4.1	13.0	6.1	N
62	2.7B	4.9	10.9	8.7	e
83	2.64	5.0	11.3	9.6	04
84	2.54	4.3	13.6	7.4	E
85	2.40	6.4	13.1	11.8	E
85	2.63	6.8	8.0	15.3	E
87	2.39	5,4	11.6	12.2	E
88	2.86	7.9	6.7	21.7	E
BB	2.58	12.3	17	58.0	N
810	2.64	7.5	7.6	21.2	N
Bti	247	5.0	12.3	9.9	N
B12	241	4.5	13.4	8.3	E

Table 2

Prodominant Frequencies: Amplituscom Festors, Estimated Depth of Enveniend General and Maxaman Sg for the Subjey

DOrSuther	H/V F(10)	√b=500m/s A	Depth.	KE	direction
site					
GI	2.93	3,72	13.8	4.7	х
62	3.00	3.25	15.4	3.5	×
- G0	2.93	3.59	14.3	4.4	X
GA	2.86	5.06	10.4	8.9	X
G5	2.91	3.97	13.0	5.4	X
G6	3.25	6.45			Y
G7	3.00	4.45	112	6.6	x
.05	2.95	3.04	10.1	8.6	Y
G9	2.95	3.15	16.1	3.4	X
G10	2.95	3.21	9.7	9.2	X
GIT	2.95	5.21	9.7	9.2	Y
G12	3.03	3.26	9.4	9.1	Y
G13	3.10	3.85	12.6	4.8	x
G14	2.95	3.06	10.1	8.7	Y
G18	3.0.3	5.04	6.8	8.4	X

Amplification Package for GA (58 and GDA are modified. (40 is on a Poor ship, not on ground.)

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Figure 70a) Kesults of Measurement for Cham Kitti (Predominand Frequency in Hz)





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Chom Kitti-Depth * 3 ŀ 1 54 Ale-III 12 Nag. 18-11 80-TI 11-30 00-1 10.00 10-11 8 7 12-02 6 Depth 11.0 11-00 11 1 (1-4) ----18-00 1.8-21 18-25 h 25 20 -1.8-41 0 18-00 ó 12-01 14-12 18-10 (head 11 18 11 -11 . .

Figure 7(c) Results of Measurement for Chom Kitti (Estimated Depth of Easement Ground in m)





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Doi Suthep-F



Figure 8(a) Results of Measurement for Dia Sother (Prodominant Frequency in Hz)



Pagrato Sib) Results of Measurement for Dei Suthop (Amplification Partor)



(Estimated Double of Basement Ground in m)



Figure 861) Results of Measurement for Doi Suther (Veloerability Index (fg)

4-5 International Support

The aforementioned cultural heritage sites have never received any assistance through international cooperation for postdisaster restoration and renovation. Articles in some guidebooks do state that UNESCO and Japanese donations funded work on the upper section of Wat Chedi Luang in Chiang, carried out in 1992 to repair damage caused by an earthquake over 400 years ago (1545). However, no confirmation of this could be found amongst UNESCO budget records, and the FAD could not verify its authenticity either because they had no record of the details, and the staff who worked in the Chian Mai regional office at that time had apparently either left or retired.

When interviewing FAD specialists about what kind of help they can expect from Japan in the future, the subject of postdisaster rescue did not come up: instead, the FAD is hoping to learn from Japanese earthquake disaster prevention case studies. In particular, they would like to learn specific earthquake resistance techniques, methods of studying cultural heritage sites' vulnerability to earthquakes, and the formulation of maintenance plans, together with the development of public systems such as the coordination of organizations involved in cultural property disaster prevention and information distribution. Current earthquake resistance standards in Thailand are only specified in laws related to building standards. None of these laws specifically target cultural heritage sites, and it appears that there are no antiseismic reinforcement guidelines specified for cultural heritage sites.

Other Japanese initiatives that interest the FAD include the inventory of information relating to the disaster history of cultural heritage sites, and the utilization of databases to support cultural heritage site disaster prevention activities, such as hazard assessment through the use of overlays with hazard maps similar to those used for earthquakes and flooding. With regard to the formulation of disaster prevention schemes utilizing GIS databases, since Japan has also just started developing such initiatives, it is hoped that mutually beneficial insights can be gained through collaborative research with Thailand.

5. Conclusion and Recommendations

During times of disaster, cultural heritage rescue operations in Thailand are carried out by a collaborative system underpinned by the Ministry of Culture's Fine Arts Department (particularly the Office of Archaeology), and 15 regional offices who directly handle cultural heritage affairs across the country. Expenditure and procedure plans for completing urgent post-disaster repairs, as well as pre-determined full-scale repairs, are submitted by regional offices for review by an FAD committee, who examine the plan's validity. On the other hand, cultural heritage earthquake disaster prevention initiatives in Thailand, such as earthquake resistance measures and hazard assessment, are in their infancy. One reason for this could be the fact that the frequency and scale of earthquakes in Thailand over the past 100 years do not match those experienced in Japan. Nevertheless, the real possibility of an M7 class major earthquake striking at any time, as indicated by past records and active fault surveys, makes the installation of cultural heritage site earthquake countermeasures crucial.

As stated at the beginning of this report, post-natural disaster rescue activities have to prioritize competing demands such as lifesaving operations and infrastructure restoration. Therefore, attempting to organize domestic operations (or even more so, international teams), to enter affected regions just after a disaster in order to rescue cultural heritage sites is not only impractical, it could also generate hostility. What is needed, instead, is a "disaster prevention" perspective that minimizes the action required when a disaster strikes. Therefore, implementing joint research projects before a problem occurs, even if it calls for international cooperation to implement effective operations, is desirable. Such prevention relates fundamentally to antiseismic reinforcement, seismic diagnosis and microtremor measurement as carried out by this study, to assess structure fragility. It also includes developing systems such as cultural heritage conservation schemes founded on damage anticipation assessment, the examination of such schemes, disaster-period information distribution, and concrete rescue operations methods. It is also necessary to communicate the significance of cultural heritage and its protection to those physically closest to the sites, such as owners and local residents. Such groups could help to protect cultural heritage sites when it is impossible for specialists to enter the scene soon after a disaster, in which case methods of educating and communicating with such groups needs to be examined. It is believed that Japan, which experienced a major earthquake of its own in 1995, has a lot to offer in terms of disaster prevention initiatives that address a wide range of matters.

It was clear from this study that, due to the similar sizes of our nations, and Japan's abundant experience in dealing with major earthquake damage, Thailand Ministry of Culture's Fine Arts Department seeks joint research opportunities with Japan. After collaborating with specialists from various fields, we believe there is great deal that Japan can contribute to Thailand in this field, and that our contribution would be highly significant. In addition, while it is acknowledged that cultural heritage in Thailand possesses its own particular problems, it is believed that since we share a number of similar concerns, such as the application of databases, Japan will also benefit from feedback obtained during joint research in this field between our two countries.

Lastly, we would like to thank all those who cooperated in this study from the Office of Archaeology, Fine Arts Department, Ministry of Culture; the 8th Regional Office of Fine Arts; and the Department of Mineral Resources, Ministry of Natural Resources and Environment; as well as friends at the Ministry of Foreign Affairs, Kingdom of Thailand, who greatly encouraged the author.

Chapter 2 Case Study

3. Indonesia

(Case studies of the Tsunami Disaster Triggered by the Sumatra Earthquake, the Central Java Earthquake, and the Padang Earthquake)

1. Research Overview

In recent years, we are seeing growing concern about damage to cultural heritage, as we witness increasing examples of such damage caused by both natural and human-induced disasters. To safeguard irreplaceable cultural heritage, routine disaster prevention measures are strongly sought, but initiatives against disasters vary widely according to country. In many cases, fullfledged disaster prevention schemes for preservation of cultural heritage are established for the first time only after invaluable assets have received catastrophic damage from a natural disaster. However, based on a growing awareness that recovery process of disaster-affected cultural heritage requires prompt and effective action, foreign countries are increasingly seeking Japan's cooperation, and Japanese experts are finding themselves providing cooperation more frequently than ever. Yet even so, once a disaster occurs, it is difficult to respond in a fully prompt and effective manner. Therefore, we must always be prepared with a clear assessment of how it may contribute to disaster relief, and should consistently maintain a cooperative relationship with potential beneficiary countries.

Under this circumstance, the Japan Consortium for International Cooperation in Cultural Heritage (JCIC-Heritage) was requested by the Japanese Agency for Cultural Affairs to conduct a research on international cooperation in the recovery process of disaster-affected cultural heritage. The main focus of the study was to examine disaster prevention and response frameworks in Indonesia in relation to cultural heritage, and to assess the reality of international cooperation in the recovery process of disasteraffected cultural heritage through specific examples of postdisaster international cooperation in five countries including Indonesia. For Indonesia, the examples we selected were the Aceh tsunami disaster that resulted from the Sumatra Earthquake, the Central Java Earthquake, and the most recent West Sumatra Earthquake, which struck Padang in September 2009.

This present section provides an overview of the survey, and Section 2 describes the characteristics of natural disasters in Indonesia and to cultural heritage. Section 3 discusses disaster prevention and restoration frameworks related to cultural heritage, and Section 4 provides a general understanding of the reality of post-disaster cultural heritage restoration and international cooperation, based on a number of case examples. The final section presents a summary conclusion of the study and proposals.

Research Schedule

Duration Phase 1: November 1 (Sun) – 6 (Thu), 2009 Phase 2: November 18 (Wed)

- December 1 (Tue), 2009

[Phase 1 Survey]

Nov 1 (Sun)	Depart Japan,	arrive in Bali
-------------	---------------	----------------

- Nov 2 (Mon) Depart Bali, arrive in Jogjakarta Prambanan Temple Compounds (Loro Jonggrang, Sewu, Asu), Ratu Boko
- Nov 3 (Tue) Participation in a UNESCO experts' site visit Borobudur Temple, Pawon Temple, Mendut Temple, Sewu Temple, Loro Jonggrang Temple
- Nov 4 (Wed) International experts meeting on Borobudur Temple and the Prambanan Temple Compounds (hosted by UNESCO)
- Nov 5 (Thu) International experts meeting on Borobudur Temple and the Prambanan Temple Compounds Depart Jogjakarta
- Nov 6 (Fri) Arrive in Japan

[Phase 2 Survey]

- Nov 18 (Wed) (Tashiro) Depart Japan, arrive in Jakarta
- Nov 19 (Thu) Depart Jakarta, arrive in Padang
 Participation in damage assessment survey on historic buildings
 Nov 20 (Fri) Meeting with Prof. Eko of Bung Hatta University
 - Participation in an urban planning survey (Sugahara) Depart Japan, arrive in Jakarta
- Nov 21 (Sat) Inspection of the Pariaman area
- Nov 22 (Sun) Depart Padang, arrive in Banda Aceh Meeting

Nov 23 (Mon) Meeting

Visit to the Harun residence (Pak. Harun Kuchik Leumiek)

Ali Hasimi Education Foundation (Yayasan Pendidikan Ali Hasjmi) Bureau of Culture and Tourism of Aceh Provincial Government Archives (Badan Arsip) International Centre for Aceh and Indian Ocean Studies (ICAIOS) Nov 24 (Tue) Archives (Badan Arsip) Aceh Provincial Museum (Museum Negeri Propinsi) Aceh Documentation and Information Center (PDIA) Tsunami Museum, Dutch Cemetery (exterior only) Research Center for the Study of History and Traditional Values (Balai Kjian Sejarah dan Nilai Traditional) Nov 25 (Wed) Meeting Taman Sari Gunongan Monument Depart Banda Aceh, arrive in Jakarta Nov 26 (Thu) UNESCO Jakarta Office National Library of Indonesia (Perpustakaan National) Directorate General of History and Archaeology, Ministry of Culture and Tourism Nov 27 (Fri) Meeting with Dr. Titik Pudjiastuti Depart Jakarta, arrive in Padang Meeting at Andalas University Nov 28 (Sat) (Dr. Oman Fathurahman) Arrive in Padang (08:00)Manuscript survey (destinations listed below) Mesjid Raya Mudiak Padang / Surau Tandikek (Padang Pariaman) Mesjid Raya VII Koto Ampalu (Padang Pariaman) Surau Ampalu Tinggi (Padang Pariaman) Surau Baru Bintungan Tinggi (Padang Pariaman) Surau Paseban (Padang) Nov 29 (Sun) Manuscript survey (destinations listed below) Surau Darussalam (Agam) Surau Syattariah (Batusangkar, Tanah Datar) (Dr. Oman Fathurahman) Depart Padang (19:00) * Tashiro to follow a separate schedule to meet with Mr. Fitra Arda, head of the local archaeological heritage preservation office for West Sumatra and Riau (known as BP3 Batusangkar),

an organization based in Batusangkar under the Directorate

General of History and Archaeology of the Indonesian Minis-

try of Culture and Tourism. Nov 30 (Mon) West Sumatra Provincial Museum West Sumatra Provincial Library Local archives Sugahara and Tashiro depart Padang (12:30) Dec 1 (Tue) Arrive in Japan

Members of the Mission

- Yumi Sugahara (Lecturer, Department of Asian Studies, Faculty of International Culture Studies, Tenri University), Phase 2 survey
- Akiko Tashiro (Research Fellow, Japan Consortium for International Cooperation in Cultural Heritage), Phase 1 and 2 surveys

Indonesian experts

Dr. Oman Fathurahman (Researcher, Islamic Society Research Center, Islamic University of Indonesia Jakarta Campus), Participation in the Padang survey

Pramono (Lecturer, Faculty of Letters, Andalas University), Participation in the Padang survey

2. Characteristics of Disaster Damage to Cultural Heritage in Indonesia

This section provides a general overview of natural disasters that have occurred in Indonesia in the past and the types of cultural heritage assets that have been damaged in those disasters.

2-1 Natural Disasters in Indonesia

Indonesia, like Japan, is a volcanic earthquake country situated within a zone of high seismic activity known as the "Pacific Ring of Fire." For this reason, it is frequently subject to such natural disasters as earthquakes, tsunamis triggered by earthquakes, and volcanic eruptions, in addition to water disasters such as floods and landslides. In December 2004, a massive earthquake occurred and shifted more than 1,000 km of Indonesia's plate boundary from the coast of Sumatra to the Indian Ocean. The resulting large tsunami claimed more than 170,000 lives. Volcanic activities are also prominent in the country. On Java Island alone, where the capital city of Jakarta is located, small eruptions frequently still occur today from a number of active volcanoes including Mount Guntur, Mount Merapi, Mount Buromo and Mount Semeru. Every year, regions throughout Indonesia experience mudslides and sudden floods caused by heavy seasonal rains. Particularly in the capital city of Jakarta, annual floods virtually sweep away entire slum communities in areas near river basins that are vulnerable to floods, and cause

extensive damage. Newspapers broadcast that the main causes of these frequent floods are deforestation and urban development based on inadequate city planning. In the large flood that struck Jakarta in February 2007, close to 340,000 local residents were urged to evacuate, but the city nevertheless suffered many casualties. In Borneo near the Malaysian border, large-scale mountain fires frequently break out every year due to the burning of fields especially during the dry season, and affect even the neighboring countries.

2-2 Overview of Disaster Damage to Cultural Heritage in the Past

Indonesia is a multi-ethnic nation made up of more than 300 ethnic groups. It is also an island nation with the world's largest number of islands, including the islands of Java, where the capital city of Jakarta is located, Sumatra, Borneo (Kalimantan), Sulawesi, Bali, and many other islands of various sizes. While respecting this diversity in ethnic groups and regional cultures, Indonesia aims to achieve "unity within diversity," as well as wishes to integrate the diversity as the nation of Indonesia. Consequently, cultural policies play an extremely important role in Indonesia. The Law on Cultural Property was issued in 1992 and remains in force today. There are more than 8,000 registered archaeological heritage sites in Indonesia, although the distribution naturally varies widely among the regions.¹ Three cultural assets-Borobudur Temple, the Prambanan Temple Compounds, and Sangiran Early Man Site-and four natural assets have been inscribed on the UNESCO World Heritage List (as of December 2009). To global society, the most well-known cultural heritage in Indonesia is the large-scale stone structures in Java, as represented by the Borobudur Temple and the Prambanan Temple Compounds. However, many other historical structures also exist in Indonesia, including the traditional wooden buildings of Toraja, Nias, and Bukit Tinggi, colonial-style buildings, Hindu temples such as the Pura Besakih in Bali, and the numerous mosques and religious buildings that are found through the country.

It is difficult to assess past disaster damage to Indonesia's cultural heritage based on a broad understanding of its diversity, but we were unable to find any historical materials containing relevant information during this research. The local archaeological heritage preservation office holds reports on the restoration of monuments mainly in Java dating back to the period of Dutch rule, including a report on the restoration of the Prambanan Temple Compounds compiled in the early 1900s, but historical materials that specifically focus on disaster damage to cultural heritage have not been found.

Here, let us simply present a list of tangible and immovable cultural heritage assets that have suffered disaster damage in the past five years and that appear to have had an influence on the framework of recovery process of disaster-affected cultural heritage in Indonesia.

December 2004	Aceh's written cultural heritage-damaged in
	the Sumatra Earthquake and resulting tsunami
March 2005	Historical wooden buildings-damaged in the
	Nias Island Earthquake
May 2006	Monuments, royal palaces, and townscapes
	in Central Java and Jogjakarta, including the
	World Heritage site of the Prambanan Temple
	Compounds-damaged in the Central Java
	Earthquake
September 2009	Historical buildings in Padang-damaged in

3. Disaster Preparedness and Recovery of Cultural Heritage: Structural Framework and Measures

the West Sumatra Earthquake

Indonesia has experienced numerous natural disasters throughout its history, given the severe conditions of its natural environment. This section discusses the framework and initiatives which Indonesia has taken to protect its cultural heritage from natural disasters and to effectively respond to the occurrence of such disasters.

3-1 Disaster Preparedness

The Indonesian government, based on its reflections of the 2004 tsunami disaster, is promoting studies regarding hazards such as earthquakes, tsunamis, and volcanic eruptions and their countermeasures, with support from various countries. For Japan's part, the Earthquake Research Institute of University of Tokyo and the Indonesian Institute of Sciences (LIPI) have commenced a project on "Multi-disciplinary Hazard Reduction from Earthquakes and Volcanoes in Indonesia." The project will be implemented over a period of three years, from 2009 to 2011, under the "Science and Technology Research Partnership for Sustainable Development (SATREPS)" program of the Japan Science and Technology Agency (JST) and Japan International Cooperation Agency (JICA).² In addition to the above two Japanese and Indonesian academic institutions, participants to the project also include ministries and agencies of the Indonesian government, such as the Survey and Map Agency; Agency of Meteorological, Climate, and Earth Physics; National Disaster Prevention Agency; Ministry of Internal Affairs; Ministry of National Education; and Ministry of Public Works. The project specifically focuses on research activities in the following areas: elucidation and estimation of the mechanisms of earthquake and tsunami occurrence; hazard countermeasures such as volcanic activity prediction and activity evaluation methods; development of social infrastructures that build anti-disaster capacities; disaster response systems and measures for overcoming social weaknesses during the reconstruction process; promotion of disaster prevention education and awareness-raising activities; and cooperation with the government to ensure the effective application of research results.

Since the 2004 tsunami damage, progress has been made in the establishment of frameworks for tsunami and earthquake prevention. However, disaster prevention framework for disasteraffected cultural heritage has not been planned or implemented especially at provincial level.

3-2 Strucutural Framework and Measures in Time of Disaster

Disaster assessment surveys are conducted by the central government, local governments, cultural property owners, and international agencies such as UNESCO. Article 3 of the 1992 Law on Cultural Property³ prescribes the obligation of the central government to conduct an assessment survey following a disaster, but the central government may delegate the task to local governments. Cultural property owners are allowed to take part in the survey. In the case of properties inscribed on the UNESCO World Heritage List, such as the Prambanan Temple Compounds and Borobudur Temple, UNESCO is also required to conduct a survey.

The funding for restoration work is paid out from the national budget by the central government in the case of national cultural heritage assets, and additional funds are accepted from local governments, NGOs, UNESCO and other international agencies, and cultural property owners. The formulation of restoration policies and plans is placed in the hands of the central government. However, if the damage is due to a natural disaster, experts are widely invited to share their views and provide their input to the formulation of restoration policies and plans. The policies and plans that are formulated in this manner are implemented by the central government, local governments, cultural property owners, NGOs, and universities⁴, under the guidance of experts.

The above restoration process differs between times of disaster and non-disaster times.

Emergency countermeasures include the following activities:

- (1) Organization of a disaster assessment survey team
- (2) Preparation of a disaster assessment survey report after implementation of the survey
- (3) Clean-up and implementation of measures for protection of damaged cultural heritage
- (4) Implementation of measures for preventing secondary damage
- (5) Establishment of a cultural heritage restoration committee and management team

4. Case Studies

This section spotlights the damage caused by the large earthquake that struck off the coast of Sumatra on December 26, 2004 and the resulting great Indian Ocean tsunami, as well as the damage inflicted by the earthquake that hit Central Java on May 26, 2006, and analyzes these examples in relation to Indonesia's response and support frameworks for cultural heritage assets that have suffered damage in the natural disasters. These two natural disasters not only captured widespread attention of global society, but they also played a significant role in triggering reforms of disaster-related frameworks in Indonesia. Furthermore, since Japan was deeply involved in providing cooperation and recovery efforts for cultural heritage damaged in the two disasters, we can analyze the process of cooperation and recovery in the two cases in detail. This, we believe, is indispensable to establishing frameworks related to the recovery of disaster-affected cultural heritage in Indonesia, as well as to examining Japan's future policies for international cooperation in cultural heritage preser-





vation.

During the planning phase of this study, the West Sumatra Earthquake of September 30, 2009 occurred off the coast of Padang, West Sumatra. With a magnitude of 6, it wrought extensive damage to a large area centered on Padang, the capital city of West Sumatra, also generated concern about damage to cultural heritage. At the request of the UNESCO Jakarta Office and the Indonesian government, a survey team composed mainly of members from the National Research Institute for Cultural Properties, Tokyo was sent to Padang to conduct a disaster assessment survey, with support from the Japan Consortium for International Cooperation in Cultural Heritage (November 11 to 25, 2009). Given this turn of events, we hastily decided to include this survey of cultural heritage damaged in the Padang earthquake as our third casestudy. By examining the situation and issues concerning the recovery process of disaster-affected cultural heritage in three different sites-Aceh five years after its disaster, Central Java three years after its earthquake, and Padang in the immediate aftermath of its earthquake-we believe we can pinpoint the type of assistance that is necessary at each post-disaster stage.

4-1 Tsunami Damage Triggered by the Sumatra Earthquake 4-1-1 Overall Picture of the Disaster Concerned

The major earthquake that occurred off the coast of Sumatra on December 26, 2004 and the resulting Indian Ocean tsunami caused great damage not only in Aceh, Indonesia, but also in Thailand, Malaysia, Myanmar, Bangladesh, India, Sri Lanka, the Maldives, Somalia, Kenya, Tanzania, and the Seychelles, and left more than 300,000 people dead or missing (Fig. 1).

The tsunami dealt such a devastating blow to economic and social infrastructures in various areas that even today, after five years, a great deal of effort is still directed to the restoration of those destroyed infrastructures.

Damage in Aceh

The tsunami originated at the epicenter of the earthquake off the coast of Sumatra and came ashore along the northern tip of Sumatra, where it caused great damage to Banda Aceh, the capital and largest city of the coastal province of Aceh (Map 1). As many as 167,000 people are said to have lost their lives in the disaster and more than 500,000 people left homeless in Banda Aceh alone.



Fig.1 Tsunami-affected areas [Source: http://www.fao.org/geonetwork/]



Map.1 Map of Ache

4-1-2 Ditails of Disaster Damage to Cultural Heritage

The tsunami not only destroyed institutions and facilities, but it also deprived the country of the cultural heritage that embodies its social history, as well as many intellectual figures. This was true also in Aceh, which was most severely affected by the recent disaster. Aceh flourished as a gateway to Islam in Southeast Asia. Numerous manuscripts were produced during this



Photo 1 Taman Sari Gunongan



Photo 2 Dutch Cemetery

time, but these manuscripts have been lost in the disaster, along with many precious lives. Let us discuss the extent of damage in Aceh from the perspective of Aceh's written cultural heritage and other cultural assets.

Aceh was established at the mouth of the Aceh River in the late 15th century. It developed as a port city-state, and a centralized administrative system centered on the sultan emerged in the early 17th century. Aceh reached its height of prosperity during the reign of Sultan Iskandar Muda (reigned 1607-1636) and the following Iskandar Thani (reigned 1636-1641). Taman Sari Gunongan, a monument that Sultan Iskandar Muda is said to have built for his wife Putroe Phang (Putri Pahang), still exists in Banda Aceh (Photo 1). As a representative architecture that dates back to Aceh's prosperous period, it was included in the UNES-CO World Heritage Tentative List in 1995. The 2004 tsunami reached up to this monument, but did not leave any conspicuous signs of damage. The many burial markers that are found in Aceh also bespeak of the prosperous trade period, as well as provide valuable information on people who lived in Aceh in the past. One such example is the Dutch Cemetery, where Dutch soldiers who died during the Aceh War (1873-1912) and during the subsequent period are buried (Photo 2). The cemetery is located next to the Tsunami Museum that was built in 2009. Many of the burial markers were washed away by the tsunami, but we understand that a search was launched immediately and the markers have been returned to their places with assistance from the Dutch. Because the battle with the Dutch was especially intense in Aceh, there are few historical buildings in Aceh that were built during the period of colonial rule under the Dutch, compared to Java. The only building in Banda Aceh that we were able to confirm in our survey was the present Bank Indonesia building that was built in 1916 as De Javasche Bank (Photo 3). We were unable to check whether the building sustained any damage from the tsunami.

As seen above, tangible and immovable cultural heritage as-



Photo 3 Bank Indonesia (formerly De Javasche Bank)

sets are limited, and although a government inventory exists, we were unable to confirm the content and details. Additionally, before the Free Aceh Movement came to a tentative end in 2005, it was difficult to enter Aceh prior to the tsunami due to political reasons, so it is difficult to say that an adequate survey of cultural heritage has ever been conducted to date. Under this situation, the tsunami drew widespread attention to the historical manuscripts that embody the written cultural heritage of Aceh.

Aceh's Manuscripts: A Written Cultural Heritage

Aceh is where Islam was first established in Southeast Asia in the 13th century. It is a well-known fact that vestiges of this history can be seen particularly on gravestones. Around the 16th to 17th centuries, Aceh became the center of Islamic learning in Southeast Asia through interactions with the Middle East. Religious scholars who were active in Aceh, such as 'Abd al-Ra' uf al-Singkili (commonly known as Syiah Kuala) and Nur al-Din al-Raniri, translated Arabic literatures into Malay, the local language, and greatly contributed to the advancement of Islamic studies in Southeast Asia. These religious scholars wrote basic texts such as Tafseer (Koran interpretation) and Fiqh (study of Islamic law), as well as books on Sufism (Islamic mysticism). These texts and books also provide invaluable resources for understanding the history of the Tariqah, a school of Islamic mysticism which came to have strong influence in Sumatra, Java, and throughout Southeast Asia thereafter.

Some of the books that were written in the past by religious scholars in Aceh are still being published in Southeast Asia today. Manuscripts of Aceh that are in existence today are mostly from the 18th to 19th centuries, and the majority of them are held by libraries in the Netherlands and other foreign research institutions. Information on their origin has been lost in most cases, however, as they have changed hands many times during the colonial period. Manuscripts that still remain in Aceh are kept by Islamic religious schools called *dayah* or by individuals. Some are now also owned by individual collectors and muse-ums, as a result of being frequently traded, especially after the earthquake. The manuscripts that are kept by old *dayah* such as Tanoh Abee and Awee Geutah, in particular, have captured the attention of experts as important materials for the research of scriptoriums in Aceh, because their origins are relatively clear.

Damage to Aceh's Written Cultural Heritage

Within a month of the tsunami, a team of researchers from the Islamic University of Indonesia gathered in Aceh and commenced a survey of damage to the written cultural heritage of Aceh in cooperation with Tokyo University of Foreign Studies (TUFS). The survey results were immediately presented to researchers in various countries including Japan, accompanied by a video documentation of the damage.⁵

The tsunami damage to the written cultural heritage can be summarized as follows. (1) On the whole, the written cultural heritage either received irreversible damage or hardly any damage from the tsunami. For instance, when buildings collapsed in the tsunami, documents that were housed on the first floor were swept away and unable to be salvaged, but in contrast, those that were housed on the second floor and above were mostly left undisturbed. Damage at the Ali Hasjmi Education Foundation was an exception. The building was inundated, but with only about 5 cm of water. Yet many books and documents were damaged, because shelves fell over in the earthquake, scattering materials on the floor and leaving them to get soaked. (2) Aceh's written cultural heritage needed assistance not so much for post-disaster restoration, but more for enhancement of regular management capacities, such as for inventorying and cataloguing of materials and for improving storage conditions. As there was hardly any information about Aceh's written cultural heritage prior to the disaster, it was firstly necessary to compile inventories and catalogs of the materials. Additionally, damage assessment surveys exposed problems in the manner of preserving manuscripts. (3) Reflecting the salient characteristic of the Aceh region, many of the manuscripts in Aceh were related to Islam. Therefore, aid workers were also required to possess knowledge of Islamic manuscripts.

4-1-3 Current Condition of Written Cultural Heritage in Ache

December 26, 2009 marked the fifth year since the tsunami hit Aceh. To assess post-disaster conditions, we conducted an inspection and interview survey mainly in areas where disaster assessment surveys have been implemented after the tsunami



Photo 4 The newly rebuilt Aceh Documentation and Information Center (PDIA)



Map2 Map of Banda Ache and Investigated Places

(Map 2), in cooperation with the TUFS Aceh Project for the Preservation of Cultural Heritage and with support from PKPM (Pusat Kajian Pendidikan dan Masyarakat), a private organization which works for the preservation of Aceh manuscripts as a part of their activities. Below is a description of the sites we visited, in the same order as the disaster assessment surveys.

(1) Aceh Documentation and Information Center (Pusat Dokumentasi dan Informasi Aceh: PDIA)

PDIA was established and operated by Syiah Kuala University in Aceh and the Aceh provincial government, and was an institution widely utilized by university students. It was destroyed in the tsunami but was rebuilt in 2009 (Photo 4). The center's entire collection of close to 70 manuscripts was completed swept away by the tsunami. The newly rebuilt building now holds books that were received as gifts from the Netherlands. Manuscripts are also desired, but are difficult to obtain. The director of the center is also a lecturer at Syiah Kuala University, and has 18 employees working under him. Although the building has been rebuilt, the center has lost its entire collection of materials in the tsunami, so its immediate goal is to collect and amass books and materials anew.

(2) Research Center for the Study of History and Traditional Values (Balai Kajian Sejarah dan Nilai Traditional)

The Research Center for the Study of History and Traditional Values is an institution under the Ministry of Culture and Tourism, on the same level as the Aceh-North Sumatra Archaeological Heritage Preservation Office (BP3 Aceh), a government institution in charge of the preservation of archaeological monuments. The first research center was founded in 1995, but there are now eleven such centers throughout Indonesia under the management of the Ministry of Culture and Tourism. With the aim of researching and disseminating regional cultures and folklore, the centers issue quarterly essays and publish annual journals, and distribute them to schools and governmental institutions in Aceh. The research center based in Aceh is in charge of the Aceh and North Sumatra area. The tsunami damaged the building and deprived the center of its collection of books and materials that were kept on the first floor. Books that were stored on the second floor survived the disaster, but were lost in a fire that occurred six days later. Prior to the tsunami, the building had housed 6,000 books and 42 manuscripts (15, according to a post-tsunami disaster assessment survey). The building was rebuilt in 2006 with funding from the Reconstruction Agency for Aceh and Nias (Photo 5). The center had requested both rebuilding assistance and book aid, but received financial assistance only. However, it now has a collection of 2,000 materials, thanks to book donations from the Royal Netherlands Institute of Southeast Asian and Caribbean Studies (KITLV) Jakarta Office, National Library of Australia, and École Française d'Extrême Orient (EFEO) Jakarta Office. It also has two manuscripts that have been donated by the local community.



Photo 5 The newly rebuilt Research Center for the Study of History and Traditional Values

(3) Ali Hasjmi Education Foundation (Yayasan Pendidikan Ali Hasjmi)

Ali Hasjmi Education Foundation is a library established by Ali Hasjmi, the late chairman of the Council of Indonesian Muslim Associations, and has amassed books related to Islam. As mentioned earlier, shelves fell over in the earthquake, scattering books and materials on the floor and causing them to get soaked when the tsunami hit and inundated the floor of the library with about 5 cm of water. After the tsunami, Tokyo University of Foreign Studies compiled a catalog of materials in 2005. The library used to have about 300 manuscripts, but now has around 400, owing to donations from throughout the local community. With support from PKPM (Pusat Kajian Pendidikan dan Masyarakat), 100 or so manuscripts have been restored. The restored manuscripts have been placed in individual envelopes along with cloves for careful preservation (Photo 6). An inspection team from Turkey had also come to survey the damage, but its visit did not lead to concrete assistance. Following the cataloguing task by Tokyo University of Foreign Studies, members from the University of Leipzig in Germany arrived with photographic equipment and began to digitize the materials. So far, 146 materials have been digitized, but this corresponds to less than half the total number of materials. The library is run by Mr.Suruya, who is director of the library and Ali Hasjmi's son, and three employees. Two of them are helping with the sorting of materials, and one is working as a digitization specialist.

Manuscripts and other important materials are kept in a separate air-conditioned room located next to the director's office (Photo 7). However, the air conditioner is turned off when nobody is present, and the room is not necessarily maintained at a constant temperature. Manuscripts that have been reinforced or otherwise repaired are kept in individual envelopes with cloves, but others are simply stacked as they are one atop the other. Moreover, molds have appeared on a number of manuscripts



Photo 6 Manuscript preserved in an envelope



Photo 7 Manuscript room

(Photo 8), but no silica gel or other desiccant appears to be used. As only one member of the library staff is engaging in the digitization task, only three materials can be processed per day at the most. The University of Leipzig is currently supporting the digitization task, but as it is scheduled to leave Aceh in December 2009 to provide its assistance in the digitization of manuscripts in Jogjakarta, the camera and other equipment that the library is currently borrowing from Germany will not be available for use thereafter. Knowing this, the staff member has been undertaking the task in haste, but there is still a limit to how much a single person can accomplish alone. In the end, the equipment will be returned without completing the digitization of all manuscripts.

(4) Aceh Provincial Museum (Museum Negeri Propinsi)

The Aceh Provincial Museum was not directly affected by the tsunami, but because it houses a large collection of manuscripts, the TUFS Aceh Project for the Preservation of Cultural Heritage has been working in partnership with the Provincial Museum to preserve the written materials of Aceh that are kept by the museum. The museum boasts a collection of 2,000 manuscripts. In a restoration office located inside the museum, workers who have participated in a paper restoration workshop hosted by To-



Photo 8 Mold discovered on a manuscript

kyo University of Foreign Studies engage in restoration activities (mainly reinforcement) (Photo 9). The Japanese paper that is being used to back manuscripts is provided by Japan's National Diet Library. A number of materials employed in the restoration process have also been contributed by Japan previously. The manuscripts are not catalogued, but those that have been restored in the restoration office are placed in an envelope and sent to a digital scanning room also located inside the museum, where they are scanned using a dedicated book scanner (Photo 10). After scanning, information about each manuscript is entered in a search system screen via the Internet, and the manuscript is stored in the museum's repository (Photo 11).

Through this study, a number of issues regarding the museum have become apparent. The first issue concerns the <u>digitization</u> <u>of manuscripts</u>. The digitization project is being implemented by the University of Leipzig of Germany, and the dedicated scanner and personal computer have been provided by the university. However, as with the Ali Hasjmi Education Foundation, the digitization task will be terminated in mid-course, because the portion of the project in Aceh is scheduled to be completed in December 2009, and the project will be moving on to Jogjakarta thereafter. The dedicated equipment that the museum has been using will also be transferred to Jogjakarta, so the museum will have no wherewithal to continue with the digitization.

The second issue concerns the museum's <u>manuscript reposi-</u> tory. Manuscripts that have been restored and digitized are



Photo 9 Restoration Laboratory



Photo 10 Book scanning



Photo 11 Museum repository

stored in a repository located inside the museum specifically for the storage of manuscripts, ancient cloths, metal objects, and other such precious items. However, the air-conditioning facility has been out of order for a long time, and the room is not maintained at the proper temperature and humidity levels. In the Aceh region, both temperature and humidity vary considerably between the dry season and rainy season. This large temperature difference and high humidity are certain to have an adverse effect on the manuscripts as well as other art objects in safekeeping. During the five years since the tsunami, restoration efforts have mostly been directed to social and economic infrastructures in Aceh, such as houses, public institutions, and disaster prevention facilities, and there is no denying the sense that the cultural aspect has been a low priority in Aceh's Action plan for recovery. Amid this situation, aid was extended to the museum, and a building was constructed on the grounds of the museum two years ago with funding from the Rehabilitation and Reconstructions Executing Agency for Aceh and Nias. The three-story building with a large open interior was designed to function as a gallery, but it was deemed unfit to be used as a museum facility, and has remained closed and abandoned since it was completed two years ago. It is a typical example of massive infrastructure assistance that has been implemented without gauging local needs.

The last issue is in regard to restoration technologies for written cultural heritage. The TUFS Aceh Project for the Preservation of Cultural Heritage has offered training programs on a number of occasions, including programs on historical document restoration techniques (May 2005, Jakarta), document management techniques (December 2005, Aceh), and material organization and preservation techniques (2006, Aceh). Additionally, two members involved in the preservation of Aceh's written cultural heritage have been invited to attend a three-month training program in Japan. The local programs were open to Aceh Provincial Museum personnel, as well as to people from the local archives, the Ali Hasjmi Education Foundation, and Dayah Tanoh Abee. Largely owing to these training programs, initiatives for the restoration of manuscripts, which did not exist prior to the tsunami, have begun to be implemented mainly by the Provincial Museum and other relevant institutions. However, people who are undertaking the restoration task today are those who have learned restoration techniques for the first time after the tsunami. Five years have passed since then, and they now require even more specialized knowledge concerning paper restoration, but they have no opportunity to do so, nor is there anyone who has the capacity to provide that kind of knowledge. Most necessary at the present stage is the development of restoration experts who possess deep specialized knowledge, and the development of younger workers by those experts. At the same time, when considering the fact that the Provincial Museum presently relies on Japan's assistance in acquiring Japanese paper and chemical agents used for paper restoration, other forms of assistance also need to be examined in regard to restoration materials in order to develop sustainable restoration efforts.

(5) Dayah Tanoh Abee

Dayah Tanoh Abee is an Islamic boarding school located about 50 km from Banda Aceh. It is said to have the largest collection of manuscripts in Indonesia. We were unable to visit the school during this study, but we understand that it remained unaffected by the earthquake and tsunami disaster. Tokyo University of Foreign Studies conducted a survey and compiled a catalog of the collection from 2005 to 2008, and thereafter, a new library for storing the manuscript collection was constructed with subsidies from the Prince Claus Fund for Culture and Development in the Netherlands.

(6) Provincial Archives (Badan Arsip)

(7) Provincial Library (Perpustakaan Daerah)

Today, the provincial archives and library are merged together. The merged institution does not possess manuscripts, but it has a collection of official documents mainly from after Indonesia's independence. It is said that there are documents among them that date back to the 1920s. The tsunami swept away the materials that were kept on the first floor of the building, but the majority of materials were stored on the second floor and above and remained intact. With the assistance of Japan International Cooperation Agency (JICA), land register documents were salvaged and a number of them were taken to Jakarta for restoration after the tsunami. The National Archives in Jakarta provided post-tsunami aid to the local archives, and the National Library in Jakarta provided aid to the local library. However, in addition to there being no archive specialists, there are no restoration experts either, and no restoration work is presently underway. The need for restoration is not acknowledged at present, probably because the library/archives houses relatively new materials and does not have any manuscripts. Still, it recognizes the need for restoration experts in the future, and expressed an interest in participating in a workshop if offered.

(8) Harun Residence (Pak. Harun Keuchik Leumiek)

The post-tsunami survey did not cover the Harun residence, but PKPM provided assistance for the restoration of manuscripts in 2008. Mr. Harun Keuchik Leumiek is known for his collection of manuscripts and other antiquities, and is also an antique art dealer. He has 28 manuscripts and 9 copies of the Koran in his possession (Photo 12). Fortunately, the manuscripts he has been collecting since before the tsunami saw no damage. Thanks to PKPM, the entire collection of manuscripts and copies of the Koran have finished being photographed. At the same time, the manuscripts have been partially reinforced and placed in separate envelopes along with cloves. Packets of silica gel are placed on the shelves holding the manuscripts, but the room itself seems to be maintained at a constant temperatureAs a discerning collector of manuscripts, Mr. Harun offers his views and judgment to the Ali Hasjmi Education Foundation regarding manuscripts that are frequently brought to the foundation. Compared to other repositories, manuscripts at the Harun residence are preserved in an excellent environment with careful attention to small details such as placing packets of silica gel near the manuscripts (Photo 13).

4-1-4 International Cooperation

Since even before the tsunami hit Aceh, political issues in Aceh had been attracting widespread concern from the international community, especially because the region uniquely remained closed off from important information compared to other regions in Indonesia. The Free Aceh Movement, which began fighting for Aceh's independence ever since Indonesia gained its independence, continued to be active even after the collapse of the Suharto administration in 1998. However, the 2004 tsunami



Photo 12 Manuscripts on display



Photo 13 A packet of silica gel placed next to a manuscript

and its total destruction of cities in Aceh in effect triggered the opportunity to thrust open the doors of Aceh's closed society to the world. The Indonesian government initially allowed foreign government teams and NGOs to provide relief in Aceh only as a provisional measure in the wake of the tsunami, but it thereafter acknowledged the necessity of international cooperation for reconstruction of Aceh. Today, it has even become possible for foreign organizations to establish a direct cooperation framework with Aceh, without involving the central government in Jakarta. Especially since the Free Aceh Movement and the Indonesian government signed a peace agreement in 2005, it has become easier for foreigners to step foot into Aceh, compared to before 2004.

Below, let us focus on foreign assistance for Aceh's cultural heritage in response to the Aceh tsunami, and discuss the role of Japan's assistance.

Japan's Cooperation

Many Japanese institutions have provided diverse assistance in response to the Aceh tsunami, ranging from emergency aid immediately after the tsunami to housing reconstruction efforts much later. In contrast, there has hardly been any assistance for cultural heritage, except for the assistance for Aceh's written cultural heritage by Tokyo University of Foreign Studies. Here let us take a brief look at Japan's assistance and particularly the activities of Tokyo University of Foreign Studies from the perspective of international cooperation.

The university was able to take prompt action in response to the tsunami damage to Aceh's written cultural heritage, because it had already established a foundation for survey and research and achieved certain results in Indonesia before the disaster. The Centre for Documentation and Area-Transcultural Studies (C-DATS) project, which was launched in the university in fiscal 2002, two years before the tsunami, was the first core. Focusing on the fact that many Asian and African language materials on local regions have not been fully appreciated and are at risk of widespread dispersion and loss, the project aims to preserve these materials in an accessible digital format and provide them for research purposes, without removing them from where they originally belong. Under this project, the university has been undertaking the cataloguing and digitization of local documents in Palembang and Padang in Sumatra since fiscal 2003 in collaboration with local Indonesian researchers. As an extension of this undertaking, it planned to work on documents in Aceh from fiscal 2005.

However, on December 26, 2004 the Sumatra Earthquake took its toll on numerous lives and wrought devastating damage to Aceh's historical documents. Archives, libraries, and universities in Indonesia requested the cooperation from Tokyo University of Foreign Studies in the restoration and preservation of historical documents and other written cultural heritage in Aceh. In response to this request and the seriousness of the situation, the university decided to direct part of its C-DAT activities to Aceh and to apply its efforts to surveying and digitizing what historical documents survived the disaster.⁶

Tokyo University of Foreign Studies is still continuing with its activities in Aceh as of 2009 today, as detailed in the reference material.⁷ Here let us focus on the characteristics of the university's assistance project for Aceh. Firstly, the Aceh project was made possible owing to the relationship that the university has established with Indonesian researchers since before the tsunami disaster. That relationship of trust led to the prompt provision of information immediately following the tsunami and to the request for assistance from the Indonesian Association for Nusantara Manuscripts (MANASSA) and other researchers.

Secondly, even amid the post-disaster turmoil, substantive information was relayed to the Japanese side through its relationship of trust with the Indonesian side, and that information was also provided to the Japan International Cooperation Agency (JICA), as it was planning to extend its assistance to disasteraffected areas. Upon careful consideration, JICA decided to concentrate its assistance in the restoration of land register documents.

The third characteristic is the project's continuity. Compared to emergency aid, which is provided intensively short term, long-term assistance is dependent particularly on the availability of funds. However, particularly noteworthy about this project is that it has been steadily ongoing and is now into its fifth year owing to its implementation as a COE (Centers-of-Excellence) project under the Ministry of Education, Culture, Sports, Science and Technology, with the sponsorship of the Agency for Cultural Affairs and the bestowment of diverse funds including grants from the Toyota Foundation. Moreover, through frequent visits made for whatever purpose, the continuity of the project has deepened the relationship of trust between the two sides.

The last characteristic is that assistance via the project is implemented from the standpoint of how Aceh's manuscripts should be preserved in the future, and not from the short-term perspective of how to deal with manuscripts that have been damaged. Full details of the manuscripts were unknown at the planning stage of assistance, so assistance was firstly deemed necessary for their documentation, namely inventorying, cataloguing, and digitizing of the manuscripts. Issues concerning restoration, preservation, and management emerged after that. The project is being implemented in phases according to the manuscript repository and its condition, and workshops on manuscript restoration have been held with the cooperation of National Research Institute for Cultural Properties, Tokyo and Gangoji Institute for Research of Cultural Property. On the Japanese side, a framework has been established for the appraisal of the value of manuscripts by experts on Middle East and Islam studies, and for the restoration of the manuscripts themselves. On the Indonesian side, liaison conferences are being held among the National Library, National Archives, the Islamic University of Indonesia, and the Indonesian Association for Nusantara Manuscripts (MANASSA), and Indonesian assistance is being implemented in consideration of the views of all institutions concerned.

Foreign Assistance

University of Leipzig (Germany)

The University of Leipzig in Germany commenced its manuscript digitization project in Aceh in 2007. It has digitized manuscripts kept by the Ali Hasjmi Education Foundation and the Aceh Provincial Museum, and completed its work in Aceh in December 2009. The scope of the project includes manuscripts not only in Aceh but also throughout the Middle East and Asia, and from after December 2009, it plans to transfer to Jogjakarta, along with all digitizing equipment, to embark on the digitization of manuscripts that are stored in the Royal Palace. However, as mentioned earlier, this has raised a problem, because the project and all its equipment have moved on to the next location even though the digitization of manuscripts in Aceh has not been fully completed.

The project is partly funded by the German Ministry of Foreign Affairs, but the University of Leipzig places main emphasis of its assistance on academic purposes, which are to digitize the manuscripts and to create a database. Its attention is not directed to the restoration and preservation of manuscripts.

École Française d'Extrême-Orient (EFEO) and the Dutch Royal Institute of Southeast Asian and Caribbean Studies in Leiden (KITLV)

The École Française d'Extrême-Orient (EFEO) and the Dutch Royal Institute of Southeast Asian and Caribbean Studies in Leiden (KITLV) both have an office in Jakarta. They are providing assistance in the form of donating books to the Research Center for the Study of History and Traditional Values, which has lost many of its books in the tsunami.

KITLV has also digitized library books about Aceh after the tsunami, and has made them available for access via the Internet, with funding from the Dutch Ministry of Education and under the supervision of the Royal Library of the Netherlands in The Hague.⁸

International Centre for Aceh and Indian Ocean Studies (ICAIOS)

The International Centre for Aceh and Indian Ocean Studies (ICAIOS) was established in cooperation by three universities in Aceh and foreign academic institutions. The concept was announced in 2007, and the research center was established on the campus of Syiah Kuala University in the beginning of 2009. The primary objectives of ICAIOS are to support regional, domestic, and international level surveys conducted in Aceh, seek a sustainable future for Aceh based on studies and research, and promote an understanding of the past. The current director of the center is a Finnish cultural anthropologist, and the steering committee is composed of members and professors from EFEO, KITLV, Tokyo University of Foreign Studies, the British Library, Harvard University, and other such institutions. Funds are provided mainly by AusAID, the Australian government's aid program, and the United Nations Development Program (UNDP). The University of Melbourne in Australia has also recently begun to provide its cooperation in research activities. ICAIOS functions as a center of Aceh studies for foreign researchers, as well as plays an important role in invigorating academic activities in Aceh, but it does not necessarily assume a role in coordinating international cooperation.

4-1-5 Conclusion

Five years have passed since the tsunami struck Aceh. Although Banda Aceh was most severely devastated, reconstruction efforts have made such remarkable progress that <u>hardly</u> any traces of the disaster can be seen in the city today. Yet, abandoned buildings, wasteland, boats washed inland and left abandoned in residential areas, and townscapes made up entirely of new buildings still <u>offer glimpses of the severity of the disas-</u> ter. Below is a summary of the post-disaster restoration of Aceh' s written cultural heritage based on activity reports of the Tokyo University of Foreign Studies and findings of this study.

<u>Characteristics of the tsunami damage</u>: The manuscripts, materials, books, and other such written cultural heritage that were swept away by the tsunami were able to be divided into two types: those that were damaged to the point they are unsalvageable, and those that were not damaged but whose preservation condition needs to be improved. In other words, it was necessary to determine what remained and what did not remain after the tsunami, and to assess the identity of what remained. In some cases, books that were only slightly damaged when they got soaked in water were later dried out, but ultimately they were unable to be salvaged, because there was no prior knowledge that soaked books should not be dried in the sun.

Emergent Assistance: With respect to the written cultural heritage of Aceh, there was hardly any information before the tsunami on the type, location, and quantity of materials that existed. However, in less than a month after the tsunami, the extent of damage to the written cultural heritage of Banda Aceh was made widely known, thanks to the network of the Indonesian Association for Nusantara Manuscripts (MANASSA). The prompt response of researchers based in Jakarta (i.e. regions that were not affected by the disaster) and their connection to researchers overseas helped substantiate the information on damage conditions and identify the types of assistance that were needed. At the same time, however, there were views worth considering, that a mere month after a disaster might have been too early to conduct a local survey in Banda Aceh, where human damage was overwhelming.

<u>Phased assistance</u>: There are two processes through which the ultimate goal of preserving Aceh's written cultural heritage must be preserved: one involves the documentation of written materials, including the inventorying, cataloguing and digitization of those materials, and the other deals with the preservation condition of manuscripts, such as their restoration, storage, and management. None of the relevant institutions in Aceh had ever systematically planned such processes, before or after the tsunami. This oversight needs to be corrected.

As emergency assistance, transferring manuscript restoration techniques and supplying Japanese paper and chemical agents for use in restoration work is easy enough to do and at times highly effective over the short term. However, from the perspective of continuity, it is also necessary to provide phased assistance to relevant institutions from a long-term standpoint in consideration of the issues confronting each institution, and to establish a mechanism that allows restoration materials to be domestically purchased on a continual basis. It might also be possible to strategically support a specific institution only and count on it to disseminate the technologies and knowledge of a certain process to other institutions, but this requires continuous longterm training.

NGO activities in Aceh and their significance: After the tsunami, foreign assistance poured into Aceh through NGOs, making NGOs an extremely important component of international cooperation in Aceh. The NGO PKPM (Pusat Kajian Pendidikan dan Masyarakat), which works in cooperation with Tokyo University of Foreign Studies and the University of Leipzig, was established in 2003 under the leadership of lecturers from Syiah Kuala University and the National Institute of Islamic Studies (IAIN) Ar Raniry. Before the tsunami, PKPM engaged in projects concerning education and gender issues, but 40% of its activities are now related to manuscripts, partly owing to its cooperative relationship with the two foreign universities. It is a precious entity, because it naturally possesses deep knowledge of Islam and has members who are well-versed in the Jawi and Arabic languages in which manuscripts are written. PKPM also cooperates in various ways in regard to manuscripts held by institutions that tend to be overlooked by the central and provincial governments, such as the Ali Hasjmi Education Foundation, Dayah Tanoh Abee, and the Harun residence. When considering the fact that much about the written cultural heritage of Banda Aceh and the entire Aceh province still remains unknown, roles fulfilled by NGOs like PKPM are particularly significant.

Regional characteristics of Aceh: The reconstruction of Aceh was the first case to be undertaken by the Rehabilitation and Reconstructions Executing Agency for Aceh and Nias (Baran Rehabilitasi and Rekonstraksi NAD-Nias: BRR), which the Indonesian government launched after the tsunami to deal with disaster recovery. The agency is now in its fifth year, and is presently focusing its efforts on coordinating international aid from various foreign countries and implementing activities in line with the reconstruction plan for Aceh and Nias. In the area of cultural assistance, the agency has added a new building to the Aceh Provincial Museum and has constructed the Tsunami Museum. However, these are strictly infrastructure assistance, and the agency has not implemented any projects related to written cultural heritage. Moreover, the building added to the Provincial Museum has no practical use, and has remained abandoned for two years, as mentioned earlier.

Aceh is the only province where foreign institutions can interact with the provincial government to ensure the effective and prompt implementation of international aid without involving the central government in Jakarta. Furthermore, even five years since the tsunami, the severity of its damage continues to stir concern in the international community today, along with the fate of the peace agreement that was thereafter signed between the Free Aceh Movement and the Indonesian government. Aceh may therefore be a unique case, but the Aceh experience has certainly proven invaluable in the subsequent Central Java Earthquake of 2006 and the West Sumatra Earthquake of 2009.

4-2 Central Java Earthquake (Bantul Earthquake)4-2-1 Overall Picture of the Disaster Concerned

On May 27, 2006, a magnitude 6.3 earthquake struck the central region of Java. According to reports, more than 3,000 people were killed, and as many as 50,000 people were injured. With an epicenter located inland, the earthquake wrought extensive damage in the regency of Bantul (Fig. 2).

4-2-2 Details of Disaster Damage to Cultural Heritage

There are many historical stone-made buildings and wooden buildings in Java, primarily in Central Java and Jogjakarta. The UNESCO World Heritage sites of Borobudur Temple and the Prambanan Temple Compounds are located near the ancient capital of Jogjakarta, close to the epicenter of the earthquake (Maps 3). There is a Royal Palace in Jakarta, and the city features many wooden and brick-made historical buildings related to the pal-



Fig 2 Epicenter and disaster assessment [Source: http://unosat.web.cern.ch/unosat/]



Map3 Map of Main Monuments in Central Java and around Jogjakarta

ace.

Damage to the Prambanan Temple Compounds was widely covered by media reports from an early stage, particularly because President Yudhoyono visited the temple compounds during his tour of disaster-affected areas on the day after the earthquake (Photo 14). The Indonesian government sought the cooperation of Dr. Giorgio Croci, an Italian expert in historical building structures, in conducting a damage assessment survey of the Prambanan and Borobudur World Heritage sites. Dr. Croci, who had been attending a conference in Angkor, Cambodia changed his schedule on short notice and flew directly to Jogjakarta from Cambodia to conduct the survey. This was ten days after the earthquake. The damage assessment survey was implemented with the cooperation of the Jogjakarta and Central Java Archaeological Heritage Preservation Offices under the Directorate General of History and Archaeology in the Indonesian Ministry of Culture and Tourism, and provided important information on the extent of damage to the two World Heritage sites. According to the survey, some of the severest damage were sustained by Loro Jonggrang, a temple complex in the Prambanan Temple Compounds which features a temple dedicated to Siva and five other temples (Photo 15), and Sewu Temple, a temple located in the same historical park (Photo 16). Damage was also confirmed at Plaosan Temple located near Prambanan (Photo 17) and Sojiwan Temple, which was under restoration at the time of the earthquake (Photo 18).



Photo 14 Visit to earthquake-affected areas by President Yudhoyono (*Antara News*, May 31, 2006)



Photo 15 Full view of Loro Jonggrang Temple (July 2006)

Meanwhile, information on cultural heritage sites aside from the World Heritage sites was provided by Jogja Heritage Society. These included the Royal Palace located in the city, wooden architectures built in Java's traditional joglo style, the Taman Sari water castle, the old townscape of Kota Gede, and the royal cemetery in Imogiri outside the city. Jogja Heritage Society was established under the leadership of a professor at Gadjah Mada University. It launched a website after the earthquake as a means for communicating information to the world about the damage to the cultural heritage of Jogjakarta. At the Royal Palace, one of the wooden buildings collapsed completely in the earthquake, and Taman Sari and other brick buildings also suffered great damage (Photo 19).



Photo 16 Sewu Temple (July 2006)



Photo 17 Plaosan Temple (July 2006)

4-2-3 Recovery of Disaster-Damaged Cultural Heritage

From the disaster assessment survey, it was known from an early stage that, of the two World Heritage sites located in Central Java, Borobudur Temple was unaffected by the earthquake. In contrast, the Prambanan Temple Compounds suffered great damage, and drew considerable attention from inside and outside the country. Particularly because the Prambanan historical park is an important tourist site supporting Central Java's tourism industry, its restoration was a potential symbol of the local community's efforts to recover from the disaster.

The main sanctuary of the Prambanan Temple Compounds is the Hindu temple of Loro Jonggrang. Damage to Loro Jonggrang was surveyed and an assessment report prepared under the supervision of the Jogjakarta Archaeological Heritage Preservation Office, with cooperation from the Borobudur Conservation Office, Gadjah Mada University, and other relevant institutions. Even while the assessment survey was underway, fallen *ratna* pieces were removed and cracks in walls were temporarily repaired. Restoration work began with the Garuda temple, which was most severely damaged, followed by Nandi, Hansa, Brahma, and Visnu temples, in this order. As of November 2009, resto-



Photo 18 Sojiwan Temple under restoration (July 2006)



Photo 19 Collapsed wooden building of the Royal Palace in Jogjakarta City (June 2006, Jogja Heritage Society)

ration has been completed up to the Hansa temple. The entire restoration process is financed by the central government and Jogjakarta provincial government, and scaffolds were provided by UNESCO and by the Japanese government's 2007 grant aid for cultural grassroots projects. The inner compound was temporarily closed off to tourists to ensure their safety, but it has been reopened in part thereafter. The greatest issue in regard to the restoration work, which is currently ongoing, lies in the restoration of the Siva temple, located in the center of the inner compound. It is the tallest of the six temples in the compound, rising to a height of 47 meters. The central main chamber is dedicated to the deity Siva, and the southern, western, and northern side chambers are dedicated to Augustia, Ganesa, and Durga, respectively. At a glance, the Siva temple shows no apparent damage, and unlike other temples, ratna pieces and balustrades have remained intact. However, results of the damage assessment survey have indicated large cracks throughout areas around the inner corners of the platform and toward the bottom of the nave, and that the western gate is tilted to the west as though the lintel above the gate and entrance stairs were pushed outward, accompanying the displacement of the rear side of the nave (National Research Institute for Cultural Properties, Tokyo, 2007, p. 107). Thus, the question arises as to whether the Siva temple, which at least appears to have no damage, should be partially dismantled or completely dismantled for restoration. Needless to say, even if no damage is apparent from the outside, damage that has occurred in inconspicuous areas puts the entire structure at risk of collapse. Additionally, the Siva temple was restored once around 1918, before Indonesia's independence, by the then Dutch East Indies Oudheidkundige Dienst (archaeological agency), but the Indonesian side does not possess the materials related to the restoration. For this reason, unlike the other five temples, it is not known what types of restoration materials were used or how the inner structure has been built. As current technologies are not yet capable of scanning a building's interior using nondestructive means, the pros and cons of resorting to partial dismantlement to ascertain the inner structure and extent of damage are being argued.

Sewu Temple is located in the same historical park as Loro Jonggrang, but comes under the jurisdiction of Central Java province, and not Jogjakarta province. It is a Buddhist temple complex with 8 <u>apit</u> temples and 240 *perwara* temples around a central temple. After Indonesia's independence, it was restored in 1980 and 1992 and designated a national heritage under the 1992 Cultural Heritage Law. Sewu Temple is also a World Heritage, as it is part of the World Heritage site of the Prambanan Temple Compounds. Emergency aid and subsequent restoration have been implemented with funding by the central government, the Central Java provincial government, NGOs, and the government of the United Arab Emirates. Total restoration fee is estimated as 1.5 million USD. The scaffolds have been provided by UNESCO after the earthquake, but bamboo and wooden scaffolds are also being used to cover for whatever shortage there was (Photo 20). The restoration work is mainly concentrated on the central temple, but some of the apit temples surrounding the central temple are also being restored in part.

4-2-4 International Cooperation

Japan's Cooperation

After the disaster, the only country which acted promptly to provide specific assistance such as by sending a survey team to the Prambanan Temple Compounds was Japan, aside from Saudi Arabia, which provided financial assistance. In the wake of the earthquake, the Law on the Promotion of International Cooperation for Protection of Cultural Heritage Abroad was enacted in Japan on June 16, 2006. The Japan Consortium for International Cooperation in Cultural Heritage (JCIC-Heritage) was established soon thereafter, and Japan had just begun to take steady steps toward creating a framework for coordinating Japanese institutions and specialists involved in international cooperation for cultural heritage and for ensuring effective and flexible international cooperation in that area. With the situation being as it was in Japan, providing assistance for cultural heritage affected by the Central Java Earthquake became the first activity of the just-established consortium.

In response to the Indonesian government's request for coop-



Photo 20 Scaffolding of the central temple (Nov 2009)

eration, Japan's assistance was planned by the consortium and carried out on commission by the National Research Institute for Cultural Properties, Tokyo. As members of the consortium, the Ministry of Foreign Affairs and the Japan Foundation also provided their cooperation. A team of Japanese specialists were thus sent to Indonesia in July 2006, two months after the earthquake (leader: Prof. Satoshi Yamato). The survey team did not restrict its survey to World Heritage sites, but aimed to assess the extent of damage to cultural heritage assets in Jogjakarta as a whole. Based on the findings of the first survey, the focus of Japan's assistance was decided to be placed on providing technical cooperation for the restoration of the six temples of Loro Jonggrang, among the other temples of the Prambanan Temple Compounds. The second survey (Feb. 20 - March 10, 2007) and third survey (Oct. 21 - Nov. 4, 2007) mainly assessed the damage in greater detail, analyzed architectural structures and geographical characteristics, and collected relevant reference materials and historical documentation of past restoration work. Ultimately, through discussions with relevant institutions on the Indonesian side, a restoration design proposal was formulated, giving due consideration to earthquake countermeasures. A report of the survey team's findings has been prepared in Japanese and English and delivered to the Indonesian government and UNESCO.

In addition to the above-mentioned technical proposal, Japan has also supplied the scaffolds that are currently being used in the restoration work (Photo 21). They were provided in response to a strong request from the Indonesian side during the first survey, through Japan's grant aid for cultural grassroots projects in 2007. The first through third surveys have been implemented entirely on commission by the National Research Institute for Cultural Properties, Tokyo, as a project of the Agency for Cultural Affairs. In April 2008, Tsukuba University took over the implementation of the project, with funding by the Grant-in-Aid for Scientific Research provided by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), and will be continuing the project under its leadership until March 2011.

Foreign Assistance UNESCO

As mentioned earlier, UNESCO took quick action to assess the situation at the Prambanan and Borobudur World Heritage sites. It called on Dr. Giorgio Croci, an internationally-renown expert, to survey the sites and prepare a disaster assessment report. It also provided scaffolds as requested by the Indonesian side, around the time the Japanese survey team was sent to Indonesia. It hosted the "Consultative Meeting on Preservation of Cultural Heritage in the Aftermath of the Earthquake" in November 2006, the "International Expert Meeting for Rehabilitation of Prambanan World Heritage Site and Taman Sari Water Castle in Jogjakarta and Central Java, Indonesia" in March 2007, and the "Technical Meeting on Rehabilitation of Prambanan Temple Complex, Sewu Temple Complex and Taman Sari Water Castle" in June 2007, to discuss technical issues in the restoration of those cultural heritage sites. Members of Japan's expert survey team also participated in those meetings and reported the results of their surveys. In November 2009, the progress of restoration at the Prambanan Temple Compounds and Sewu Temple were reported at the "International Coordinating Meeting for Safeguarding Borobudur and Prambanan World Heritage Sites."

Saudi Arabia

In the wake of the earthquake disaster, Saudi Arabia pledged to provide financial assistance to Indonesia, and the assistance was implemented through UNESCO, instead of as bilateral cooperation. UNESCO convened its first conference in regard to the funds it has collected, and has allotted a part of the funds to the restoration of Sewu Temple.

<u>Prince Claus Fund for Culture and Development (The Netherlands)</u>

The Prince Claus Fund of the Netherlands is an NGO providing assistance throughout the world, including Aceh and Padang. In Imogiri, it has rebuilt a severely damaged batik factory in cooperation with the Jogja Heritage Society. Thanks to the recon-



Photo 21 Scaffolds provided by the Japanese government

struction of the factory, the production and sales of Jogjakarta's traditional craft resumed quickly, and batik makers were able to return to their workplace without losing their job.

The Prince Claus Fund was established for the purpose of culture and development on September 6, 1996 in commemoration of the 70th birthday of Prince Claus of the Netherlands. Its objective is to focus on various cultures and promote the relationships between culture and development, but in response to the looting of the Iraq National Museum in April 2003, the Fund established a Cultural Emergency Response⁹ project in September 2003. Through this project, the Fund provides emergency support for culture that has been damaged in man-made and natural disasters in various countries throughout the world. Examples include the Citadel of Bam in Iran damaged in an earthquake (2003), Nablus damaged in conflict in Palestine (2004, 2005), and the restoration of a mosque damages in an earthquake in northern Morocco (2004). The Fund not only assists national governments, but also local research institutions, providing emergency financial assistance where the locals play the main part in operations.

4-2-5 Conclusion

Three and a half years have passed since the earthquake disaster, and the affected areas are steadily recovering, owing to international aid from various foreign countries and NGOs. In regard to cultural heritage, restoration is underway at the Prambanan World Heritage site and Sewu Temple, but compared to these two, other temples that are found throughout the region have been so severely affected that restoration work cannot even be launched. Below, let us make a few observations in view of the fact that disaster assistance focused on tangible and immovable cultural heritage assets.

New Style of International Cooperation by Japan: Providing assistance to the Prambanan Temple Compounds was the first case to be addressed by the Japan Consortium for International Cooperation in Cultural Heritage after its establishment. The Indonesian side provided information to the consortium via the Japanese Ministry of Foreign Affairs, and the consortium relayed that information to the Agency for Cultural Affairs, the Japan Foundation, and other institutions and experts. The collected information was carefully examined by the consortium and used to select survey team members mainly from among various architectural experts, such as specialists in Indonesia's historical buildings and structural specialists of historical buildings. The Agency for Cultural Affairs provided the dispatch fee as an emergency aid expense, and the Japan Foundation assumed the

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local expenses, while the Ministry of Foreign Affairs facilitated local activities through the local embassy of Japan. This style of information coordination was also applied to subsequent earthquake cases in Sichuan and Padang.

International Cooperation and Joint Research: The Indonesian side requested Japan's cooperation in conducting an earthquake resistance survey of buildings and a geographical survey at Prambanan, in light of Japan's accumulation of studies as an earthquake nation. The ground survey was conducted with cooperation from Oyo International Corporation, a private stock company, and a materials test for earthquake resistance was conducted with cooperation from Gadjah Mada University and Bandung Institute of Technology. Earthquake measurement, however, could only begin after installing the necessary equipment, and is still ongoing under the study taken over by Tsukuba University with funding by the MEXT Grant-in-Aid for Scientific Research. Japan is certainly advanced in the study of earthquake resistance of historical buildings, and the results of those studies can be provided in the form of technical cooperation. However, such cooperation should be implemented from a long-range perspective, and is difficult to provide as a short-term emergency assistance measure. In fact, Japan's assistance for Prambanan consisted of a dispatch of three survey teams and nothing more under its emergency framework, and was continued as a study funded by the MEXT Grant-in-Aid for Scientific Research. The assistance it is providing today for cultural heritage damaged in the disaster will necessarily focus on short-term emergency assistance, but in order to respond to the needs of the aid-receiving country, the first survey must present short-term, medium-term, and long-term cooperation plans and frameworks based on careful consideration. At the same time, if assistance measures include academic elements, it is necessary to coordinate efforts and maintain a long-term relationship with universities and other academic institutions in the recipient country.

4-3 Padang Earthquake (West Sumatra Earthquake)4-3-1 Overall Picture of the Disaster Concerned

The earthquake that occurred on September 30, 2009 off the coast of Padang is thought to have occurred deep inside a subducting plate, and no tsunami was caused by the earthquake. The epicenter was roughly 45 km northwest of Padang, off the coast of Sumatra, at a depth of 81 km. The earthquake's magnitude was 7.6, and damage was centered on Padang (population roughly 840,000), Pariaman (population roughly 70,000) Padang Pariaman Regency (population roughly 380,000) and Agam Regency (population roughly 420,000) and surrounding areas. In particular, Padang is the state capital of West Sumatra, and site to many mid-high rise government facilities and commercial buildings. In particular large public facilities over three stories tall constructed with reinforced concrete received major damage during this earthquake (Photo 22). According to data released by the Indonesian Government (as of October 15 2009), the number of dead or missing is 1,117.

4-3-2 Damage Assessment of Cultural Heritage

Padang serves as the capital of West Sumatra Province and contains many public facilities related to government and education, in addition to being recognized for numerous historical buildings constructed under the influence of the Dutch who entered the region in the 17th century. Whereas many of the buildings influenced by the Dutch are constructed from brick, there are also many wooden structures using a format unique to the Minangkabau in the highlands inland from the coast. This earthquake did not cause damage to wooden structures located in such inland areas, but many of the structures in Padang, which is near the sea, were damaged.

There are 73 historical buildings in Padang registered by the Batusangkar Archeological Service (BP3 Batusangkar), 52



Photo 22 A large facility that collapsed

buildings in Pariaman to the north of Padang, and 23 in Padang Pariaman regency. An emergency disaster report on these historical buildings was conducted by BP3 Batusangkar four days after the earthquake occurred. A disaster study covering a broader range of historical buildings not limited to those registered on BP3 Batusangkar's list was conducted by the Indonesia Heritage Trust over a period of 15 days from October 10, with the cooperation of BP3 Batusangkar and the financial support of the Dutch Prince Claus Fund. Furthermore, as mentioned below, Japanese experts conducted a disaster survey on historical buildings and



Fig.3 Epicenter of the Earthquake [Source: United Nations Office for the Coordination of Humanitarian Affairs (OCHA)]

urban planning over a period of 24 days from November 11 at the request of UNESCO's Jakarta office and the Indonesian government. Refer to the report [NRICPT 2010] for detailed information on the damage to these buildings and urban planning.

Damage to Written Cultural Heritage in Padang

As mentioned above, most of the earthquake damage to buildings in Padang city was to large-scale public facilities. This includes the museum, library and public archives, responsible for storing much of the region's important records. The 4-story library building, for example, had floors 1 - 3 collapse in the earthquake. In additionally, the 100,000 books and documents stored in the building were exposed to the rain that fell after the earthquake. These books were collected and moved to the public archives. As this written cultural heritage stored by public facilities is under the jurisdiction of the central or state government, the books and documents had been moved and efforts made to create a catalog at the time of our survey – i.e. two months after the earthquake.

After the earthquake, a survey of damage to written cultural heritage was conducted on manuscripts stored in villages by a research team from Andalas University, which had been focusing on studying the regions manuscripts since before the earthquake. The state of damage identified in the surveys conducted using the networks and information developed to date was partially reported to academics (including foreign researchers) through the Indonesian Association for Nusantara Manuscripts (MANASSA). Public institutions such as museums do not seem to have detailed information on the location of manuscripts dispersed over a broad region in the way that Andalas University does.

The damage to written cultural heritage revealed in this survey is shown in the order of the sites visited, but(1) to (7) are the results of surveys conducted with the cooperation of Andalas University on manuscripts stored in private and religious facilities dispersed throughout the region. UNESCO's cooperation was obtained for public archives. (See APPENDIX 6 for photos)

Private-sector / Religious Facilities, etc.

(1) Mesjid Raya Mudiak Padang / Surau Tandikek (Padang Pariaman)

This is a mosque in Kec. Patamuan in Padang Pariaman that was damaged by the earthquake. Many cracks were noted on the walls and columns of the mosque, but it is still being used for worship services. A building attached to the mosque is used as an office, and manuscripts are stored on a shelf in the office. Seven manuscripts are stored, and in several of these, we noted smudging of some letters. Manuscript data has been recorded in a catalog prepared by Andalas University and the Tokyo University of Foreign Studies, but no steps such as desiccant or insect repellant have been implemented. It has not been converted into digital data.

(2) Mesjid Raya VII Koto Ampalu (Padang Pariaman)

This is a mosque located in Kec. Sungai Sarik in Padang Pariaman. A landslide occurred on the entry road to the village, and for some time after the earthquake the road was impassable. At the time of our survey, the villagers were carrying out works, and bikes and pedestrians were able to pass. The mosque itself has been damaged and we noted cracks not only on the walls and columns, but also on the floor. However, the damaged part is still being used for worship services. According to Andalas University, at the time of the previous ceremony 23 manuscripts were confirmed, and all of these had been moved to the state library for restoration. However, the state library was completely destroyed, leaving the manuscripts buried in bricks, and 17 of these were sent to the National Library in Jakarta to be restored again. There were also several other manuscripts placed in boxes, which are stored in a wooden residence to the east of the mosque. Desiccant agents and insect repellent are not being used, and even though the manuscripts are being stored inside, they are not in a case with glass doors, but instead in one box on top of a cabinet against the wall.

(3) Surau Ampalu Tinggi (Padang Pariaman)

This is a house of worship in Padang Pariaman regency. Construction of a new mosque has been in progress since before the earthquake, and only the first floor is complete. This new mosque is currently used for worship services. The old mosque was badly damaged by the earthquake and people are not allowed in. There is a dwelling located next to the old mosque, and the manuscripts are stored there. 26 manuscripts are stored there, and according to Andalas University, cataloging and digitalization of the manuscripts was completed before the earthquake. In contrast with the previous two sites, manuscripts were stored in individual envelopes and stored in a glass cabinet in a file-box. However, desiccant agents and insect repellent are not being used. When we visited, the manuscripts were in the filebox vertically, but this places too much stress on one edge of the manuscript, so we suggested that they store them laid down flat.

(4) Surau Baru Bintungan Tinggi (Padang Pariaman)

This is a place of worship in Kec. Nan Sabaris in Padang Pariaman regency, registered as a cultural asset with BP3. The building registered with BP3 is a wooden mosque, and the grave in front of the mosque has been destroyed apart from its roof. There was little damage to the wooden structure, but the brick extension at the back of the mosque was been damaged. In total 16 manuscripts are stored, in the mosque and in a dwelling located next door. This dwelling was destroyed in the earthquake. The old Quitabs (Islam texts) stored there got wet in the rain as they sat under the collapsed house. Currently the occupants of the collapsed house are living in the wooden mosque which was not affected by the earthquake. The manuscripts that had gotten wet are still being dried in the shade in the mosque. In the Aceh tsunami, many cases were reported where manuscripts were wrongly dried in the sun, but here the correct procedure was followed. When we asked where they learnt this, the mosque custodians replied that they had learnt this when they participated in a course on manuscript preservation at the state museum in 2005, and training held by Andalas University in conjunction with the British Museum in 2007. The Quitabs stored there were published in the Middle East and West Sumatra, and the items published in West Sumatra are particularly rare, making it an extremely valuable collection.

Currently, all the manuscripts are stored in a small room in the mosque, and some of them are stuffed into envelopes and placed vertically. Further, desiccant agents and insect repellent are not being used.

(5) Surau Paseban (Padang)

This is a place of worship in Kec. Koto Tangah in Padang Pariaman regency. Said to have previously been home to over 100 manuscripts, it now has 33 manuscripts. The Tokyo University of Foreign Studies' catalog has data on the 31 items. The place of worship is of wooden construction and was not damaged in the earthquake. The manuscripts were stored in glass cases within the place of worship and on shelves in a small room within the place of worship according to the instructions given by Andalas University. It seems that the former is for important manuscripts, and they are laid down horizontally and stored correctly. It seems that the remaining manuscripts on the shelf have not been sorted out. For both shelves, desiccant agents and insect repellent are not being used.

(6) Surau Darussalam (Agam)

This is a house of worship in Agam Regency. It has four manuscripts. This is a house of worship newly contacted by Andalas University. In this case, believers brought the manuscripts to be stored and the place of worship had trouble dealing with this. At present, manuscripts are only stored on the office within the place of worship and have not been organized. This time, there was no damage to the manuscripts or the place of worship, but because earthquakes frequently occur in the region, it is necessary to consider steps for the future.

(7) Surau Syattariah (Tanah Datar)

This is a house of worship in Batusangkar, Tanah Datar Regency. 27 manuscripts are stored here. Digitization has been completed in a survey sponsored by the British Library. The manuscripts are placed in envelopes and stored in the place of worship. The administrator of the place of worship is a teacher at a national Islamic high school in Batusangkar (Sekolah Tinggi Agama Islam Negeri), and has conducted surveys of the manuscript collection with the cooperation of Andalas University since 2006. Instruction is also being provided to local residents on the management of old manuscripts. The same applies to the region above with regard to earthquakes.

Public Facilities

(8) State Museum

Located in Padang city. Unfortunately, as we visited on Sunday and the curator was not on site, we were unable to go inside and only inspected the exterior. It is said that the museum has 58 manuscripts. These are recorded in Tokyo University of Foreign Studies' catalog. The manuscripts were not damaged in the earthquake.

(9) State Library

Located in Padang city, roughly 50m from the State Museum. It is a four-story building constructed with reinforced concrete, but floors 1 to 3 are said to have collapsed. At the time of our survey visit, the books and documents had already been removed from the library, and the collapsed building had been demolished. The books taken out were moved to the public archives for safekeeping. A survey was performed by the National Library in Jakarta in June 2009 before the earthquake, and 23 manuscripts deposited in the state library were restored (manuscripts owned by ②). 17 of these are currently being restored in the National Library in Jakarta. The whereabouts of the remaining 6 is unknown. As the library has jurisdiction over old manuscripts in West Sumatra, there are plans to increase the collection with the cooperation of Andalas University.

(10) Public Archives

Located in Padang city. The curator, Eka Nuzia showed us around. There are three buildings on the grounds of the public archives: an office building in the center, a document storage building behind that, and a new document storage building under
construction next to that. While the office building was almost undamaged, the first and second floors of the document storage building were badly damaged. While the storage boxes with the documents in them can be seen from outside the building, the building itself is extremely unstable, and the documents cannot be removed for fear of setting off a secondary disaster.

4-3-3 Recovery of Disaster-Damaged Cultural Heritage

Action Plan for the Recovery of Padang is currently being formulated by the central government and the West Sumatra provincial government of December 2009. Recovery plans have been formulated for regions, provinces and cities that have experienced major disasters in the past, and Padang is no exception. Moreover, the Indonesian government followed the precedents of Aceh and Central Java and Jogjakarta with the establishment of the Rehabilitation and Reconstructions Executing Agency for West Sumatra as the third example of its kind, and there are plans to reconstruct homes and public facilities in accordance with short, mid and long term recovery plans in the future. Furthermore, as the recovery plans made on a provincial or municipal level in the past did not incorporate items on cultural heritage, UNESCO submitted a cultural heritage damage assessment report to the Indonesian government, and intends to propose the inclusion of cultural items in the Padang Action Plan. The survey report written on cultural heritage damage in Padang made in this survey has already been submitted to UNESCO's Jakarta office

4-3-4 International Cooperation UNESCO

The main difference in the international support for the restoration of Padang's cultural heritage when compared to the tsunami damage in Aceh five years ago and the Central Java earthquake three years ago is the moves made by UNESCO. UNESCO began collecting information on damage from the Indonesian government and locals in Padang immediately after the earthquake, and worked with the Indonesian government to assist requests by the Indonesian government for assistance from international society. In addition, a damage survey funded by UNESCO was scheduled one month after the earthquake, and experts on museums, historical buildings and urban planning were dispatched provide the required assistance based on information obtained to date and discussions with the Indonesian government. Two experts were dispatched from the United Kingdom to museums where exhibits fell and were damaged as a result of the earthquake, and six experts on historical buildings and urban planning were dispatched after consultation with Japan consortium. Also, based on moves by UNESCO, in addition to the survey scheduled to be conducted by the consortium in Aceh, a survey on damage to written cultural heritage of Padang was urgently implemented and the survey report was submitted to UNESCO. UNESCO is scheduled to prepare a comprehensive report based on these reports, and to submit this to the Indonesian government, and the proposals made by international experts are expected to be incorporated into the Padang Action plan. This would be quite significant if Padang could be used as a pilot case for culture to be incorporated and established in post-earthquake recovery plans in Indonesia in the future.

Considering the fact that there were no cultural heritages in the Padang region recorded on the UNESCO world heritage list, UNESCO's moves in this case are noteworthy for their speed along with the scale and content of the assistance. Conversely, it could be said that Jogjakarta and central Java, home the internationally known tourism sites of Borobudur and Prambanan, which are also registered as world heritage sites, gained much attention from inside and outside Indonesia regardless of UNES-CO's moves. We hope that in the future, the comprehensive report being prepared by UNESCO generates much interest in international society, which can then be directed toward assistance for specific cases of restoration.

<u>Prince Claus Fund for Culture and Development (The Netherlands)</u>

The Prince Claus Fund based in the Netherlands has provided assistance for the construction of a manuscripts library in Tanoh Abee to store many manuscripts in Aceh. The Fund has also provided assistance to the Indonesia Heritage Trust in Padang by supporting the damage survey conducted from October 10.

4-3-5 Conclusion

Now we will summarize the results of the survey based on the items mentioned above while keeping in mind case immediately after the earthquake in Padang.

Timing of local surveys and assistance: Padang is a case in which action was taken immediately after the earthquake, and the on-site survey was conducted two months after the earthquake occurred. There was no atmosphere of tension in Padang city where building and urban planning surveys were centered, or in the *surau* or mosques around Padang Pariaman regency where the manuscripts are scattered. However, according to Indonesian experts who entered the village most severely damaged one month after the earthquake, it was in no condition to be surveyed. Some people are of the opinion that cultural heritage surveys should be conducted 3 months after an earthquake, but it is believed that the most important aspects are quickly and accurately collecting on-site information. The timing of assistance through on-site surveys and the dispatch of experts should be decided based upon such information. For example, in Padang, the bricks from a collapsed building began to be cleaned up one month after the earthquake, and after one month it was difficult to maintain the condition of exhibits in the museum that were damaged when they fell. Furthermore, with respect to the conditions in Padang city, many large public facilities suffered severe damage, but very few homes were completely destroyed, and the security situation recovered relatively quickly. Based on this, the timing of the dispatch of experts by UNESCO (one month after the earthquake) is believed to have been appropriate.

<u>Trends in international assistance</u>: Due the swift response by UNESCO, the current issue id how to support the restoration action plan implemented by the Indonesian government. Until now, regions in Padang had not been registered based on the idea of "urban landscape" but it is probably necessary to consider protection of the townscape when reviewing the registration list, to review the protection system used to date, and to create links between restoration action plans and implementation systems.

Roles of universities and NGOs: In Padang, universities and NGOs play different roles to those of the government in their efforts aimed at restoration. Eko Alvares, a professor of urban planning at Bung Hatta University, has been involved in the creation of a 20-year plan for Padang. One month after the earthquake, he set up an office for people affected by the earthquake in the old city of Padang (Kota Lama Padang) to provide advice for residents. He has also selected seven buildings within the city to create design plans for restoration from earthquake damage with his students¹⁰. NGO activities include damage surveys conducted by the Indonesian Heritage Trust with the support of the Prince Claus Fund. This survey was a damage survey covering historical buildings not limited to registered cultural assets. Members from Gadjah Mada University who experienced the survey of damaged cultural heritage during the central Java earthquake also participated in this survey. The activities of these universities and NGOs play important roles for damaged cultural heritages owned or managed by the private sector or communities that cannot be handled by government institutions.

From Aceh and Jogjakarta to Padang: implementation of surveys by the Indonesian Heritage Trust utilized the experiences of Jogjakarta in Padang, where the next earthquake occurred. For manuscripts, Indonesian Association for Nusantara Manuscripts (MANASSA), which quickly provided information to international society in Aceh, utilized its academic network in an effort to improve networks for quickly provided information on affected areas since Aceh.

Meanwhile, with regard to moves made by active NGOs and universities, there seems to be a lack of collaboration by these NGOs and university institutes along with public institutions such as local governments, the central government in Jakarta and regional offices under the jurisdiction of the central government. Information on the cooperative relationships NGOs and universities have formed with foreign institutions is difficult for public institutions to obtain. In order to rapidly collect information and perform restoration more effectively after earthquakes, the issue faced is how to form a collaborative relationship between the government and the private sector. Furthermore, it is also necessary for countries providing assistance to consider which organizations would be the best counterparts to make assistance the most effective under such conditions.

5. Conclusion

5-1 Conclusion

Over the past five years, there have been many natural disasters including the tsunami in 2004, the central Java earthquake in 2006 and the West Sumatra earthquake in 2009. The experiences of these disasters have had an impact on measures taken in Indonesia to recover from disasters. Although there are differences in the disaster prevention measures taken by each region, they are gradually becoming better established with the assistance of a variety of countries. However, no standards have been established for disaster prevention for cultural heritage, steps taken after damage is incurred or how much detail is required for surveys of the cultural heritages covered by such measures. Moreover, although the historical importance of the identification of written cultural assets has begun to be recognized mainly by academics, there is currently a lack of awareness of what kind of written cultural assets are located in each region.

Here, we would like to address the situation and issues related to the restoration of damaged cultural heritage revealed by this survey in Indonesia from the perspective of international cooperation.

- There were differences in optimal timing for the initiation of assistance in Aceh, Java and Padang. The timing of assistance varies depending on differences in the damage to cultural heritage incurred in each affected region.
- Looking at examples such as the Japanese paper and chemical products used for restoring documents and manuscripts

in Aceh, the scaffolding provided for the monuments in Prambanan, physical aid provided as emergency assistance should be effectively conducted based on consideration of information on the damage and the requirements of the affected country.

- Cooperation not only with governments but also NGOs is essential; for some cultural heritages subject to assistance. It is necessary to understand the relationships and roles of NGOs and governments in countries being dealt with in order to consider counterparts able to effectively utilize assistance provided.
- · Japan is expected to accumulate of research on the earthquake resistance of historical buildings and provide technical cooperation utilizing such research. However, research and technical cooperation based on long-term plans extends beyond the framework of emergency assistance and the formulation of plans on international cooperation based on the results of emergency surveys is essential to carry this out. The plans should then be considered by various experts and related organizations within the consortium based on factors such as financial aspects. Trends in international assistance for damaged cultural heritages need collaboration not only with international organizations such as UNESCO but also countries providing assistance such as European and American countries. It is necessary to constantly collect information on the timing of moves by each country and what kind of assistance is provided, in addition to information on international conferences, etc. on progress after assistance is provided.

5-2 Proposals

Based on the situation and issues described above, the matters that need to be addressed by Japan to provide assistance for cultural heritage restoration are as follows.

• <u>Strengthening of Ties with Academic Networks</u>: It is clear that the creation of academic networks and relationships of trust with other countries in normal circumstances are essential for information collection and assistance in the event of a disaster. The role of the Japan Consortium for International Cooperation in Cultural Heritage is gaining importance as a place for international cooperation and collaboration with these academic fields.

• Importance of First Damage Assessment : Damage assessment conducted immediately after a disaster should be conducted after duly considering requests from the country concerned, and need to produce results that can be used as material for the consid-

eration of short, medium and long term plans implemented by countries providing assistance. Surveys should be conducted at a time carefully considered based on information on damage in the country concerned, and the details of the survey need to be based not only on a certain region or cultural heritage, but a perspective rooted in the overall system for preserving cultural heritage in the country receiving assistance.

• <u>Provision of Goods for Emergency Assistance</u>: Physical assistance required for emergency assistance is effective if sufficient consideration has been given the requirements and situation in the relevant country. For example, the provision of PCs for creating catalogs for damaged libraries in Padang is believed to be effective while only requiring a small expense. However, Japan's emergency assistance related to cultural heritage does not include any funding for the provision of inexpensive consumables and equipment such as PCs. The provision of goods without surveying the damage situation is not useful, and there is a high likelihood that it will end up being short-term assistance with little outlook for long-term effectiveness, but the rapid provision of goods should be considered depending on survey results.

• <u>Interdisciplinary research cooperation</u>: It is impossible to conduct sufficient technical cooperation or research only utilizing academic fields related to cultural heritage. That is, collaboration with fields other than cultural sciences, such as seismology, civil engineering and meteorology is also required. The Consortium for International Cooperation in Cultural Heritage related to the restoration of damaged cultural heritage needs to play a role as a place for sharing information between a variety of academic fields.

- ² See [http://www.eri.u-tokyo.ac.jp/indonesia/] for details.
- ³ Law on Cultural Property No.5/1992
- ⁴ Based on an announcement given by the Indonesian government at the "Expert Meeting on Cultural Heritage: Restoration and conservation of immovable heritage damaged by natural disaster, 14-16 January 2009, and at Bangkok / Ayutthaya, Thailand Immovable Cultural Heritage and Emergency Actions in Southeast Asia," hosted by National Research Institute for Cultural Properties, Tokyo.
- ⁵ See Appendix 5
- ⁶ [Tokyo University of Foreign Studies 2006]
- ⁷ See Appendix 6
- ⁸ See [http://www.acehbooks.org/] for details.
- ⁹ See [http://www.princeclausfund.org/en/what_we_do/cer/

¹ See [http://www.budpar.go.id/page.php?ic=622&id=4294/] for details.

index.shtml] for details.

¹⁰ Based on an interview with Professor Eko Alvares held on November 19, 2009.

4. Iran

(Focused on the Case of Bam)

1. Outline of the Research Project

1-1 Research Abstract

This research project was carried out under the tile of Research Report on the Recovery of Damaged Cultural Properties based on the contract consigned between the Kokushikan University and the Japan Consortium for International Cooperation in Cultural Heritage (JCIC). The cultural heritage as a target of this project is an archaeological site of Bam. It was awfully and totally damaged by the earthquake which occurred in Iran in the end of 2003.

At the site of Bam, many experts from abroad such as Italy, German, and France have still engaged in various schemes of activity in the recovery process as well as the staff dispatched from the national authority. As for Japan, in the mean time, most of related parties and persons have recently been kept away from the process after the kidnapping of a Japanese student which occurred in 2007, although it had once a strong presence in financial support and personnel contribution immediately after the earthquake.

The purpose of this research is to ascertain precisely the current conditions of recovery process going on site, and then what the site really require for the coming future, through the observation presently in November 2009, when six years have elapsed since the earthquake had occurred. Unfortunately, however, the present author in charge of this research project could not have an opportunity of visit to the site of Bam within the contract. Instead, he made an effort in the best way to collect the information and to obtain relevant documents from the official persons in the city of Tehran.

The project team would like to express sincere thanks to:

UNESCO Tehran Cluster Office,

Bam Base Tehran Office of Iranian Cultural Heritage, Handicraft and Tourism Organization,

ICOMOS Iran National Committee,

Isfahan University,

and excellent staff members of these organizations for their invaluable cooperation.

Kokushikan University

1-2 Member of the Research Project

The following members took part in and contribute this research project. The members except Okada did not join the mission team to Iran, but contributed in the form of informative cooperation such as seismic data collection and interpretation of Persian documents.

Name	Affiliation & status	Assignment
Okada, Yas-	Professor, Institute for	Generalization of
uyoshi	Cultural Studies of Ancient	data and report
	Iraq, Kokushikan University	making
Toshikazu,	Professor, Faculty of	Information of
Hanazato	Engineering, Mie Univer-	seismic and
	sity	structural
		engineering
Solemaniye,	Graduate Course of the	Interpretation of
Kimiya	University of Tokyo	Persian docu-
		ments

1-3 Itinerary of the mission to Iran

The member of this research project, Mr. Okada, alone visited Iran for the mission in mid September this year, of which the itinerary including the details of his visit is as follows:

Table 1: Itinerary of the mission to Iran for research on the recovery of damaged cultural properties of Bam

date	institutions visited &	description
	interview persons	
2009/		
8 Sep.	Left Japan via Kansai	
	airport.	
9 Sep.	Entered Iran at Tehran	Mr. Mokhtari introduced
	airport via Qatar.	a vice-director, Mr. Ne-
	Met with Mr. Mokhtari,	jati. Talked about the
	director of BBTO, and	purpose of visit and con-
	his colleague at Hotel.	firmation of schedule.
10 Sep.	Called on Mrs. Mokh-	Information of recov-
	tari and Nejatiat at	ery project controlled
	BBTO in Saad Abad	by BBTO and related

	Park.	publications.
		Joined by Mr. Vatan-
		doust, former Director
		of RCCCR, Mokhtari's
		boss.
11 Sep.	Called on Mr. Boustani,	Talked about Iranian ad-
	secretary general of	ministration of heritage
	ICOMOS Iran.	protection and activities
		of ICOMOS Iran.
12 Sep.	Visit the office of	Exchange of views on
	ICOMOS Iran and met	ICOMOS activities of
	with its board members	national level such as
	including President Mr.	relationship with the
	Hojat.	government
13 Sep.	Second visit to	Received copies of major
	BBTO.	publications and dis-
		cussed on cooperation
		with Japan.
	Visit to Japanese Em-	Exchange of views on
	bassy to see cultural at-	cultural cooperation be-
	taché, Mr. Abe Left Iran.	tween two countries.
14 Sep.	Arrived in Japan via	
	Qatar.	

2. Disaster Characteristics of Cultural Properties in Iran2-1 Disaster Characteristics in Iran

According to Geological Survey of Iran (GSI), there are three major seismic belt in the whole country of Iran. The first one is along Zagros mountain range in the west, the second along Alborz mountain range, and the third the north-south belt



Fig.1 Location of Bam

of faults in the east including the area of Bam (Fig.1).

The investigation teams sent by Japanese academic institutes including those of architecture and of civil engineer immediately after the earthquake, reported that the city of Bam is said to have had no experience of earthquake throughout history, and in fact there is no indication of any seismic damages there.

On the other hand, in the east of Bam there is active Bam fault (or Gowk fault), which is a right-lateral one running in the northsouth direction, and it is said that this fault might be associated with the earthquake in 2003. According to United States Geological Survey (USGS), the hypocenter was located some 10 km south to the city center of Bam and some 10 km deep. It further announced that despite of shallowness of the hypocenter, the fault rupture did not reach the earth surface due to a relatively small scale of magnitude which indicated 6.6 (Fig.2). The hypocenter was assumed within 10 km from the citadel of Bam and some 8 km deep.



Fig.2 Fault line near Bam

Most of buildings in Bam had been of masonry structure with adobe (mud-brick) and/or ordinary bricks, and very few were of modern construction. Adobe is very traditional as well as *chineh* wall in the way of construction simply with mud compiled, buildings of which are usually constructed with thick walls and domical-vaulted roofs of the same brick masonry. Due to the inferiority of seismic resistance this kind of masonry construction has been prohibited after the twice revisions since the enforcement of aseismic designing method in 1967.

2-2 Previous disaster damages on cultural properties

According to the relevant research by Hanazato and Hejazi (2009), large parts of Iran are seismically very active. However,

the Bam region was not regarded as belonging to the most active zones. The main reasoning behind this assumption was that: a) no historical damaging earthquake had previously been reported from Bam, and b) the Bam Citadel (Arg-e-Bam) was an indirect evidence of the lack of damaging earthquakes. The youngest parts of the citadel dated approximately to 400 years ago, while the oldest parts were over 2000 years old. Arg-e-Bam had, to the best of our knowledge, not been damaged previously by any earthquake. The historically low seismic activity around Bam is reflected in the predicted accelerations of around 0.30g at 10% probability in 500 years, which is relatively moderate.

Three large earthquakes have struck the region north of Bam (on the Gowk fault) over the last decades:

the Golbaf earthquake of 11 June 1981, Ms=6.6;

the Sirch earthquake of 28 July 1981, Ms=7.0;

the North Golbaf (Fandogha) earthquake of 14 March 1998, Mw=6.6.

The trends of the main faults (including the Bam fault) in this region are north-south, and NW-SE. The Gowk fault system is recognisable for its surface ruptures during the 1981, 1989 and 1998 earthquakes as well as a hot spring system.

3. Disaster Prevention System and Recovery of Cultural Properties — System and Efforts of Iran

3-1 Disaster Prevention System and Efforts

On the disaster prevention system of the national level of Iran, we have a detailed report produced after the Bam earthquake by the collaboration of the UNESCO Tehran Cluster Office and the University of Shahid Beheshti:

> Fallahi, Alireza & Sharif Motawef, 2007, "Bam Earthquake Reconstruction Assessment, An Interdisciplinary analytical study on the risk preparedness of Bam and its cultural landscape, a World Heritage Property in Danger"

> (A joint project between UNESCO Tehran Cluster Office & University of Shahid Beheshti).

The following description is after the above document unless a special notice would be indicated.

3-1-1 Conceptual Framework

UNDRO (Office of the United Nations Disaster Relief Coordinator) in 1984 recounts eleven general preparedness measures: emergency plan, legislation, financial measures and compensation, organization, communications, predictions or forecasts, public warnings and information, damage and needs assessment for post-disaster phase, emergency health care, evaluation, training and education. It also mentions the special types of assistance, such as military assistance, search and rescue, space technology and non-material assistance. However, in the context of historical areas there are some other measures that should be considered. They are:

- 1) Vulnerability assessment,
- 2) Planning,
- 3) Institutional framework,
- 4) Information systems,
- 5) Resource base,
- 6) Warning systems,
- 7) Response mechanism,
- 8) Public education and training,
- 9) Rehearsals.

3-1-2 Stakeholders in Risk Preparedness of Bam

Stakeholders in a risk preparedness process usually include representatives of the following:

· Community members,

• Governments (national and local) encompassing public and semi-public entities,

- · Civil society organizations including NGOs,
- · Private sector, i.e. business and industrial groups,

• Professional groups, including academic researchers, training organizations, consulting firms,

· Media, including newspaper and TV networks,

For the risk preparedness process to be effective and successful all these stakeholders should demonstrate commitment to the cause through transparency, bottom-up planning, democratization, cost effective measures, ensuring proper utilization of resources and strengthening close collaboration and partnership. (see attached Table).

3-2 System and Efforts in the Disaster Management

It is no doubt that the disaster of Bam has urged to build up a nationwide system of disaster management in Iran though the specific information was not available. Here at first is introduced based on Fallahi's report mentioned above which recorded in detail and concluded how the people of Bam behaved themselves in response to the earthquake. Secondly abstracted is a national effort referred to in the document prepared last year as a national report to submit to UNASCO World Heritage Committee.

3-2-1 On-site Data Collection in Fallahi's Report

The people who lived in Bam is categorized at first into the following three groups from the viewpoint of the lifestyle.

Group A: People engaged in business affected by cultural heritage,

	Community and impacted populations	Local Government	National Government	Civil Society Organizations	Private corporate sector	International Organizations
Key representatives	Impacted householders City residents Local citizens' groups	Bam Municipality Bam Islamic City Council	Cultural Heritage Organization Housing Foundation Kerman Provincial Government	International NGOs National and Provincial NGOs Local NGOs	Building Materials Contractors Consultants Local businesses	UNESCO UNDP
Priorities	Housing Income and employment Improvement in urban services	Urban infrastructure Urban planning Building permits Subdivision and setback applications	Housing National historic Cultural Heritage Infrastructure Agriculture	Social Vulnerability reduction Psychological help Women and children Empowerment	Receiving contracts Selling the building materials	Capacity building Resource management Training and education Vulnerability reduction Coordination
Available resources	Labor Money Ideas	Knowledge of the situation Authority	Financial resources Technical resources Material resources	Technical resources Financial resources		Technical advisory resources Financial Support

Table 2: Stakeholders' analysis of Bam risk preparedness process community

Group B: People with deep interest in cultural heritage. Group C: Ordinary people.

Further in the report the residential area of Bam is divided into seven sub-areas and summarized each by the sub-area the results of the data collection by means of personal interview. Noticeable points of conclusions as a whole are as follows:

1) Arg-e Bam is a symbol of culture, tradition and history within Bam. For this reason, it represents and conjures a sense of identity and pride within the community. The next priority deals with the restoration of Imam shrines and mosques. This sequence of priority coincide with the viewpoint of Bam's residents

2) There exist significant differences between the residents of Bam whom hold long entrenched historic within the area, and those who have migrated during the post-earthquake period in regards to their feelings of belonging to Arg and other historic sites.

3) There does not exist significant differences between low, middle and high social classes in regards to their feelings towards Arg and Bam's overall Heritage.

4) Those individuals whom remained residents of Bam after the disaster posses much stron g er feelings of affection to Bam.

5) Younger residents under the age of 20, lack awareness about Arg-e Bam and other historic monuments. Therefore, there is an urgent need to educate and train residents in this regard.

6) Support is required for palm and date tree owners in order

to assist in deterring plants diseases and other epidemics.

7) Relations must be strengthened between the District Governor, Mayor, the CHO and other related stakeholders.

 Greater responsibility must be allocated toward the private sector in order to persuade them to assist in maintaining historical buildings.

 There exist 4 main elements in Risk Preparedness: planning, regulation, budget and people participation.

3-2-2 Action plan for Risk Preparedness and Disaster Mitigation



(after "Management Plan" in [ICHHTO 2008])

4. Bam Earthquake in 2003 – a Case Analysis 4-1 Outline of Disaster

The earthquake occurred at 05:26 a.m. in local time on Dec. 26, 2003. The United States Geological Survey (USGS) an-

Table 4: Risk Preparedness and Disaster Mitigation

Objectives	Strategy					
to safeguard the significance of lam and its cultural Landscape by efficiently managing the post- biaster recovery and econstruction process and ensuring preparedness for future values id disaster risks.	Integrate Risk Reduction and Disaster Management Plaining emphasize this issue in all planning programmes. Advocate a culture of disaster preparedness through awaren gatherings, educational establishments, government offices	in the	itsing m Col	and p anty.	ntilye Manageme ublic participati	nt Plan, and In notably in pub
Activities		Ter	-	-	Barnonthis	Linesine
ALTIVILIES		-	-	144	Arencies	Acency
Preparation of a Disaster Sanagement and Aitigation Plan DMAP]	Identify the elements at risk based on the natural disatter types prevalent in the Ban County Cultural Landscape (BCCL): Exittinguase: instance and hydraulic structures Flooding: plantations, adobe structures Sand storms: plantations Grought: plantations, ganats	•			WGTHBCL OPMBCL ICHHTO	Bain County
	 Prepare the DMMP within the general framework of national disaster rescores policies so as to not undermine the significance and values of the elements in cultural landscare in the disaster accounts and consider process. 		•			
	 Rating awareness to obtain maximum participation in preparation of the DWWP, especially on part of the private sector and the community 		•			
	 Propose mitigation measures for the elements in BCCL, based on the nithural disabler types prevalent in this landscape Earthquake retroit of historic structure and building earthquake resistance modern structures proceding building soil divies, clearance and 		1			
Activities		Ter	10		Responsible	Leading
		-	-	Ling.	Agencies	Agency
	construction of matural guilles Sand storms Expand protective green belt with appropriate types of domestic plants (e.g. Goz and Kohoor) Drought Efficient water management and agriculture by maintaining the gonots, Developing early warning systems					
	Propose a post-disaster recovery, reconstruction and rehabilitation programme, to include actions for: Protection and conservation of significant elements in BCCL Preservation of the identity and integrity of the overall BCCL Safeguarding of the intangible heritage				WGTHBCL OPMBCL ICHIRTO	Bam County
implementation of the DMMP	 Raising awareness to obtain maximum participation in implementation of the DMWP, especially on part of the private sector and the community by; Organizing awareness raising campaigns throughout the BCCL Developing community groups for emergency response in case of natural disasters 				WGTMBCL OPMBCL ICHINTO	Bam County



Fig.3 Damage level map of the central area of Bam city (part of map made by Building and Housing Research Center and provided by UNESCO Tehran Cluster Office)

nounced the seismic scale as 6.6 in magnitude. The earthquake acceleration was figured 0.8g in horizontal one and 1.1g in vertical.

UN Office for the Coordination of Humanitarian Affairs reported that some 50,000 buildings were collapsed, some 43,200 people were killed, some 90,000 people lost their residences, and that more or less 200,000 people were hurt both physically and economically.

International Institute of Earthquake Engineering and Seismology (IIEES) informed that severe damages were concentrated in the city Bam, and that in the old quarter, i.e. northeastern and southeastern part of the city, in particular, more than 80 percent of the buildings in the built area were collapsed completely. The Citadel of Bam located within the area was also thoroughly damaged

4-2 Disaster Damages on Cultural Properties

4-2-1 Outline of the Property

The Bam Citadel, the Arg-e Bam, is one of the most remarkable complexes of earthen architecture and construction that was ruined in the Bam earthquake of 26 December 2003. Soon after the earthquake restoration activities started in the Citadel.

The Bam Citadel stands on a rocky slope at an altitude of 1065 m, latitude $26^{\circ}5'$ North and longitude $58^{\circ}27'$ East, with a hot-dry climate, on the North-east side of the city of Bam, South-east Iran. The Citadel, with a area of about 20 ha, is one of the largest mud complexes in the world, which dates back to near 2000 years ago. It used to be a residential site until the middle of the nineteenth century A.D., at which time people abandoned the

Citadel to build the new city of Bam. The first restoration action of the Citadel as a historical monument was taken in 1958. It was registered as a national heritage site in 1966. The comprehensive restoration of the Citadel began in 1971, which continued until the devastating earthquake on 26 December 2003.

The Citadel, which is mainly made of adobe, is surrounded by walls of up to 18 m high and 2000 m long. The commoner's quarters and the governor's quarters are the two major sections of the Citadel, which are separated by walls and fences. The former consists of seven residential areas, and the latter consists of the military section and the governor's residence and associated buildings.

4-2-2 Detailed Description of Disaster Damage – Effectfactor Analysis of the Earthquake Damage and the Typology

In Vol. 1 - No. 2 issued in 2007 of the special serial publication "ARG: Annual Report of Arg-e Bam Research Foundation" commenced after the earthquake, Mr. M. Nejati, vice-director of the Bam recovery project, described effect factors and their types recognized in the series of building damages of Bam as follows:

"The first step of the recovery process after the earthquake was to reinforce the damaged historical buildings in Bam. In this work, it was recognized that the condition of damaged structures varied widely, and that such variation was caused by several factors including building material and construction method. These can be classified into:

1) Affection to seismic damage: analysis of earthquake proved that the unevenness of ground could have caused difference of affection, and that even in the same building, variety of quality



Fig.4 ICHTO model of the Bam Citadel (after Langenbach).

of building material and construction method of previous restoration as well as time difference of restoration stage could have affected the condition of damage.

 Affection of previous restoration works: restoration works carried out in Iran so far were always sought for the authenticity of structures and spaces, but not prepared for earthquake and other disaster.

3) Affection of lacking seismic design: the facts of earthquake are very often left behind in Iran due to considerably long intervals, and therefore no architects and other building craftsmen had any experience of seismic disaster.

 Affection of faults of building materials: substantial weakness of mud-brick was an important cause as well as shortness of seismic resistance of mud-brick structure.

5) Affection of faults in architectural plan and foundation design: the difference of damage might have been suggested through confirming the presence of accurate design of dome and arch by means of precise measurement, and besides, the lack of foundation in many of buildings could have made a loss worse

6) Affection of other natural factors: damage done to timber by termites is an example of this category; damage by wind like as sandstorm cannot be also neglected; neither of them needs to be emphasised to compare to seismic damage.

4-2-3 Architectural Landscapes Before and After the Earthquake

As mentioned above, restoration works had already started at the site before the earthquake. In restored spots the structural remains mostly appear to be damaged much worse than other spots because of structural discontinuity between parts of original masonry and later addition. Some of remains which had already been restored relatively better such as the Main Gate and Governor's Residence, represent a stronger contrast of change between appearances before and after the earthquake as are presented below.

4-3 Recovery of Damaged Cultural Properties 4-3-1 Activities from "Periodical Report 2009"

1) Equipments

• Completion and equipment of the Document Center by providing two external hard disks, and in order to increase the security level of data protection, the external hard disks are keeping in two different locations in safe box,

• Production of over 200,000 adobes to use in restoration process in Bam Citadel, • Production of over 25,000 reinforced adobes with palm fibers required by the University of Dresden (*Technische Universität Dresden*) for continuation of restoration of





Fig.5 South Main Gate

Sistāni House,

• Production of over 11000 adobes required by the Italian Ministry of Culture for restoration of Tower 1,

• Making a contract with Bam Municipality of *Nezām Shahr* for providing the clay from *Nezām Ābād* area to the adjacent of Bam Citadel for production of adobe, mortar, and mud plaster,

• Adding up six more shades measuring 12 by 6m to the adobe workshop, aiming to increase the number and improve the quality of adobe,

- Further equipment of the adobe workshop and the laboratory,
- Further equipment of the model workshop,
- Purchasing drilling machines for new restoration approach,
- Purchasing drilling machines for inserting the tensile elements in the walls, domes and etc.,
- · Purchasing the necessary scaffoldings for restoration works,
- · Purchasing the material needed for the workshops,
- Expansion of the general warehouse and the facilities for storing tools and equipments of the project,
- Completion of the Building of the Center for study of archeological findings (the warehouse and pottery exhibit),
- Equipping and supplying the items of consumption for the workshops,



Fig.6 Central complex of the citadel



Fig.7 Around the stable building



Fig.8 Courtyard of the barrack



Fig.9 Grand Jami Mosque



Fig.10 Ice House

- Completion of the residence of the project staff,
- Computer hardware and software updating,
- Equipping the technical of office with broadband internet,

2) Emergency restoration

Acts of emergency conservation have been carried out to preserve the remaining elements in the following areas:

- Fortification of the Second Gate,
- Windmill Tower of Jame Mosque,
- Ramp of the Stable,
- · Vast areas of the west and east of the Public Quarters,
- Jame Mosque.

3) Debris removal

More than 80% of the debris has so far been removed. The task has been carried out the following places: North of the fortification of the Second Gate, Windmill Tower, Vast areas of the west and east of the public quarters, Payāmbar Mosque, Architecture units of the south of the Stable, Architecture units of the southwest of Sabbath, Army Commander Building, Western walls of the Governor Seat, Inside of the perimeter walls for a length of 1830m.

4) Stabilization

In view of the threats endangering various parts of the Citadel, fortification workshops have been established, and the collapsing structures have been stabilized in the following area:

 Completion of two rooms of Sistani House by injection method and installation of fiberglass elements.

• Completion of two rooms of the Stable by injection method and installation of geo-grid mesh in various layers of the piers.

• Reinforcement of Payambar Mosque by using Sisse elements (palm tree fibers) (ongoing).

• Reinforcement the range of structures in the west of the public quaters

5) Restoration and reconstruction

- · Chahār Souk,
- · Fortifications of the Second Gate,
- Windmill Tower,
- Ramp of the Stable,
- Sistāni House,
- One architectural unit to the east of the Second Gate,
- · West and east of the passageway of the Bazaar,
- · West of Sabbath House,
- Walls of the pilgrimage place of Jame Mosque,
- · Completion and conservation and restoration work at the Bar-

rack

4-3-2 Action Plan Proposed by Isfahan University

The action plan for restoration of the Bam Citadel consists of three major parts: (1) research, (2) conservation, restoration and rehabilitation, and (3) presentation and education. The action plan is not aimed to complete reconstruction of the whole complex, but to conserve, restore, revitalise, present and develop the historical areas, based on clear guidelines and a strategic, realistic action plan to be implemented in the coming months and years. Thus, restoration of the main parts of the complex and rehabilitation of some parts such as surrounding walls, passageways and squares, residential units and public buildings are in priority. The three phases of actions to be undertaken in different stages are: phase I: emergency measures; phase II: documentation, assessment, analysis and planning, and phase III; long-term restoration, rehabilitation, presentation, and sustainable utilisation of Bam's cultural heritage.

Phase I: Emergency Measures - The Bam Citadel required urgent interventions in order to prevent further damage to the structures in case of after-shocks, and to ensure the conservation of the documentation on the site and to commence the research and analysis need to proceed with restoration plans. Phase I was accomplished in the first half of the year 2004.

Phase II: Documentation, Assessment, Analysis and Planning - Phase II, which was undertaken in 2004 and 2005, comprised comprehensive analysis and research aimed at improving the knowledge of the structural, geological and geotechnical conditions of the site, extending the knowledge of the archaeological strata, and improving the performance of the materials and of the construction of all future reconstruction or restoration activities.

Phase III: Long-Term Conservation, Restoration, Rehabilitation, Presentation, and Sustainable Utilisation of Bam's Cultural Heritage - These activities must be linked to the overall reconstruction and recovery plan of Bam City and represent an opportunity to improve the local and national capacities to build and restore structures in a seismic-safe manner, while representing the authentic designs and materials of the heritage assets. This action will be implemented in the coming decade (2005-2015) and beyond.

For reference, contents of the above publication are shown below:

/ Abstract

/ 1. Introduction: 1.3. The Action Plan 1.3.1. Phase I: Emergency Measures 1.3.2. Phase II: Documentation, Assessment, Analysis and Planning 1.3.3. Phase III: Long-Term Conservation, Restoration, Rehabilitation, Presentation, and Sustainable Utilisation of Bam's Cultural Heritage

/ 2. Description of the Project: 2.1. Original State of the Adobe
Shop 2.2. State of the Adobe Shop before the Earthquake 2.3.
State of the Adobe Shop after the Earthquake 2.4. Project Outline 2.5. Activities Carried Out So Far

/ 3. Experimental Tests: 3.1. Adobe Material Properties 3.1.1.
 Material Properties of Adobe Shop 3.1.2. Material Properties
 Selected for Structural Analysis 3.2. Palm-Tree Rope Properties
 / 4. Structural Analysis: 4.1. Material Properties 4.2. Loading

4.3. Method of Analysis

/ 5. Further Activities

/ 6. Conclusion

4-3-3 Activities Known from the Publication of Annual Reports of Arg-e Bam Research Foundation

1) Annual Report, vol. 1 no. 1 (2005)

// Preamble: Sayyed Beheshti, Bam earthquake, a tremble in the Iranians mind. / Skandar Mokhtari, A glance over post-earthquake activities of the Arg-e Bam Urgent Recovery Project.

// Archaeology: Bam after earthquake: selective information on ethnoarchaeology of disaster. / Debris removal from Arg-e Bam./ Human bone remains inside Arg-e Bam walls: historical context.

// Mud-brick excavation: A glance over laboratory achievements of the Arg-e Bam Urgent Recovery Project. / Soil mechanic laboratory: methods and techniques. / Laboratory studies on Arge Bam mud-bricks (tower 1). / Laboratory studies on Arg-e Bam soil mines.

// Geology: A report on geological setting of Bam.

// Pathology: On the Pathology of Arg-e Bam surrounding walls.
/ Pathological study on Arg landscape. / Pathological study on
Yakhdan (ice house). / Restoration and conservation of tower 7. /
Relics and limits of the old Bazaars (Markets).

// Reports and case studies: A plan for study of Qanats (well gaallary) of Bam region. / A plan for study of Qalahs (forts) of Bam religion. / Using GIS in Arg-e Bam documentations. / ICHTO international activities after earthquake of 26 December 2003 in Bam. / 'Bam' Tsrategic-structural project (from culturalhistorical point of view): the first phase.

2) Annual Report, vol. 1 no. 2 (2007)

/ Technical activities in the urgent recovery works on the cultural heritage Bam.

/ Activities inside Bam.

/ Archaeological research and activities in the recovery project of Bam.

/ Archaeological research of Ahraz area and the Bam fault.

/ Conservation of research materials on the Arg.

/ Ranking the enormity of damage caused by the earthquake.

/ Making 3D models of five historical buildings in Bam.

/ Activities at the courtyard of Takiyeh in Bam.

/ Restoration works at the barrack of Arg-e Bam.

/ Planning of an access route to Arg-e Bam.

/ Introduction of pre-historic pottery sherds found in the postearthquake

investigations.

/ Masjid-i Jami: discoveries after the earthquake.

/ Measuring the stress between arch and vertical wall in earthen buildings.

/ Translation: "Conservation and Structural Restoration of Architectural Heritage" adopted at the conference in Zimbabwe in 2003.

/ Activities outside the Arg: former hospital building and city walls.

/ Studies and classification of mud brick.

/ Arg-e Bam: barrack in Governor's residence.

/ Proposal of restoration of the Ice House in Bam.

/ Reconstruction of the former hospital building.

 "Arg-e Bam after the earthquake: archaeological activities" issued in 2007

/ Review of activities of the Bam recovery project after the earthquake.

/ Bam: its geography and history.

/ Report the outline of archaeology of Arg-e Bam and the removal of debris.

/ On-going program of current situation survey and archaeological investigations.

/ Stone artifacts discovered at the site of Tal-e Atasi.

/ Introduction of pre-historic pottery sherds unearthed in Bam.

/ Arg-e Bam and its cultural landscape in Achaemenid era: fundamental view.

/ Introduction of Sasanian to Islamic archaeology of Arg-e Bam and its vicinity.

/ Introduction of pottery of 8th to 13th centuries in Hijrah.

4-4 International Cooperation

4-4-1 Scheme of International Aid

Many experts of earthen architectural heritage visited Bam on occasion of "Terra 2003 - the ninth international conference on the study and conservation of earthen architecture" held in Yazd in November to December, 2003, just before the earthquake. Accordingly, because the international interest in the landscape of Bam had considerably increased when the earthquake occurred, movement of international aid for rescuing Bam had quickly been raised with the UNESCO Tehran office as a key organization.

In particular, Italy and Japan took the initiative in direct financial support in the early stage of recovery process of damaged Bam. The Japanese fund, however, was applied mainly to the cost of international conferences and experimental restoration works done not only by Iranian groups but by the German team other than the expense for Japanese consultants.

Italy and France (CRATerre-EAG) dispatched some experts and set about on-site restoration works soon after the earthquake, and then have been producing a certain results at the specific spots, part of the outer fortification for Italy and the inner second gate for CRATerre. As for Japan, on the other hand, although some experts have been involved, any on-site works are not currently promoted other than an experimental collaboration done recently by Professor Hanazato, Mie University with the staff of Isfahan University.

4-4-2 Required International Cooperation

The Iranian authority expressed necessary programs in the form of international cooperation under the title 'Need for international supports' in the periodical report submitted to UNESCO in 2009 as follows:

1) For the time being, the salvation project of Bam and its Cultural Landscape is in need of financial support from international institutions, co-workers, and universities to survive. Due to having limited financial funds, it is not feasible to call on international experts on the side of the Iranian government to take part in the project. On the other hand, the project seriously calls for constant international cooperation; thus, it has to exert a pull on international institutions as financial sponsors. So far, UNESCO has been of great help for the project through the funds siphoned by the Credit Fund in Trust of Japan. Also, Italian Ministry of Culture (*Ministero per i Beni e le Attività Culturali*) has financed one joint project. As several universities have so far expressed their readiness to take part in the project, the financial funds have to be provided as quickly as possible.

2) Given the fact that the works included in the project cannot be carried out without a proper scientific and research support, it seems crucial to establish an international research centre for brick heritage at Bam Citadel. The initial steps have already been taken, and those in charge of the project intend to take complete possession of the lands in order to start to build the research center. However, equipping the center requires international cooperation. In research phase, too, the desired goals could only be reached through international supports.

3) As for the required equipments in the Citadel, the greater part of them still needs to be procured. From the current stage on, advanced technical equipments are needed.

5. Conclusions and Recommendations

This research project aimed mainly at rather technical tasks including international cooperation and disaster countermeasures, and has successfully been resulting in abundant collection of latest information and relevant materials thanks to the courtesy of the Iranian authority and UNESCO Tehran Office as well as other personal cooperation.

Six years have elapsed since the earthquake occurred in the end of 2003, and the recovery project controlled by the Iranian government seems to have been continued with success both in academic research and practical restoration in general though not so rapidly.

Nevertheless, at present when most of financial aid offered from abroad or international organizations has ceased, we are faced still with various problems in order to recover and maintain continuously "Bam and its cultural landscape" by which the damaged site was inscribed in the UNESCO World Heritage List.

The author would like to recommend here the following proposals for the next stage of recovery and maintenance of the site based on various research results mentioned above and also on the latest information obtained from some key persons with whom the author contacted in last September:

1) Long term program:

Such intensive restoration works as operated in theses six years at Bam so far gave us precious experiences, but they deserved just an initial stage of the entire recovery project. Now an urgent and setting of a long term program is needed, taking into consideration the future voluminous task.

2) International conference:

Sustainable conference system should be produced in order to share the results of so far completed experimental works brought by several teams organized for research and practical restoration including foreign missions, and to promote the exchange of critical comments.

3) Equipments:

The lack of necessary equipments is most severe problem at

the site of conservation and restoration. Supply of more heavy machines would no doubt smoothly promote any on-site works. In particular, earthquake simulation vehicles or the like are required not only for conservation of Bam, but for seismic experiment in the nation scale, where with relatively short intervals disastrous earthquakes occur.

4) Permanent research base:

The history of Bam as well as its urban structure is of great international interest, and at the same time, not only various materials for restoration but plenty of seismic information are currently stored. Therefore, the author believes to be very reasonable conditions here in Bam to install a permanent research base for seismic disaster from the view point, both academic and administrative, where also the program of capacity building is expected to undertake.

Chapter 2 Case Study

5. Greece (Case Study on the Monastery of Daphni and Archaeological Site of Olympia) Ritsumeikan University Ritsumeikan-Global Innovation Research Organization

1. Research Overview

1-1 Research Objective

Recently increasing attention is being paid to damage to cultural heritage, and we are seeing more and more examples of cultural heritage sites suffering damage caused by natural or human disasters. We should take disaster mitigation measures to preserve our precious cultural heritage on a daily basis. Disaster mitigation measures differ from country to country. Some countries do not include cultural heritage in their schemes for disaster mitigation, and there are a number of examples where there was no real disaster mitigation system for a cultural heritage until it had been severely damaged by a natural disaster. In addition, since there is the need for quick and proper recovery of a cultural heritage after a disaster event, we have had increasing requests for cooperation from other countries, resulting in real cases of cooperation. However, it is be hard to cooperate quickly and appropriately if measures are planned after a disaster has happened. Thus, it is important to determine how we can contribute to other countries' disaster mitigation measures in advance, and to maintain close coordination with them.

Ritsumeikan-Global Innovation Research Organization, Ritsumeikan University was commissioned by the Japan Consortium for International Cooperation in Cultural Heritage and carried out case surveys on recovery of damaged cultural heritages as part of a research project on international cooperation for protecting cultural heritages. The project mainly consists of surveys on disaster mitigation systems and response systems in target countries, as well as concrete cases of both recovery and actual international cooperation. This research took up the Monastery of Daphni and the archeological site of Olympia, Greece as its main cases. Generally, Section 2 presents the characteristics of disasters and the characteristics of damage to cultural heritage sites. Section 3 presents a disaster mitigation and recovery system for cultural heritages, and Section 4 summarizes concrete examples of damaged cultural heritages and their recovery as well as international cooperation, based on the outcomes of the research. Section 5 reports "Special Session on Earthquake Protection and Post-earthquake Restoration of Cultural Heritages" in the 3rd Greece-Japan Workshop during the term of this research. Last but not least, Section 6 presents conclusions of these case surveys and proposals resulting from them.

1-2 Members of the Mission

The Members of this research are as follows.

Name	Position / Affiliation	Mission
Kanefusa	Professor, Ritsumeikan Global Innovation Re-	General coordination, Survey on
Masuda	search Organization, Ritsumeikan Univ.	Greek policy for the protection
(chief)	(Research Center for Disaster Mitigation of Ur-	of cultural properties
	ban Cultural Heritage, Ritsumeikan Univ. (Rits-	
	DMUCH))	
Kenzo Toki	Professor, Ritsumeikan Global Innovation Re-	Summary of the special session
	search Organization, Ritsumeikan Univ.	on the protection of cultural
	(Director, Rits-DMUCH)	properties
Yozo Goto	Project researcher, Earthquake Research Institute	Survey on seismic damage
	of The University of Tokyo	cases, Surveys on methods of
		reinforcement
Minsuk Kim	Post-Doctoral Fellow, Ritsumeikan Global Inno-	Survey on Greek policy for the
	vation Research Organization, Ritsumeikan Univ.	protection of cultural properties
	(Rits-DMUCH)	and concrete cases

1-3 Research Schedule

The research took place from the 20th to the 28th September 2009. The research schedule and the interviewees are presented in the table below.

Date		Visiting Places	People Interviewed
20 th Sent.	AM	Ancient Agora in Athens	
p.	PM	Library of Hadrian. Temple of the Olympian	
		Zeus, etc.	
21th Sept.	AM	The Parthenon of the Athenian Acropolis	Maria Ioannido
		(Fig.1-1)	(Director of The Acropolis Restora-
			tion Service)
		Hellenic Ministry of Culture (Fig.1-2)	Elena Korka
			(Director of Prehistoric and Classi-
			cal Antiquities, Hellenic Ministry of
			Culture)
			A. Miltiadou-Fezans
			(Directorate of Technical Research
			for Restoration, Hellenic Ministry of
			Culture)
	PM	The Exhibition Room for Archaeological	A. Miltiadou-Fezans
		Finds from Santorini in the National Ar-	
		chaeological Museum of Athens	
		The New Acropolis Museum (Fig.1-3)	
22nd / 23rd	AM	3rd Greece–Japan Workshop : Seismic De-	
Sept.	PM	sign, Observation, Retrofit of Foundations,	
		Contor at the Island of Santorini (Fig. 1.4)	
24th Cant	4.14	The Manasters of Dankai	A Mikindan Frances
24 Sept.	AM	The Monastery of Daphin	A. Milliadou-Fezails
			(Head of the Section for Resto-
			ration Studies on Byzantine monu-
			ments, Hellenic Ministry of Culture)
			Harris P. Mouzakis
			(Assistant Professor, National Tech-
			nical University of Athens)
	PM	The Monastery of Hosios Loukas	
		Archaeological Site of Delphi (Fig.1-5)	
25 th Sept.	AM	moving	
	PM	Archaeological Site of Olympia and its	Konstantinos Antonopoulos
		Museum	(Head of local service at Olympia,
			Hellenic Ministry of Cul¬ture)
26th Sept.	AM	moving	
	PM	Sanctuary of Asklepios at Epidaurus (Fig.1-	Nikos Ninis
		6)	(Head of the Engineering Division,
			Finance Management Fund for
			Archaeological Projects, Hellenic
		Archaeological Sites of Mycenae and Tiryns	Ministry of Culture)
27th Sept.	AM	The National Archaeological Museum of	
		Athens	
	PM	The Byzantine and Christian Museum	
28 th Sent	AM	The Acropolis Restoration Service (VSMA)	Maria Ioannidou
20 bept.	7101	The receptors residuation bervice (TSWA)	Maria Kominidou



Fig.1-1 Site visit in the restoration site of Acropolis, Athens



Fig.1-2 Interview in Hellenic Ministry of Culture





Fig.1-3 New Acropolis Museum (designed by Bernard Tschumi and others. Opened in June 2009)





Fig.1-4 View of Special Session of the 3rd Greece–Japan Workshop



Fig.1-5 Fire protection systems in Delphi



Fig.1-6 Fire protection systems in Epidaurus



Fig.1-7 Research sites and venue of workshop

2. Characteristics of Disaster Damage to Cultural Heritages in Greece

2-1 Features of Natural Disasters in Greece

The main natural disasters in Greece are earthquake and wildfire. Earthquake disasters often cause landslides. Floods and volcanic eruptions are also a threat from the viewpoint of cultural heritage preservation, and they often cause mudflows.

1) Earthquake

Greece is the highest earthquake-prone country in Europe. Earthquakes of magnitude greater than 5.5 on the Richter scale occur 0.64 times per year on average. This is lower than Japan (1.14) but is greater than Italy (0.52) (UNDP, 2004). However, when compared by unit area, Greece is 4.9 times per year per million square kilometer, whereas Japan is 3.0 and Italy is 1.7.

Table 2-1 shows recent damaging earthquakes in Greece. These earthquakes are not as large as those that have occurred in Japan, but they are more frequent.

Table 2-2 is the historical earthquake list of Greece, showing another aspect of Greek seismicity. Mega-earthquakes greater than magnitude 8.0 have occurred at intervals of several hundred years.

These seismic features of Greece may be understood through Fig.2-1, which gives a broad overview of the tectonic plate movement around Greece. From the east, the Anatolian plate of Turkey breaks into the Greek Aegean plate, which is diverted to move to the west and south. From the south, the African plate subducts under the Aegean plate, and forms typical subduction arc geology. Hence, Crete and Rhodes islands have suffered many earthquakes.

Mega earthquake of M8 have occurred at intervals of several hundred years, and caused damage not only to these islands but also to the Greek mainland. The shallow earthquakes among them, occurring at intervals of about one thousand years, caused tsunamis that affected the coasts of the Mediterranean Sea. Some historians think that these mega-earthquakes may have affected the sociocultural rise and decline of ancient Greece to some extent.

Another active seismic zone of Greece is the west coast along Ionian Sea. In this zone the strike-slip fault has caused frequent M7 scale earthquakes. One of the recent tragedies in this zone was the 1953 Ionian Islands Earthquake (M7.2), which killed about 450 persons and burned down 90% of the historical town on Zakinthos Island.

There are two more seismic zones which are dangerous to many cultural heritages in Greece. One extends from east to west in the center of the Greek peninsula and the other from Athens to Patra along the north coast of Korinthiakos Kolpos. The 1999 Athens earthquake, which affected Monas-teries of Daphni, occurred in the latter zone.

Year	Region	Magnitude	Impacts	
1953	Ionian Islands	7.1	450 dead, major damage + fires	
1954	Thessaly	7.1	31 dead	
1965	Peloponnisos	6.2	32 dead	
1978	Thessaloniki	6.6	45 dead, 220 injured, major damage	
1981	Korinthian Gulf	6.8	19 dead, 500 injured, 12220 buildings	
1986	Kalamata	5.7	20 dead, 2000 buildings damaged/destroyed	
1993	Pyrgos		Extensive damage to masonry houses	
1995	Aegion	6.5	26 dead, 60 injured, extensive damage	
1999	Athens	6.0	143 dead, 1600 injured, 50000 homeless	
2003	Lefkada	6.3	40 churches seriously damaged, liquefaction, harbor damage, landslide	

Table 2-1 Recent Damaging Earthquake in Greece (European Commission Directorate, 2003)

Table 2-2 Historical Mega Earthquake in Greece (Papazachos, 1997)

Year	Longitude	Latitude	Depth	Magnitude	Region
1000-1300BC				>8	Crete
365AD	35.2	23.4	<60km	8.3	Gortyna/Crete
1303	36.1	29.0	<60km	8.0	Rhodos
1856	35.6	26.0	60-120km	8.2	Heraklio/Crete
1926	36.5	27.5	60-120km	8.0	Rhodos



Fig.2-1 Plate motions which affect active tectonics in the Aegean and surrounding area (Papazachos, 1997)

2) Wildfire

Wildfire is becoming a serious natural disaster in Greece. From 1955 to 1973, 11,500 hectares of land were burned per year on average. However, this increased to 55,000 hectares per year from 1980 to 2000. Then, 270,000 hectares were burned in the summer of 2007, which is the worst wildfire season in contemporary Greek history. Zirogiannis (2009) discussed the background to this increase, pointing out ecological and socioeconomic factors. The following is a summary of his discussion.

Within the past 50 years, Greece has undergone serious social and demographic changes. From the end of the 1940s a rapidly growing urbanization movement was initiated and people started moving into the big cities. This movement reached its peak around the end of the 1960s and led to the isola-tion of many rural areas. A steady decline in rural population was observed. There was less demand for fire wood and grazing land, agricultural fields were left uncleared, paths in the mountains were no longer needed. Moreover, Mediterranean markets for forest products were steadily shrinking. Then, rural dwellers, traditionally the "managers" of forest land, were no longer attached to the woodlands as a means of making a living.

The consequences of the above are an ever increasing accumulation of biomass in the Greek forest, and a decrease of the incentive for rural dwellers to protect woodlands from natural threats, such as wildfires.

Furthermore, from the late 1970s, as the results of economic prosperity and increased pollution in urban centers, many people started leaving the cities during the summer months and building vacation houses in coastal areas and mountain villages. Thus, the urban lifestyle contacted to wildland, and raised the opportunity of accidental fires as well as the increase of tourism travelers.

Additionally, the Greek legal system greatly impedes any change in the use of forest land. Short-age of land led the land



Fig.2-2 Burned areas of Greece during the summer of 2007 (Zirogiannis, 2009)



Fig.2-3 Satellite photo during the burning of 2007 (DLR)

prices extremely high. And wildfires started to appear with an increasing frequency in areas where development land was great demand. Corrupt developers might have made intentional fires to construct houses and tourist lodgings soon after the fires.

The professionals of Hellenic Ministry of Culture mentioned another aspect of the increasing danger of wildfire to cultural heritages, which is a change of mountain vegetation, i.e., the covering of pine trees, which did not exist in ancient Greece ages.

Pine trees have spread across all of the wild area of Greece except the man-made olive forests. Fallen pineneedles contain oil and are very inflammable. In addition, pine-cones can survive during a fire and disperse many seeds soon after it. Thus, the risk of wildfire recurs within a short time even though the flammable pineneedles were burned out in the previous wildfire.

3) Volcano eruption

There are only three active volcanos (Methana, Santorini and Nisyros) in Greece that have erupted in historic times. They are located along the volcanic arc of the Southern Aegean Sea, and their activity is assumed to be an effect of the African plate subduction (Papazachos, 1997).



rig.1.5. The five seismovolcanic centers in the southern Aegean volcanic are (Papazachos and

Fig.2-4 Volcanic Arc of Southern Aegean Sea (Papazachos, 1997)

Only one weak eruption of the Methana volcano (in 250 BC) and five also weak eruptions of the Nisyros volcano are known (in 1422, 1830, 1871, 1873, 1888).

The most important and dangerous volcano in Greece is that of Santorini. This has a very big caldera, which was formed in approximately 1620 BC. There are thirteen known historic eruptions of this volcano from 197 BC to 1950. Some of them were very strong, causing damage and killing people. The eruption of approximately 1620 BC not only damaged the civilization of Santorini but also caused a large tsunami, which affected the island and coasts along the Aegean Sea. Some historians have tried to relate the Atlantis Legend to this historic volcanic activity.

2-2 Overview of Disaster Damage to Cultural Heritage *1) Ancient Ages*

Earthquakes, volcanic eruptions, tsunami and slope failures must have damaged very many cultural heritages in the long history of Greece.

Actually, there are many stories about the impact of these natural disasters on civilized towns in ancient Greece. Knossos on Crete Island was the site of a palace of the Minoan civilization. This site was continuously inhabited from the Neolithic period (7000-3000 BC) until Roman times. An earthquake and probable eruptions of Thyra (Santorini) volcano destroyed the town before 1890 BC. A new Palace was built in 1700 BC and

destroyed in 1570 BC by an earthquake. It was rebuilt in 1450 BC and redestroyed in 1375 BC (Christaras, 2003).



Fig.2-5 Knossos in Crete (Christaras, 2003)

Akrotiri on Santorini Island also contains ruins of the Minoan civilization. A large volcanic erup-tion in about 1550 BC blew the mountain body of the ancient Santorini Island and Akrotiri town was covered with volcanic ash and pumice stone. Inhabitants of the town was assumed to have escaped before the eruption. Excavation of the buried town began in 1974 and its richness and large scale raised the hypothesis that the Atlantis of legend was on Santorini Island.

Another site of ruins on Santorini is the ancient Thyra, which prospered after 900 BC. In 631 BC, the inhabitants of Thyra moved to Cyrene in Libya to escape a famine caused by volcanic activity. Minoura et al. (Minoura, 2000) surveyed tsunami deposits along the coast of the Southern Aegean Sea and also numerically simulated a tsunami caused by subsidence of the caldera of Santorini. They concluded that Santorini's volcanic activity had caused a large tsunami that affected the Aegean region in the late Minoan period.

Another interesting story about an earthquake in ancient Greece is the Trojan War legend. In the epic poem of "Ilias" created by Homeros, Troy was defeated by a trick of a dummy horse. However, some dreamers have postulated that the Trojan walls were broken by a strong earthquake and that the ancient Greece army utilized the chance to invade the city. Poseidon in Greek mythology is a god of the sea creates tsunami, and a horse in Greek mythology is a god of earthquakes. It is a fact that the active North Anatolian fault extends through the Trojan region.

2) Recent Years

Papazachos and Papazachou (Papazachos, 1997) described representative damage to cultural heri-tages in more recent years as follows:

"The cultural consequences of earthquakes in Greece have been very significant since historical monuments



Fig.2-6 Troy and North Anatolian Fault (Papazachos, 1997)

have been repeatedly destroyed by earthquakes. We can mention the destruction of the Colossus of Rhodos (227 BC), the Olympic Zeus temple in Olympia (365 AD), the Asclepios building in Cos (554 AD), the Roman market in Thessaloniki (620 AD) and of many archeological articles exhibited in the museum of Heraklion (1926, 1935). One of the most impressive recent destructions of the national cultural heritage is that caused by the earthquakes of August 1953 in Ionian island. Romas (1975) mentioned that 90% of the cultural asset of Zante became ash by the earthquakes of 1953 and the fire which followed."

Christaras (2003) listed the most destructive earthquakes to Delphi archaeological site as follows:

- 600 BC: complete destruction of the sanctuary
- 373 BC: extensive damage to the archaic temple of Apollo, mainly by rockfalls.
- 1870 AD: significant damage to the monuments (reactivation of the Arachova-Delphi fault zone)

The archaeological site of Delphi is built under an almost vertical limestone slope. Almost vertical discontinuities are developed in the rock mass, which are intersected by joints, fractures and open cracks. When we visited the site, entry to the center of the site was inhibited by a small rock-fall that had happened several days before.

Theofili et al. (Theofili, 2001) mentioned damage to classical monuments caused by the 1999 Mt Parnitha-Athens Earthquake as follows:

Most classical monuments survived the earthquake almost without damage. Serious damaged occurred to the Fortress of Fili (5th Century BC) and the Wall of Elefsina (5th Century BC). Some Byzantine monuments suffered damages. This is the case of the Monastery in Daphni (11th Century AD), which suffered significant damage. Damage to historical masonry buildings of the last centu-ries was reported also. Among them, are the Metropolis (the Cathedral Church) and the National Lyric Theatre. Also affected, though repairable, were a large number of buildings hosting cultural activities or objects of cultural value, including the National Opera and the Archaeological Museum.

The monastery of Daphni, already inscribed in the world heritage list of UNESCO, is one of the most important monuments of the middle Byzantine period, being famous worldwide for its excellent mosaics of the Catholic (Miltiadou, 2004). However, it is situated in a Neogene tectonic graben on the west side of the basin of Athens, 150m from the E-W trending marginal fault. Being located in a tectonically active area, it has suffered damage due to many intensive earthquake shakes. When considering the last two centuries, earthquakes of 1889 estimated magnitude 6.7 on the Richter scale (M6.7R), 1894 (M7.0R), 1914 (M6.0R), 1981 (M6.7R) and 1999 (M5.9R) should be mentioned. The 1999 earthquake was not large in magnitude, but occurred in a shallow crust about 15 km north of the Monastery. The building did not collapse but became unstable, and needed emergency fixing and much repair work.



Fig.2-7 View from cliff, Delphi (Christaras, 2003)



Fig.2-8 Delphi ruins and cliff



Fig.2-9 Mosaic of Daphni



Fig.2-10 Monastery of Daphni under repair

3) Wildfire

Many of the cultural heritages in Greece are made from marble stone, whose surface is metamorphosed by fire. In fact, some parts of some monuments have been scarred by fire, and most of the fires are assumed to have been manmade. Although, the number of wildfire disasters in Greece has increased in recent years. The level of damage to cultural heritages by wildfire is not clear.

3. Disaster Preparedness and Recover of Cultural Heritage: Structural Framework and Measures

3-1 Disaster Preparedness

Vatavali (2003) summarized the Greek policy for earthquake disaster preparedness in his report to the European Commission, Directorate General Environment Unit D3: Civil Protection as follows.

1) Seismic protection policy

Greece has paid a heavy toll in terms of life loss and has suffered a serious damage to property and cultural heritage due to earthquakes. Eventually this experience has led to forming over the years an earthquake protection policy framework. The main lines of the earthquake protection policy are:

· To mitigate seismic risk in the built environment

• To ensure preparedness at central government, prefecture and local authorities level

• To upgrade earthquake awareness and to keep the public informed on seismic safety issues

· To improve emergency response and aid provision.

The basis of the anti-seismic policy in Greece consists of the following legislative tools:

- · FEK 534 B/20-6-1995, New anti-seismic regulation.
- FEK 315B/17-4-1997, New reinforce concrete regulation.

• FEK 1329/6-11-2000, Greek regulation of reinforce concrete.

2) Agencies in the field of seismic protection

The Earthquake Planning and Protection Organization (EPPO)¹ under Ministry for the Environment, Physical Planning and Public Works (YPEHODE), established in 1983, is the competent authority to guide the national earthquake protection policy and to coordinate the state and private resources for its implementation. EPPO assigns and supports research projects on earthquake protection issues. Collaboration with foreign institutions and authorities, cooperation with the scientific community and a leading role in promoting seismic safety in the country, are among its tasks. A variety of EPPO publications about prevention of earthquake disasters and earthquake protection are available.

The **Earthquake Rehabilitation Service** (YAS) under YPE-HODE has as main task the implementation of the policy on earthquake reconstruction of buildings at national, prefecture and local level. YAS supervises the rehabilitation and reconstruction procedure and the Service keeps records of the state funds expenditure for the reconstruction and repair of earthquake damaged buildings.

The **General Secretariat of Civil Protection** $(GSCP)^2$, established in 1995, under the Ministry of Interior is mainly involved in the field of civil protection. It is assigned by law to comprise all measures as well as civil and private means for the protection of the population against all types of disasters (natural, technological, etc., at national, regional and local level).

The **Institute of Engineering Seismology and Earthquake Engineering** (ITSAK)³ was established in 1979, in Thessaloniki, after the 1978 earthquake disaster. The main objective of ITSAK is applied research in the fields of engineering seismology, soil dynamics and earthquake engineering aiming at upgrading the Greek Seismic Design Code and mitigating earthquake damage. Further development of structure monitoring and laboratory techniques on structural mechanics, as well as involvement in public and private projects by performing special studies and providing consulting, participation in national and international research projects on seismic-risk mitigation and expansion of collaboration with relevant research institutes and industry in Europe and beyond, with emphasis on the Eastern Mediterranean and Balkan regions, are included in the research and activity programme of the institution for the future.

The **Geodynamics Institute** (GI)⁴ of the National Observatory of Athens aims at the study and promotion in the fields of seismology, of the physic of the earth's interior, geophysics, volcanology, geothermy and seismotechtonics. The main tasks of GI are collection and processing of seismological-geophysical parameters, the performance of research projects, the elaboration of relevant studies, the training and services to third bodies.

University departments and laboratories in most Greek universities carry out significant research in a wide range of scientific fields relevant to earthquake protection. Significant research activity has been carried out by the Department of Civil Engineering and the Department of Rural and Surveying Engineering of National Technical University, the Faculty of Geology of National and Kapodistian University of Athens and the Department of Civil Engineering of University of Patras.

3-2 Structural Framework and Measures in Time of Disaster

The Greek crisismanagement structure against disasters is mainly operated by the General Secretariat of Civil Protection (GSCP), the Hellenic Fire Brigade and the Hellenic Police. GSCP was established in 1995, under the Ministry of the Interior⁵. It is assigned by law to comprise all measures as well as civil and private means for the protection of the population against all types of disasters (natural, technological, etc., at national, regional and local levels). The Hellenic Fire Brigade is also controlled by the Ministry of the Interior⁶, but the Hellenic Police⁷ is controlled by the Ministry of Citizen Protection⁸(Formerly the Ministry of Public Order).

An organizational chart of GSCP is shown in Figure 3-1. On the top page of the web site of the Ministry of Citizen Protection, Figure 3-2, the logos of agencies related to civil protection are shown in the center. This seems to mean that close cooperation is required among GSCP, Fire Brigade and Police.

3-3 Structural Framework for Cultural Heritage in Times of Disaster

There is no description of activities in times of disaster or preservation of cultural heritage on the web page of the Hellenic Ministry of Culture. The author made questionnaires about the structure of preparedness and recovery for cultural heritages, and posted them twice to several staff members of the Hellenic Ministry of Culture, but no answer was received.



Fig.3-1 Organization chart of GSCP (http://www.civilprotection.gr/)



Fig.3-2 Logos of Organizations concerning civil protection (http://www. yptp.gr/main.php?lang=EN&lang=EN)

The author does not think that this indicates a lack of serious awareness of natural disasters in the Hellenic Ministry of Culture, because even in the English-language web site of the Agency for Cultural Affairs of Japan, there is no clear description of measures to protect Japanese cultural heritages from natural disaster.

It was heard that the role of each staff member was re-defined and the center and local agencies have practiced frequent disaster drills since the wildfire disaster of 2007.

4. Case Study

4-1 Monastery of Daphni

4-1-1 Overview of Disaster

1) Name: Katholikon of Daphni Monastery

2) Date: 7th September 1999

3) *Nature and extent of damage:* Severe damage to the structure and the mosaics due to the 1999 Mt Parnitha-Athens Earthquake (M5.9R) which occurred about 15km north.

4) Location: About 10km northwest of downtown Athens

5) Profile as a cultural heritage:

Miltiadou (2009) summarized the profile of Daphni Monastery as follows:

The Byzantine monastery of Daphni (world heritage list of



Fig.4-1 Location of Daphni Monastery (Attached to Google Map)

UNESCO), is one of the most important monuments of middle Byzantine period, famous worldwide for the mural mosaics of its Katholikon (main church).

The monastery comprises various buildings (laid out in a square plan shown in Fig.4-3), constructed over a long period of time, starting on the 11th century AD. Currently, most of the buildings are in ruins, with the exception of the Katholikon, part of the internal range of cells, the cistern and the northern fortification walls. The Katholikon belongs to the octagonal type and preserves large part of the original mural mosaics. It comprises the main church, the sanctuary, the narthex and four chapels, which complete its orthogonal plan. In the western part, only the perimeter walls of an exonarthex or portico and those of a spiral stairway tower leading to the upper floor have survived (Figs. 4-4, 4-5).

The central part of the main church is cross-shaped in plan, the hemispherical dome rising over its square core. The dome is 8.2m in diameter and 16.4m high, and rests on an almost cylindrical drum with 16 piers and 16 vaulted windows. The



Fig.4-4 N-W view of Katholikon (Miltiadou, 2009)



Fig.4-2 One of the mosaics of the Daphni monastery



Fig.4-5 N-E view of Katholikon (Miltiadou, 2009)



Fig.4-3 Original plan (Miltiadou, 2005)



Fig.4-6 The central dome and its drum, curried by eight pendentives and eight arches (Miltiadou, 2009)



Fig.4-7 Plan of the Katholikon and schematic presentation of emergency measures (Miltiadou, 2009)

dome and its drum are carried by eight pendentives and eight arches (four semicircular and four embodied in the squinches of the corners), forming an octagon and achieving in this way the transition from circle to square. Thus, twelve piers (laying out in a square plan), provide support to the dome together with the groin vaulted arms of the cross, situated in a higher level (Figs. 4-6, 4-7). All the other parts of the monument are covered with byzantine groin vaults.

6) History of Disaster and Restoration:

Severe damage was caused to a Greek cultural heritage by earthquakes in 1889 and 1897, after which restoration was carried out by the Greek Archaeological Society⁹: mosaics were cleaned by Italian artisans and the west side of the narthex and the dome were entirely rebuilt. The structure was reinforced in 1920. In 1955-57, a more extensive restoration project was undertaken by the Restorations Department of the Ministry of Culture. The church was restored, the cloister was repaired, and the mosaics were cleaned again. In 1960, the walls filling the arches in the western wall of the exonarthex were removed and in 1968 the west entrance to the monastery was cleared. After another damaging earthquake in 1999, the monastery was closed



Fig.4-8 Excavators of Daphni, 1891 (Roland et François Etienne, 1995)

for restoration¹⁰.

4-1-2 Details of Disaster Damage to Cultural Heritage *1*) *Details of disaster damage*

A systematic survey of damage due to the September 7th, 1999 earthquake is summarized by Miltiadou (2009). The contents of this section 4-1-2 to section 4-1-4 are excerpts from Miltiadou's paper presented at the special session on "*Earthquake Protection and Post-earthquake Restoration of Cultural Heritages*" in the 3rd Greece-Japan Workshop: Seismic Design, Observation, and Retrofit of Foundations.

In Fig.4-9 some typical drawings of cracks and deformations survey are presented, showing the severe damages observed in the monument (both to its structural part and to the mosaics). An extensive network of shear and bending cracks (ranging from hair cracks to those several centimeters wide) has appeared on the walls and piers of the monument, whereas numerous old cracks (due to previous earthquakes) increased in length and width. Severe structural dislocation and outwards movement of the walls was recorded in the NE corner of the main church (~14cm to the N and ~10 cm to the E). Significant out-of-plane displacement of the N and S arms of the cross (~16 cm and 21cm respectively), and of the free standing west wall of the exonarthex were also recorded, due to further deterioration of previous deformations (~16 cm in the corners and ~25 cm in the middle).

The damages were more extensive in the higher parts of the structure, especially in the sanctuary, the arms of the cross and all the arches below the dome area. As shown in Fig.4-9, the NE and NW small arches just below the squinches presented severe dislocation near their crown, followed by out of plane deformations of the squinches themselves. Cracks appeared also in all the groin vaults of the church. The structural condition of the dome (reconstructed at 1891 and damaged soon after its reconstruction at 1894), was assessed as extremely critical immediately after the earthquake.

Horizontal cracks have appeared along the perimeter of the drum (both at its base and top, Fig.4-10). In the piers of the drum that are situated perpendicular to the East-West direction, horizontal cracks (due to out-of-plane bending) have opened at their top and bottom. In the piers that are situated parallel to the E-W axis, diagonal or bi-diagonal (shear) cracks have appeared. In the intermediate piers, mixed type of (less severe) cracks was observed.



(a) East-West section. View to South

(b) East-West section. View to North



(c) North-South section. View to West



(d) North-South section. View to East





Fig.4-10 Zoom up of North-South section. View to West (Unit indicator is meter.) (Miltiadou, 2009)

2) Qualitative Interpretation of Damages

It was observed that the number and the opening of crack in the vertical elements of the Katholikon increase from the base to the top of the monument. The monument exhibits the tendency to "open" from the base to the top along both main directions. This deformed shape of the church is confirmed also by the history of the monument. The South façade of the narthex reached in 1894 a total out-of-plane deformation larger than 200mm and it was reconstructed (Fig.4-11). However, even this reconstructed part of the monument presents today a total out-of plane deformation of 90 mm (drawing in Fig.4-11). This is another element proving that the feature we observe now in the monument is an inherent characteristic (due to its initial construction scheme and the extended alterations/interventions undertaken during its lifetime). Thus, out of plane deformations were reported both for the perimeter walls and for all the main arches bearing the dome in the central area of the monument, followed by a geometrical deformation (and loss of initial shape) of the arches themselves. The lack of wooden or metallic ties (typical structural elements for the Byzantine architecture) or other horizontal elements connecting the vertical walls, pillars and piers should have played an important role towards this pathology.

Moreover, the increase of crack openings with height was found more pronounced along the transversal axis (N-S), than along the longitudinal one (E-W). Such a difference in behavior is usual in churches with an orthogonal plan and could be attributed to the larger number and sections of vertical elements available along the E-W axis in the main church. This behaviour was also noticed in the past, whereas previous interventions were applied with the aim to alleviate this problem (external stone buttresses in the north, metallic trusses and confinement of piers in the south). Although those corrective measures were in the right direction (allowing the church to withstand the 20th century earthquakes without local collapse), they were proven to be insufficient to prevent extensive cracking of the monument.

The damages observed in the drum of the cupola may, therefore, be attributed to the (increasing with height) tendency for out-of-plane deformations of the church. It should be reminded here that the damages that made imperative the demolition and reconstruction of the cupola at the end of the 19th century were of the same nature, as those observed now; this is proved by the missing parts of the mosaics. As described above, most of the piers in the drum exhibited out-of-plane deformations. Since the substructure on which the system of the cupola rests is deforming out-of-plane and the cupola itself (being very stiff) is practically non deforming, the piers of the drum (being rather flexible out-of-plane) are called to follow the deformations of the substructure.



Fig.4-11 N-S transversal section in the narthex. The south wall, although reconstructed in 1896, presents today a 90 mm out-of-plane deformation. (Miltiadou, 2009)

4-1-3 Recovery of Disaster-damaged Cultural Heritage

1) Emergency response

The following are excerpts from the paper presented by Miltiadou (2009) and rearrangement of the on-site explanation by Miltiadou.

Immediately after the earthquake, a multidisciplinary working group was formed by the Hellenic Ministry of Culture (HMC) with the assignment to do the necessary inspections, assess the nature and the significance of damages and elaborate, together with a Scientific Committee set to this purpose (composed by Professors Ch. Bouras, T. P. Tassios, E. Mariolakos and N. Zias) and all competent authorities of the Ministry, a strategic plan for the protection, conservation and restoration of the monument, its mosaics included.

Due to the severe damages of the structure and the danger of eventual aftershocks, the decision was taken for the application of emergency measures. The aim of those measures was

(a) to reduce the danger of further deterioration of structural damage and

(b) to ensure accessibility and safe working conditions for all the scientific and technical personnel, thus enabling the execution of all the surveys and investigations, necessary for the design and implementation of the most adequate structural restoration interventions.

The emergency interventions were designed taking into account specific demands deriving from the importance of the monument and the necessity for implementation of final restoration works without removing the supports and scaffoldings. Thus, they had to be reversible, easily assembled and allowing for gradual disassembling in the interior, as well as adjustable to the deformed geometry of damaged elements. Moreover, any contact with the vulnerable mural mosaics was to be avoided.

To this end various alternative solutions were examined. Fig.4-12 shows schematically the retained one. In the NE corner of the building, three double-framed steel raking shores was constructed, as in this area a pronounced tilting of the external walls has been noticed and the telltales installed just after the earthquake, indicated further opening of cracks and a tendency of the corner to detach (Fig.4-12). In the interior, and in the exonarthex, vertical steel props were built beneath the main arches, in order to provide vertical support to their cracked structure (Figs. 4-13, 4-14).

Between the metal framework (the raking shores and the vertical props) and masonry walls, a 12cm full layer of wooden beams and wedges (together with a 3mm soft packing) were inserted, to provide good contact with the masonry without harming the surfaces, while allowing relative movement, unless

the structure did start to move towards them. Moreover, the upper part of the exonarthex walls and the NW and SW piers were confined using steel plates and bars.

Regarding the drum of the dome, specially designed steel elements were constructed to brace the windows and confine in two levels the masonry piers (Fig.4-15), taking special care to assure the in situ assemblage of all these structures without harming the mural mosaics.



Fig.4-12 Raking shores installed in the NE corner (Miltiadou, 2009)



Fig.4-13 Interior vertical steel props (Miltiadou, 2009)



Fig.4-14 Exonarthex vertical steel props (Miltiadou, 2009)



Fig.4-15 Dome's emergency measures (Miltiadou, 2009)

Furthermore, the following measures have been undertaken:(a) the installation of adequate types of scaffoldings in the interior and exterior of the church, in order to offer safe working conditions for the personnel, and

(b) the removal of the tiles of the roof and the application of temporary water isolation membranes just below them, to protect the cracked extrados of the vaulted structures, and hence the mural mosaics from leaking water.

2) Numerical Verification of the Pathological Image

Preliminary linear parameter analyses were performed (Miltiadou, 2004), as a means for verifying the pathological image extracted from qualitative interpretation mentioned in 4-1-2 in order to select adequate emergency interventions.

For the preliminary analytical study, using the computer code ACORD, the structure was modeled by shell elements (Fig.4-16), whereas the mechanical properties of elements belonging to various parts of the structures were assumed on the basis of the available data for the construction materials. Linear elastic analyses were performed for various combinations of actions (self weight alone or combined with seismic action). Both static and dynamic analyses were performed and provided a quite satisfactory numerical verification of the pathological image of the monument.

Fig.4-17 shows the calculated stresses for the inner face of shell elements, due to vertical loads. Irrespectively of the accuracy of numerical values of stresses, one may clearly distinguish the vulnerability of the region of arches and domes (especially in the west part), even for the self-weight of the monument alone. As expected, tensile stresses are developed in the apex of several arches, in the groin vaults of the narthex, in the base of the cupola and that of its drum, as well as in the four squinches.

In Fig.4-18, an out of phase movement of the east and west parts of the monument is shown. Such a movement can explain



Fig.4-16 One of the finite elements models prepared for parameter analyses (Miltiadou, 2004)



Fig.4-17 Inner face of shell elements. Tensile stresses due to selfweight of the structure (Miltiadou, 2009)

the severe damages occurred to the drum of the dome, as well as to the arches and vaults supporting the dome. In general, the analyses for loading combinations including the seismic action have shown a critical concentration of tensile stresses in arches at various levels, as well as in the piers of the drum. In addition, extensive damages in vertical elements (masonry in the perimeter of the monument, as well as piers) were confirmed.

Furthermore, in the framework of this preliminary work, the plots of principal tensile stresses were compared with the respective drawings on which observed cracks were reported (Miltiadou, 2004). This comparison proved to be quite satisfactory, as, in general, the observed crack pattern (location and inclination of cracks) seems to be confirmed by the analytical results in all regions of the monument.



Fig.4-18 Deformed shape of the structure looking from the N. Dynamic analysis; seismic action along the longitudinal axis (Miltiadou, 2004)

3) Decision of Structural Restoration Scheme

Due to the high values of the monument, its vulnerability and the fact that interventions should not drastically alter the initial structural system, the decision was taken to investigate thoroughly its structural behavior. To this end additional data were necessary in order to avoid extensive interventions that might not be needed and that would inevitably alter the architectural value of the monument. Then, it was decided to implement the structural restoration works in two phases, thus giving the possibility for these additional data to be collected.

The first phase of works comprises all those considered necessary to achieve the better possible repair and strengthening of masonry elements (mainly stitching and deep re-pointing where necessary, systematic grouting injections, local reconstructions, etc). During this first phase of works a better structural survey of invisible parts of the monument (internal face of masonry elements, extrados of vaults) could be possible.

The second phase concerns the various strengthening interventions that will be designed and selected as optimum, in order to improve the overall behavior of the whole building (such as installation of ties, diaphragmatic structures in the extrados of the vaults and the exonarthex, etc).

The implementation of the first phase of structural restoration interventions has been now accomplished, together with the most of the research and investigations undertaken to support both phases of works.

Preliminary proposals for the second phase of interventions have also been approved, but their final design is still under elaboration.

4) Research and Development for Design and Restoration works

(Design of Grouts and Investigation of Masonry Behavior Before and After Grouting)

a) Design of grout compositions and tests on cylinders

The design of high injectability grouts was carried out taking into account the performance requirements derived from the structural restoration study. Following target values were set for the basic mechanical properties of the grouted masonry: tensile strength approximately double than that one of the masonry before grouting, and compressive strength approximately equal to 3.0 MPa. And then, on the basis of the available literature, it was estimated that the compressive strength of the grout at the age of six months should lie between 6MPa and 10MPa; a grout flexural strength of the order of 2 to 3MPa was required. In addition, the physical-chemical properties of the raw materials should be selected in a way that the durability of the structure and its precious mosaics would not be jeopardized. Finally, the grouts should have high injectability capacity, so that, under low pressure (~0.075 MPa), they enter and fill fine voids and cracks, with a nominal minimum width (Wnom) equal to two tenths of millimeter.

Two main categories of grouts could satisfy injectability, strength and durability requirements:

(i) ternary grouts composed of lime, pozzolan and a low cement content (30%) and

(ii) natural hydraulic lime - based grouts.

Thus, various grout mixtures, belonging to the above two categories, were designed and tested at the laboratory of the Directorate for Technical Research on Restoration of the Hellenic Ministry of Culture (DTRR/HMC). In order to determine injectability characteristics, the penetrability, fluidity and stability of the suspensions were fully examined in various water/solids ratios, with or without superplastisizer. The compositions presenting satisfactory injectability capacity were further tested to evaluate their behavior to salt decay and estimate their mechanical characteristics (compressive and flexural strength). Furthermore, six alternative grout formulations presenting similar injectability were injected into twenty eight cylindrical specimens, simulating the infill material of three leaf stone masonry. The cylinders were then subjected to compression in different hardening ages. After comparative evaluation of the results, two grout compositions fulfilled simultaneously the injectability, the strength and durability requirements (Table 4-1). Therefore, they were selected to be applied to six three leaf stone wallettes, simulating the masonry of the upper parts of the monument.

Grout properties	Ternary (1) Nh15-based grout (2)			.tt (2)		
T36 (sec)		19		22.5		
Sand column 1.25/2.50 mm						
(W _{nom} ~ 0.2 mm)						
Bleeding %		2		3		
App.viscosity td=4.7 (sec)		20.5		22		
Compressive fgc	Age (days)					
and flexural fgt	28			90 180		80
strength (MPa)	f_{gc}	f _{gt}	f _{gc}	f _{gt}	f _{gc}	f _{gt}
Ternary	4.08	2.11	8.16	2.29	10.6	3.13
NHL5-based grout	2.82	2.47	4.50	2.52	6.36	3.87

Table 4-1. Mechanical and injectability characteristics of the grouts selected to be injected in the wallettes (Miltiadou, 2009)

- Ternary: 30% white Danish cement, 25% Lime (powder), 45% natural pozzolan Petr. (<45 μ m), super-plasticer 1%, water 80% of the solid phase of the grout
- (2) NHL5-based grout: 100% NHL5 (St Astier), superplasticer1%, water 80% of the solid phase of the grout

b) Construction and testing of wallettes

The geometry of the wallettes was chosen to simulate the upper and more vulnerable part of perimeter masonry. In order to avoid scale effects a scale 2:3 was selected. Six three-leaf stone masonry wallettes were constructed using materials of similar characteristics as the in-situ ones (Fig.4-19).



Fig.4-19 The wallettes prepared for grouting (Miltiadou, 2009)

Both grouts applied to the specimens were able to achieve homogenisation of masonry by filling cracks and voids of wallettes. Thus, the wallettes exhibited substantial improvement of their behavior, in terms of compressive strength, tensile strength and reduction of the separation between the three leaves of masonry, without substantial increase in their stiffness, and proved to be efficient from the mechanical point of view.

From the two alternative compositions, the natural hydraulic lime based grout was selected for the application to the Katholikon of Daphni Monastery, due to the substantial (compressive and tensile) strength enhancement of wallettes, the rather ductile behavior under diagonal compression compared to that of masonry grouted with the ternary grout, and the better durability properties that contribute to the protection of mosaics and frescoes.

c) Optimum grout composition

In order to further improve the hydraulic lime based grout, the addition of fine natural pozzolan (dmax<45 μ m) with 10% was decided, on the basis of additional data, deriving from porosity measurements, salt durability tests and from in situ pilot trials. The mix proportions and the injectability characteristics of the optimum grout composition are presented in Table 4-2. This optimum grout composition was used for the repair of the monument.

Table 4-2 Optimum grout composition and injectability characteristics measured in the laboratory and in situ at the first pilot preparation (Miltiadou, 2009)

	Grout composition			
NHL5 (St Astier)	NHL5 (St Astier)			
Pozzolan Petrotech	niki	10)%	
Superplasticizer (1)), (2)	1	%	
Water (1)	80	80%		
Grout properties	In lab	In situ		
T36 (sec) – Sand column 1.25/2.50 mm (Wnom ~ .0.2 mm)		19 - 22		
Bleeding		<1%	1%	
Apparent viscosity	0 min after mixing	21	22	
td=4.7(sec)	60 min after mixing (agitated)	23	25	

(1) % of the solid phase of the grout(2) superplasticizer based on polycarboxylic ether

<u>d)</u> Construction and testing of a large scale structure with a byzantine groin vault

Byzantine groin-vaults are used for covering the most of the parts of the Katholikon of Daphni Monastery, including the arms of the cross, where severe damages have been occurred. Thus, an experimental research was carried out by DTRR/HMC in collaboration with the Laboratory of Earthquake Engineering of NTUA.

A model of a byzantine groin-vaulted structure bearing locally mural mosaics was constructed. The materials and the construction type used for its masonry walls were exactly the same with those used for the construction of the wallettes.

The groin vault was built without any formwork, following the traditional way of byzantine masons. The total dimensions of the model are in plan 2.70m x 2.60m and in height 2.85m. These

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dimensions were selected taking into account the limitations imposed by the capacity of the seismic simulator.

The model was tested after nine months from its construction by imposing seismic loads gradually increasing, until rupture. Then local application of grouts and installation of ties to the arches was performed and after a suitable period of time the tests were repeated, until rupture.

The model was then injected with the final grout composition (Table 4-2) to homogenize the whole structure, following the same methodology with that used for the injection of the wallettes and the injection of the monument itself. Tests were again repeated until rupture. As expected, it was observed that the dynamic characteristics of the model were changed after the application of grouting to the whole structure, and the model could suffer stronger base motions.





Fig.4-21 The groin vaulted structure after grouting (Miltiadou, 2009)

5) Restoration works of the First Phase

This first phase of masonry repair interventions comprised mainly the following works (Fig.4-22):

i) very careful removal of plasters and deteriorated pointing mortars applied during previous interventions, without harming the old ones, adjacent to or underneath them,

- ii) removal of tiles and other covering and filling materials to reach the extrados of all vaulted structures,
- iii) stitching of the most severe cracks, using long stones, bricks, or thin titanium plates,
- iv) few local reconstructions necessary either for the repair of dislocated or collapsed parts or for the restoration of past morphological alterations,
- v) deep re-pointing where necessary and preparation of the masonry for injection grouting,
- vi) implementation of injection grouting,
- vii) removal of all injection tubes,
- viii) in situ conservation of all deteriorated old mortars using frescoes techniques,
- ix) execution of all necessary works to ensure the protection of the extrados from rainwater.

In parallel with the works for the masonry repair, the competent Conservators have carried out all the necessary works for the in situ conservation (including grouting) of severely damaged mural mosaics. As anticipated, in most cases, the cracks on the masonry affected also the mosaics beard on its internal face (Fig.4-23). In order to ensure the protection and in situ conservation of old pointing mortars, on the external facades, the upper central area just below the dome, and the groin vaults of the sanctuary, the deep re-pointing works have been executed by



Fig.4-22 Cracked mosaics have to be preserved in situ. (Miltiadou, 2009)



Fig.4-23 Typical examples of in situ mural mosaics conservation works (including installation of fine tubes for grouting) (Miltiadou, 2009)
experienced Conservators.

For the majority of the re-pointing works adequate limepozzolan based mortars were used. For the local reconstructions, deep re-pointing of extremely damaged critical areas and stitching with thin titanium plates, hydraulic lime based mortars were applied.

As anticipated special attention has been given to the design of the adequate grouts, furthermore, a specific on-site application methodology has been developed and applied. The most important aspects of this methodology are reported in Miltiadou-Fezans et al. (2008). This application methodology permitted the implementation of injections to this important monument, bearing mosaics, frescoes and old mortars that had to be preserved in situ, in a more rational and fully controlled way.

During the whole project, all interventions have been documented in a detailed way, together with all the new findings concerning the materials, types of construction, past interventions and pathology of various invisible elements.

6) Monitoring

a) Installation of earthquake monitoring system

In order to increase the understanding of the seismic structural response and to decrease the uncertainty of the seismic action, the installation of an earthquake monitoring was installed on the central core of the monument at 2003, after the implementation of the aforementioned emergency measures, and before the beginning of restoration works.

Thus, when the hydraulic lime grouting application started, in June 2006, the system was functioning and had already recorded two weak earthquakes. The first took place before the beginning of masonry repair (26/9/2004) and the second during the preparation of masonry for grouting by stitching of cracks and local deep re-pointing (8/1/2006). After three and four months from the end of the first grouting period, during which grouting was implemented up to the springing level of groin vaults, two more

weak earthquakes were recorded (5/11/2006 and 12/12/2006). The analyzed data (Table 4-3) clearly shows the increase of the period during the stitching of cracks and local deep re-pointing (8/1/2006) and the decrease of the period by a result of grouting injection to some extent (5/11/2006 and 12/12/2006).

Thus, it was proved that the effect of interventions and more specifically of grouting on the overall behavior of the structure can be evaluated by a seismic monitoring system. This promising finding led to the decision to install in 2007 complementary instrumentation, with the aim to cover the whole structure.

Table 4-3 Variation of the period of the first mode and the rigidity ratio

	Wes	t-Est	South	-North
	Period	Rigidity ratio	Period	Rigidity ratio
26/9/2004	0.27	1.0	0.32	1.0
8/ 1/2006	0.30	0.81	0.39	0.67
5/11/2006	0.20	1.8	0.26	1.5
12/12/2006	0.22	1.5	0.26	1.5

The rigidity is assumed to be proportional to square of reciprocal of the period.

b) Application of nondestructive test (NDT) for Mapping Mosaics Substrata and Grouting Monitoring

Two kind of NDT were applied for mapping mosaics substrata and grouting monitoring.

An exhaustive high frequency ground-penetrating radar survey has been realized on the fifty main mosaics of the Katholikon of Daphni Monastery, with the aim to investigate the possibility of GPR application to locate doubtful zones (delaminations, changes of substrata mortar or other buried heterogeneities, etc), related to the mosaics very near bearing-structure. It has been shown that the GPR maps, giving a more detailed and less subjective qualitative evaluation of mosaics substrata, can be a very useful tool for the Conservators in order to locate doubtful zones in a more refined way. Furthermore, the possibility of using GPR procedures to monitor the movement of the grout behind the mosaics, in real time, during injection was also investigated.

Investigations have been also realized to control the grouting effect into the masonry walls, using seismic techniques, including some sonic 2D travel time tomographies. In Fig.4-24 two in-



Fig.4-24 Tomographical reconstruction in a grouted and in a non grouted area (Miltiadou, 2009)

dicative tomographical reconstructions of a grouted and in a non grouted area are presented. The comparison of these two cases permits to conclude that the grouting survey of such masonry structures may be achieved by the observation of the velocities of their inner part.

4-1-4 Issues for Second Phase Restoration and International Collaboration

Miltiadou summarized the first phase restoration as follows: "The high values of the Katholikon of Daphni Monastery and, hence, the need for accurate information to serve the design of optimum structural interventions led to the adoption of a step by step multidisciplinary approach, both concerning the design and the implementation of the structural restoration interventions. This approach proved to be very efficient, as it gives the possibility to perform the in situ and laboratory investigations that are necessary for the design of the next step, as well as for the evaluation of the previous ones."

Greek professionals should be admired for their passion and strong will to restore their worldwide valuable cultural heritages by developing their own technology. Consequently, their own experience and knowledge are being accumulated in the Greek cultural heritage preservation community. They did not seem to need help from other countries.

Although funds for the restoration came from the EU, it was an unrestricted subsidy. The Greek government receives a large pack of subsidies from the EU and distributes it to many projects according to its own judgment. Moreover, more money than the EU subsidy has been spent by related organizations of Greece.

Meanwhile, the professionals on the site believe that a surface earthquake fault appeared 150m from Katholikon. They said that a crack in the ground was seen there. However, seismological investigation showed that the seismic fault of the M5.9 earthquake of September 1999 was located 15km north of Daphni Monastery. This means that a large earthquake greater than 1999' s could be expected during the long life of the valuable cultural heritage.

More discussion about the design earthquake for this indispensable cultural heritage seems to be needed, and second phase restoration should be based on this issue.

- 4-2 Archaeological Site of Olympia
- 4-2-1 Overall Picture of the Disasters

2) Date: August 24th till the 28th, 2007

3) Nature and extent of damage: Partial damage to the surrounding hills due to the 2007 Peloponnisos wildfire.

- 4) Location: Ilia state of Peloponnisos prefecture
- 5) Profile as a cultural heritage:

In addition to being a highly important panhellenic Sanctuary, the site is also the cradle of the Olympic Games, an institution of worldwide prestige and brilliance from ancient times to the present day.

The sacred grove of Olympia, the Altis, which began to take form in the 10th-9th c. BC, was dedicated primarily to Zeus. The first buildings were erected in the Archaic period (7th-6th c. BC), and new structures were gradually added to them to serve the constantly increasing needs of the Sanctuary. The site received its final layout at the end of the 4th c. BC, and in the Hellenistic and Roman periods it underwent a number of modifications dictated by the circumstances of the time (X. Arapoyanni, 2004).

The sanctuary consists of an unordered arrangement of various buildings (Fig.4-26). Enclosed within the temenos (sacred enclosure) are the Temple of Hera (or Heraion/Heraeum) and Temple of Zeus, the Pelopion and the area of the altar, where the sacrifices were made. The hippodrome and later stadium were also to the east.

To the north of the sanctuary can be found the Prytaneion and the Philippeion, as well as the array of treasuries representing the various city states. The Metroon lies to the south of these treasuries, with the Echo Stoa to the East. To the south of the sanctuary is the South Stoa and the Bouleuterion, whereas the West side houses the Palaestra, the workshop of Pheidias, the Gymnasion and the Leonidaion.

Olympia is also known for the gigantic ivory and gold statue of Zeus that used to stand there, sculpted by Pheidias, which was named one of the Seven Wonders of the Ancient World by Antipater of Sidon. Very close to the Temple of Zeus which housed this statue, the studio of Pheidias was excavated in the 1950s. Evidence found there, such as sculptor's tools, corroborates this opinion. The ancient ruins sit north of the Alfeios River and Mount Kronos (named after the Greek deity Kronos). The Kladeos, a tributary of the Alfeios, flows around the area. Its located in the part of Greece which is called Peloponesse.

To the north along the river, Olympia Museum is located, which preserves and shows valuable ancient sculptures (Fig.4-27) and garnitures gotten from the Olympia ruins. Mount Kronos, being called as the holy place of Zeus and playing the north backdrop of the sanctuary, was severely burned by the 2007 wildfire.

¹⁾ Name: Olympia monument



Fig.4-25 Location of Olympia and the burned area (percentage) of each district (attached to Zirogiannis 2009)



Fig.4-26 Plan of Olympia sanctuary



Fig.4-27 Ancient sculptures shown in Olympia museum

6) History of Disaster and Restoration:

a) History of the excavation of Olympia

In 1767, special interest in Olympia was shown by J.J. Winckelman¹¹, founder of modern archaeological research. He drew up a collection of ancient remains and carefully observed the excavations at Herculaneum and Pompei, making the sharpest criticizes of the measures taken, while dreaming of excavating Olympia. He categorized the research method for sacred precincts in Greece, which was implemented in the field in the 19th century (Roland et Francois Etienne, 1995).

The first to locate the Sanctuary was R. Chandler, an English traveler who visited Olympia in 1766. Soon afterwards, in 1780, L.S.F. Fauvel arrived at the sacred site and drew the first plans of it. In 1806 the first trial trench was made in the temple of Zeus by E. Dodwell and W.Gell, and in 1811, C.R. Crockerell and C. Haller von Hallerstein made a small excavation at this site. The first plan of Olympia using the trigonometric method was prepared in 1813 by Allason and J. Spencer Stanhope.

In 1829, shortly after liberation from the Turks and the foundation of the Greek State¹², the first excavation was carried out, for a period of two months, by a French scientific mission (Expédition Scientifique de Morée), led by General N.J. Maison, incluing A. Blouet and J.J.Dubois (Olympia Vikatou, 2006). At this time parts of the temple of Zeus were uncovered on the surface, as well as parts of early Classical marble metopes (Fig.4-28) from the temple, now in the Louvre (Helmut Kyrieleis, 2007).

Systematic excavation of the Sanctuary began in 1875, after efforts over the years by E. Curtius of the German Archaeological Institute, with an agreement signed by the Greek and German statues, defining the terms and obligations of each. The first excavation period, during which most of the buildings were discovered, lasted from 1875 to 1881 and was carried out by E. Curtius, A. Adler, W. Dörpfeld, C.A. Boetticher, R. Borrmann, A. Furtwängler, G. Treu and P. Graef (Figs. 4-29, 4-30).¹³ From 1937 to 1942, excavations were concentrated on the Stadium, with E. Kunze and H. Schleif in charge. With the 2nd world war, excavations were halted in 1942 and the site itself suffered great damage under the army of occupation. Post-war research began in 1952 under the supervision of E. Kunze and A. Mallwitz. Almost all the Sanctuary had by now been revealed (Fig.4-31). A second excavation period followed, lasting from 1906 to 1929, with W.Dörpfeld in charge.14

Recent decades have brought to light large building complexes of Roman times. Under way at present are small-scale excavations and restoration by the German Archaeological Institute, under the supervision of the Ministry of Culture and the local Archaeological Ephorate. Results of the research are published yearly by the excavators in the scholarly journals "*Olympische Forschungen*"¹⁵ and "*Olympia Bericht*".



Fig.4-28 West metope in Zeus Temple. ca. 460 BC. (Louvre Museum)



Fig.4-29 The temple of Zeus after it was uncovered, in 1876 (Helmut Kyrielesis, 2007)



Fig.4-30 The Heraion after its discovery during the excavations in 1877 (Helmut Kyrielesis, 2007)



Fig.4-31 Excavation activity in the stadium in 1958 (Helmut Kyrielesis, 2007)

b) Recovery of the ancient site

Apart from excavating, the archaeologists and architects working at Olympia have attached great importance to the conservation of the monuments and their visual revaluation through partial reconstruction of the original architecture. The completely restored Classical stadium, for instance, the re-erected columns of the palaestra and the Heraion (Figs. 4-32, 4-35) and parts of the terrace of treasuries are impressive testimonies of these activities.

The first feature of the restoration work at Olympia is a reconstruction drawing. The reconstruction drawing of the elevation of the temple of Zeus at Olympia (Fig.4-33) was drawn by Victor Laloux, which was designed with no consideration for scientific precision. In fact, the discreet (but false) color on the building does not reveal the trend in the 1880, but rather the observation records of the architecture.

George Kawerau erected two columns of the Hera Temple in 1886-90, excavated in consultation with Balanos¹⁶, restored using the techniques learnt from the Acropolis, in 1905 (Jukka Jokilehto,1999).

The latest restoration works, undertaken on the occasion of the modern Olympic Games of 2004 at Athens and Olympia, were the anastylosis of one of the huge columns of the temple of Zeus (Fig.4-34) and the partial reconstruction of the Philippeion (Fig.4-36). These challenging and highly expensive restoration projects would not have been realised without the generous financial support of sponsors, who supplied the necessary means: The Anastasios G. Leventis Foundation has financed the whole Phillippeion project and has borne the lion's share of the costs for the column of the great temple, while one third of the costs for the latter were contributed by the Society of Friends of the German Archaeological Institute-Theodor Wiegand Gesellschaft¹⁷.

The partial restoration work of Phillippeion, finished in 2005, was executed by the German Archaeological Institute. It included some architectural members, which were brought back to Greece from the Pergamon Museum (Berlin) in 2004 when Olympic game was held in Athens. This is in stark contrast to the Elgin Marbles¹⁸ in the British Museum, which has provoked a discussion for a long time and has not yet been solved. It represents the ties of the friendship between Germany and Greece regarding the restoration of cultural heritage since Greece became an independent kingdom from Turkey.



Fig.4-32 Temple of Hera Restoration work, 1972 (Helmut Kyrielesis, 2007)



Fig.4-33 The temple of Zeus. Detail of an imaginary reconstruction drawing of the sanctuary of Olympia by V.Laloux (1883). (Helmut Kyrielesis, 2007)



Fig.4-34 Column drums and architectural members from the temple of Zeus





Fig.4-35 Temple of Hera



Fig.4-36 Phillippieion

4-2-2 Details of Disaster Damage to Cultural Heritage 1) Wildfires and Emergency Responses

The following are excerpts from the thesis presented by Zirogiannis N. submitted to the Graduate School of the University of Massachusetts Amherst (Zirogiannis, 2009).

a) Wildfires in August 2007

The summer of 2007 was by far the most devastating wildfire season ever recorded in Greek history. Approximately 270,000 hectares of land were burned. Fig.4-37 illustrates the geographic location of the burned areas. The red rectangle on Fig.4-37 highlights the prefecture of Peloponissos. As one can observe, the greater extent of burned areas of the country are concentrated in that prefecture. Peloponissos is comprised of 7 states (i.e. Achaia, Argolida, Arkadia, Elia, Korinthos, Lakonia and Messinia). Fig.4-25 illustrates the location of those 7 states as well as the percent of area burned in each one, during the summer of 2007. The burned acreage of the prefecture of Peloponissos amounts to 180,310 hectares. That was the result of a series of blazes staring from early July and lasting until early September. However, the most extensive damage took place towards the end of August. From August 24th till the 28th wildfires burned through the Peloponnesian state of Elia, where 77,756 hectares of land (i.e. 29% of the state's area) were burned. Ancient Olympia country belongs to this state Elia.

b) Wildfires in the state of Elia

Administratively the state of Elia is divided into 22 counties. Fig.4-38 provides an illustration of those counties along with their respective burned areas. Each county is further divided into a number of towns and villages. In total there are 210 settlements in the state of Elia (including towns and villages). 168 of them were affected by the fires out of which 133 were severely burned.

In the county of Ancient Olympia, the burned area was 5,200 ha, 29% of its territory. The blazes brought with them devastating consequences. 68 people were burned during the summer of 2007 in Greece. Out of those, 46 lost their lives during the 5 day crisis period (August 24th-28th) in the state of Elia. Most of the victims died in their effort to evacuate burning villages, or during their attempt to save their property, such as animal stables, houses, or agricultural fields.

Scientists argued that weather conditions definitely played a key role in the spread of the fires. Three heat waves had hit Greece by late August, something that was never recorded before. In addition, lack of precipitation in southern Greece, where the region of Peloponissos is located, further exacerbated the intensity of the blazes. Nevertheless, it would be unjustified to solely blame weather conditions for the extent of the damage. The increased accumulation of biomass, the poor management of forests and the idea that wildfire management is comprised exclusively by fire suppression are all key aspects.

These are extensive wildfires that burn at 1000oC creating their own climatic conditions that can even lead to the appearance of tornados. The toll on houses and other infrastructure was also heavy. Approximately 847 residences were burned to the ground in Greece. The vast majority (815 houses) were located in the region of Peloponissos. Amongst them 524 were found in the state of Elia.

Table 4-4 provides aggregate information regarding different types of infrastructure that were burned during the summer of 2007 in Greece. As one can observe the state of Elia, suffered the greatest number of losses compared to all other states that were affected by the blazes.



Fig.4-37 Burned areas of Greece during the summer of 2007. The red rectangle highlights the prefecture of Peloponissos (Zirogiannis, 2009).



Fig.4-38 The 22 counties of the state of Elia, along with a graphical illustration of their burned areas (identified by the different colours) (Zirogiannis, 2009).

		Resid	lences	Public b Chur Profession	uildings / ches / nal venues	Stables / W	/arehouses / ic.
Region	States	Total destruction	Partial destruction	Total destruction	Partial destruction	Total destruction	Partial destruction
4	Arkadia	185	110	6	3	157	171
lo lo	Korinthos	3	0	1	0	10	5
noi	Elia	524	238	30	12	498	233
Reg	Lakonia	8	33	0	0	90	32
- 2	Messinia	95	40	4	2	33	8
Total f	for region oponissos	815	421	41	17	788	449
	Evia	31	245	0	2	29	95
Other	Etolo- akarnania	1	2	0	0	0	0
	Attika	0	4	0	0	0	D D
Natio	nal Total	847	672	41	19	817	544

Table 4-4 Burned infrastructure during the summer of 2007 in Greece (Zirogiannis, 2009)

c) Meteorological data

Data for the month of August on humidity, wind speed, as well as maximum and minimum temperature from a meteorological station in Elia are presented on Figs. 4-39, 4-40 and 4-41 respectively. It is clearly seen that 24th of August (on the day the wildfire started to terribly spread) suffered multiple bad conditions, high wind, low humidity and high temperature.

The wind direction during August of 2007 is shown in Fig.4-42. This is also clearly related to the direction of the spread of the wildfires.

d) Emergency responses in Elia

① Response of local people

The blazes that affected the region lasted during a 5 day period between August 24th through 28th. The fires were so massive and the need for the intervention of the Fire Brigade so great that fire crews were not able to keep track of and record the starting times of most blazes, beyond those that appeared during the first day (August 24th). The official records of the Fire Department of the city of Pirgos (the capital city of the state of Elia) included documentation only for the 6 initial blazes of 24th of August. These are illustrated in Fig.4-43. After those 6 initial blazes the Fire Brigade could not keep track of the new blazes that occurred (if any). As the fires spread and reached more and more villages firefighters would respond based on the level of threat perceived.

One of the 6 initial blazes occurred on August 24th at 2:40 pm at the settlement of Paleoxori (see Fig.4-43 for the geographical location of the settlement). Paleohori is located on a mountainous landscape with very narrow roads. Tall blazes, in combination with strong winds and extremely low levels of relative humidity led the locals to spontaneously evacuate the villages. A big convoy of cars with people seeking shelter at the nearby beach, located just a few kilometers away, was coming down the road. A fire truck coming up the road and heading towards the villages crashed against incoming traffic. That accident blocked the road and people were trapped on the spot. Very soon the fire reached the location of the accident burning 9 people (3 seasonal firemen and 6 citizens) at approximately 3:30 pm.

This tragic incident was of paramount importance in the course of the 5-day wildfire crisis-period. Very soon the news was broadcasted all over the state. It was the first time in the nation's contemporary history that so many people had died in a wildfire. The incident caused a great deal of panic in Elia. From that day onward, whenever a fire approached a village, authorities (predominantly the Police and in some cases the Fire Department) would order the evacuation of the settlement, in some cases, even if there was no immediate danger. Faced with an unprecedented national tragedy the federal authorities decided that their first priority should be to protect human lives by making sure that citizens were transported away from villages that were close to the blazes.

What foresters and fire scientists claimed should have been done, however, was for authorities to have summoned capable villagers that could provide significant assistance to the efforts of firefighters.

As the days went on both citizens and officials started realizing that local villagers (predominantly farmers by occupation) were a rather effective fire suppression force given the equipment and experience they had in combating blazes. Most of these people had fought wildfires in the past and possessed farmer's trucks as well as water tanks that could be used as "mini-firetrucks". As a result evacuation orders would decrease after the 3 day (i.e. August 26th) and people would start realizing that engaging in fire suppression efforts was an effective way of protecting themselves and their property. Fig.4-44 shows the change of the participation of villagers in fire suppression efforts.



Fig.4-39 Wind speed in km/hour on a daily basis for August 2007, from the meteorological station of Andravida (Zirogiannis, 2009)



Fig.4-40 Relative humidity on a daily basis for August 2007, from the meteorological station of Andravida (Zirogiannis, 2009)



Fig.4-41 Min and Max temperature on a daily basis for August 2007, from themeteorological station of Andravida (Zirogiannis, 2009)



Fig.4-42 The diversion of the wind that occurred during August 2007 (Zirogiannis, 2009)



Fig.4-43 The 6 initial blazes of August 24th and their respective times of occurrence. Blazes are presented by yellow pins (the fire of Klindias occurred at 1:00 am on August 25th). Colored segments of the map represent areas burned. Two of the six blazes (Thines and Amaliada at the North-West of the region) were successfully contained. The other four burned almost uncontrollable for a period of 5 days. (Zirogiannis, 2009)



Fig.4-44 Bar chart illustrating the participation of villagers in fire suppression efforts by day (Zirogiannis, 2009)



Fig.4-45 The fire stations in Elia (Zirogiannis, 2009)

2 Operation of fire crews and waterbombers

The state of Elia has 5 fire stations. Their locations (marked by yellow pins) and respective areas of responsibility (identified by different colours) are illustrated in Fig.4-45. Each station is staffed by a combination of permanent and seasonal personnel. The latter consists of fire fighters working on 6-month long contracts that last from May 1st until October 31st. As of 2008 these contracts have been extended to 8 months (April 1st to November 31st) in an effort to provide seasonal fire fighters with a more stable source of income. Table 4-5 provides information on the personnel and automobile infrastructure capacity for each of the 5 fire stations in Elia

Given the infrastructure capacity of the fire department in the state, as well as the fact that 59% of the villages in Elia were affected by the fires (130 out of a total of 219 were burned), fire-fighters were in great scarcity during the 5 critical days.

Apart from ground crews, aerial support is also of paramount importance in any wildfire suppression. During the summer of 2007 the fire fighting fleet of Greece (analyzed on Table 4-6) was significantly reinforced by a total of 23 planes and 18 helicopters that were offered in the form of assistance by several European countries.

There are two bases hosting firefighting planes in the state of Elia. One in the military airport of the town of Andravida that hosts four Canadair CL-415 planes and one in the area of Epitalio that hosts two PZL M-18 planes. The latter are exclusively under the command of the Fire Department commander of Elia.

Approximately 330 firefighters with 60 vehicles had to respond to dozens of cases of threatened villages within a matter of days. In addition, the four Canadair CL-415 planes stationed in Andravida had to operate in other states that were threatened by wildfires during the same 5-day crisis period. Ground forces in Elia were reinforced by fire fighting personnel from other states of Greece, as well as by foreign volunteers. Nevertheless, it was often the case that outof-state fire fighters could not contribute significantly to suppression efforts. That could be explained by the fact that they lacked the knowledge of the local terrain, the landscape and the prevailing winds in the area.

After the tragic incident in Artemida, where 9 people lost their lives, the main preoccupation of the officials in charge of the crisis, was to protect human lives and people's houses, often neglecting woodlands and agricultural fields. It was often the case that a fire truck would arrive at a village with orders to remain in the main square and operate only to save burning houses. That would severely restrict the potential contribution of a fire crew since it was not allowed by its superiors to engage in suppression efforts in the woods and/or agricultural fields.

In their vast majority citizens of Elia acknowledged the contribution of fire crews and stated that fire fighters would often demonstrate heroic efforts to save people and property. However,

	Perso	nnel	Fire t	rucks
Fire station	Permanent	Seasonal	Forest	Urban
Amaliada	35	25	8	
Pirgos	49	29	16	10
Olympia	20	44	6	4
Krestena	24	54	7	4
Lehena	49	-	4	-
Total	32	9	5	9

Table 4-5 Fire fighting personnel and equipment capacity in each of the 5 fire stations of Elia (Zirogiannis, 2009)

Table 4-6 Aerial fire fighting capacity of Greece (Zirogiannis, 2009)

4 Erickson Air-Crane helicopters
7 MIL MI-26s helicopters
5 Kamov Ka-32s helicopters
13 Canadair CL-215 waterbombers
9 Canadair CL-415 amphibian waterbombers
19 PZL M-18 Bromader single engine airplanes
Total: 16 helicopters and 41 planes

blazes were so severe that both civilians and fire fighters were overwhelmed by the magnitude of the threat. As a senior citizen of the village of Smerna stated "even if each and every one of us was a professional firefighter, we would still not have been able to extinguish the fire". Another citizen of Makistos further emphasized the point: "Even with 100 water bombers we would not have been able to suppress the blazes".

2) Influence on Olympia Archaeological Site and emergency response by the site office

The following are summaries of the author's interviews with officers in the central and site offices of the Ministry of Culture.

<u>a) Crisis</u>

On August 26th (two days after the outbreak of big wildfires), the fire invaded the forest of Mount Kronos from the northern mountainous area. Behind Mount Kronos, there is a highway, which was expected to become a firebreak against wildfire.

(a) Before the wildfire (Zirogiannis, 2009)

However, the fire traveled across embankments where the road goes through a tunnel.

The forest of Mount Kronos was completely burned (Fig.4-46b). Then, the fire came close to the border of the Olympia area and began to burn some trees in the east part of the stadium. However, fortunately it jumped the stadium and went eastward in the evening (Fig.4-47). This was the first damage by wildfire since the site had been excavated.

b) Fire fighting by the archaeological site officers

About twenty elevated water cannons located on towers (Fig.4-49) around Mount Kronos and nearby hills were operated, but the fire was so strong that the water cannons seemed not to be effective enough. These water cannons were supplied in 2003 and had been used mainly for watering the trees.

Approximately sixty persons, including officers of the site, firefighters and volunteers, mainly used forty hydrants located at the site (Fig.4-48) to fight the fire. By their heroic fights against

(b) During the wildfire (Zirogiannis, 2009)

(c) Just after the wildfire (Zirogiannis, 2009)

(d) Two years after the wildfire

Fig.4-46 Change of view of Mount Kronos

the fire and by the firefighting facilities such as hydrants and water cannons, the Olympia archaeological museum and most part of the archaeological site were saved.

An electric power line was cut, but a dynamo-electric generator was activated. Water from a tank located behind the mountain and water pumped from a river near the site were used for fire fighting. These facilities had been improved since 2002.

4-2-3 Recovery of Disaster-damaged Cultural Heritage

Mount Kronos became bald, and it was necessary to recover the green on the mountain because the ceremony of lighting the torch for the 2008 Beijing Olympic Games was approaching.

(a) Before the wildfire

Mount Kronos was covered with pine trees before being burned by the wildfire, but from literature on ancient Mount Kronos was known to have been previously covered by plane trees, cypress, olive and oak. Thus, thirty-five thousand young trees of these kinds were collected and planted. Erosion control systems made from wooden members were also placed on the mountain (Fig.4-50).

A risk management structure of the Olympia archaeological site office was redefined and disaster response drills have become more frequent.

For the further protection of the archaeological site, the Hellenic Ministry of Culture had implemented the following (Sofia

(b) Just after the wildfire

Fig.4-47 Eastern end of Olympia archaeological site (Zirogiannis, 2009)

Fig.4-48 Hhydrants in the site

Fig.4-49 Towers for water cannon

Chapter 2 Case Study

Avgerinou Kolonia, 2008):

• Construction works for the procurement of water (boreholes, technical works on a flat section of the adjacent river for water collection, construction of water reservoirs in suitable locations).

• Monitoring of the area via satellite (Athens Observatory).

• Creation of a PUP-UP system¹⁹ in areas of low vegetation (stadium slopes).

• Expansion of the existing fire protection system in the complex around building perimeters.

The budget for the prevention of the corroding and flooring was covered by the special depository for the confrontation of emergency situations. The project of the planting of the new trees was fully covered by Latsis Group and Eurobank EFG (Olympia Vikatou, 2008).

Fig.4-50 Check dams in the channel

4-2-4 Issues for Risk Reduction and International Collaboration

It can be said that many archaeological treasures in Greece had been preserved by being buried with airborne dust, mudslide, vegetation etc., and are now facing new risks after being dug up in recent years. The increase of wildfire in recent years is also assumed to come from human factors, such as lower maintenance of mountain forests and warmer climatic temperatures. These human factors must be conquered, or at least suppressed, but it will take a very long time. As it is unrealistic to rebury the archaeological treasures, we must compete with these manmade natural disasters.

One way is to arrange a wide fire-belt around the archaeological site, but most of the land around the sites is owned privately, and sometimes the wild green of neighboring areas compose indispensable landscapes for the site.

Another way is to change the vegetation of neighboring areas from flammable trees such as pines to flame-retardant and ancient indigenous trees. This has already been tried on Mount Kronos in Olympia, and should be applied more universally.

However, the quickest way is to strengthen fire fighting capability. As was experienced during the big 2007 wildfire, multiple wildfires may occur simultaneously. This is like multiple fires in a big urban earthquake case. Thus, sufficient fire fighting capability should be provided and local people should be trained to protect important archeological sites, without the need to depend on professional fire brigades.

International cooperation in coping with large wildfires in Greece has been implemented by many European countries offering water-bombers. They have joined with the Greek fire brigade and contributed to suppression of fires around archaeological sites. However, our survey heard of no cases of international direct contribution to fire fighting at archaeological sites.

In any way, the Greek experience of fire fighting of multiple simultaneous terrible fires should be exchanged with Japanese professionals and administrators of cultural heritages.

4-3 International Cooperation

Greece is subject to two different kinds of disaster: severe earthquakes and the large wildfires. However, Greece has not received any assistance for heritage recovery from specific foreign countries. Assistance from the EU, a regional European organization, were limited within its general financial support to Greece as a member country and the emergency supply of fire extinguishing airplanes by its member countries, but did not include any technical assistance.

This is not because Greece already had enough expertise for recovery of heritage disasters through its frequent disaster experience. Greece is now meeting the challenge to develop new scientific techniques for disaster mitigation and recovery in these cases, which shows how it has become one of the most developed countries in heritage protection.

As a good example, in the post-earthquake retrofitting work at Daphni Monastery, all the recovery works are scientific and open to public professionals. Each recovery step from the beginning to the end are published as English scientific presentation papers by the resident conservation engineer, Ms. Miltiadou. This information is then made available to foreign researchers or site managers from foreign countries that have similar problems. During our visit, Ms. Miltiadou kindly guided us around the sites, and she was very open to any questions from us. This open attitude is very important in formulating a better disaster mitigation policy, which requires the cooperation of people from many very different scientific fields. If we in Japan have something to learn from Greece, this attitude and methodology would be most important for all professional experts in many different fields, and mutual communication between Greece and Japan should be encouraged.

In the case of the fire disaster at the Olympia site, the Hellenistic Ministry of Culture organized an international expert meeting on disaster reduction of World Cultural Heritage in November 2008, one year after the fire, in cooperation with UNESCO World Heritage Center. They openly showed all the problems of the site, and provided a public place to formulate international policy frameworks necessary for the improvement of future disaster reduction measures for World Heritage sites. Greece is intending to contribute to international society, not in a bilateral arrogant way, providing an opportunity to share their disaster experience with the world including developing countries.

This Greek intention was widely communicated to international society through the conclusion document named "Strengthening Disaster risk Reduction at World Heritage properties: the Olympia Protocol for International Cooperation"²⁰, and the contents of this document were already reflected in discussions of the UNESCO World Heritage Committee in June 2009. This intention is continuing in the 2nd expert meeting, organized by both the UNESCO World Heritage Center and the Israeli government in November 2009, and in preparing the next international movement. Greece also played an important role in this 2nd meeting. There is something to learn here for Japan, who tends to focus on bilateral international assistance projects.

In conclusion, Japan is expected to collaborate with Greece in contributing to international society, and also for mutual communication among heritage experts in the field of earthquake

Fig.5-1 Prof. K. Toki at his Presentaion

and fire disasters, not simply in bilateral support to Greece. One important work would be to formulate a disaster mitigation plan for World Cultural Heritages that would be universally useful for both wooden and stone masonry structures.

5. Special Session on Earthquake Protection and Postearthquake Restoration of Cultural Heritages

This workshop was originally organized as an opportunity to exchange technical knowledge concerning seismic design, observation and retrofit of foundations by the Japanese Society of Civil Engineers and the Hellenic Society for Earthquake Engineering.

As the location of the workshop is one of the important Greek cultural heritage sites, the Ritsumeikan University investigation group proposed to hold a special session on protection of cultural heritages during the workshop. This proposal was welcomed by the Greek side, and Professor G. Gazetas, a Greek side chairperson of the organization committee, kindly introduced some key persons of the Greek Ministry of Culture and National Technical University of Athens. Then, the aim of the special session was agreed by them and a call for papers for this special session was announced. At the same time, four invited speakers were selected: Professor K. Toki of Ritsumeikan University, Dr. A. Miltiadou-Fezans of Greek Ministry of Culture, Professor T. P. Tasios and Professor E. Vintzileou of National Technical University of Athens.

Fifteen papers including 5 from the invited speakers were submitted to this special session, which was held on Tuesday, September 22 from 14:20 to 20:00. Presentations and active discussions prolonged the time allocated for the session by one and a

Fig.5-2 Prof. K. Masuda and Dr. A. Miltiadou-Fezans at co-chair desk

Fig.5-3 Dr. Y. Goto at his Presentaion

Fig.5-4 Participants at the session

	and then be all and a	(FLEASE NOTE: Only the list additist are shown)
CEREMO	WY for the Agreement of	f Collaboration between Vechnical Chamber of Greece and JSCE
Session	100000	and the second
	Plamada M.	Global Increase of Natural Unsatteni and International Cooperation for Disaster Miligation
	Bhattacharya S.	A study on the behaviour of raked piles in seismically liquefiable soils
	Mikami A	Statistical Evaluation of Embedment Effect on Damage to RC Building Structures during the 1995 Hyogoken-Nanbu
	Milkailu A.	Earthquake
4	Gerolymos N.	New approaches on performance-based seismic design of foundations
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Session		
2	O' Rourke T.	The 49th Rankine 2009 Lecture: Geohazards and Large Geographically Distributed Systems
2	Pitllakis D.	Topographic irregularities and soll-foundation-structure interaction.
	Drosos V	Seismer response of bridge pile columns
	Anastasopoulos I.	Design of structures against tectoric deformation: analysis and experiment
	Tobita T	Numerical Analysis of Near-Field Asymmetric Venical Motion
10	Gazetas G.	Unique Bi-normalized response spectrum for SSI analysis
Lunch B	iestik 35 miss	
Special	Seculor: Earthquake P	rotection and Paul-warthquake Restoration of Cultural Heritages
1	Tanice T.D	Projection of Cultural Herbage Non-Post-earthquake Fire: Proposal shitt Present Situation
2	Pallakin K	Selection Risk of Monimum a will Emphasis on Maclaval Monimum of Diades
4	Milliodou A	Policy of Salamic Protection and Rahabilitation of Monuments in Oreace
Ton & Co	Hos Brask 30mins	
5	Toki K.	Dynamic analysis of rupture process of masonry buildings using new simulation method
6	Vintzileou E.	Setamic behaviour of timber reinforced historic buildings
7	Bouckovalas G.	Georechnical issues on the seismic protection of Monuments
8	Koumousis V	On the dynamic behavior of a nonlinear lightweight isolator for museum antitacts.
10	Makris N.	The reconstruction of the Temple of Zeus, Nemes: emphasis on seismic response of multidrum columns
Bruak	20rmins	
11	Pitilakis K.	Seismic analysis of underground monumental structures. The Catacombis of Kom El-Stiogafa in Alexandria
12	Psycharis I. N.	Estimation of the seismic response of historical structures and evaluation of interventions
13	Zimmermann I.	In Plane Response of old Masonry under Seismic Loads
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Fig.5-5 Program of Workshop "3rd Greece – Japan Workshop: Seismic Design, Observation and Retrofit of Foundations with Special Issue on Protection of Cultural Heritages"

half hours. This session provided a lot of important information to our survey and created invaluable opportunities to exchange experiences with Greek specialists and professors.

Figs.5-1, 5-2, 5-3 and 5-4 are snapshots of the special session. The program of the workshop including the special session is shown in Fig.5-5.

6. Conclusion

6-1 Conclusion

As stated above, Greece has many ancient archaeological sites built since 17th century BC., as the mother of European classic civilization, and also has many Byzantine cultural heritage sites built in medieval time. Greece is situated at the border area of tectonic plates between African and European continents, and has been suffering seismic damage since ancient times. It is also situated in the dry Mediterranean climate, and many forest fires happen every year, which has a severe impact on efforts to protect its cultural heritage.

This research focused on two recent big disasters in Greece; the Daphni Monastery (World Heritage registration in 1990) damaged by an earthquake in 1999, and Olympia archaeological sites (World Heritage registration in 1989) affected by the forest fire in 2007. With the support of Hellenic Ministry of Culture, we were able to visit these two sites for our field survey, and also organize a meeting with Greek seismic professionals, exchanging views through professional presentations. We found as a result that Japan is advanced in several fields at the basic scientific level, but also that Greece has developed several better measures for cultural heritage risk preparedness measures against earthquake and fire than Japan, and also that they have similar problems of shortage of funds and difficult relationships among different administrations, as we do in Japan.

For international assistance for the recovery of cultural heritages following a disaster, Greece has been accepting financial support from EU since its participation to Euro currency area in 2001, but this is not limited to disaster recovery or cultural heritages. Greece receives 75% subsidy assistance for its many cultural heritage conservation projects. However, they regard these as natural delivery right, as they pay their contribution to the EU.

Greece has been the target of many archaeological surveys by Britain, France and Germany, etc. since 18th century. Since its independence from Ottoman Turkey in 1832, Greece has been playing an important international role in European modern conservation movement, like the Athens Charter International meeting organized in 1931. It has no special relationship with any specific countries, but has a very friendly relationship with Germany since the excavation by Heinrich Schliemann, and many German tourists visit his special exhibition room at National Archaeological Museum. Although it is in advantageous position in receiving international assistance from the EU, Greece believes it has a high level of heritage conservation expertise, and has no need for any technical assistance from foreign countries.

In recent international discussions related to cultural heritage destruction, Greece has requested the return claim of reliefs of Parthenon (Elgin Marbles) owned by the British Museum. The New Acropolis Museum, opened in 2009, has been prepared to display them after their return. Mr. Matsuura, the UNESCO Director General, attended to the opening ceremony, and made a congratulatory speech²¹. After the Olympia fire in 2007, UNESCO and the Hellenic Ministry of Culture cooperated in organizing an international experts' meeting for disaster risk reduction for world heritage in November 2008, and it adopted a conclusion document "The Olympia Protocol for International Cooperation"²², which is expected to describe a basic strategy for the UNESCO World Heritage Centre. According to the proceedings, Greece contributed to the preparation of a new international framework on this subject as the host country. However, the Japanese government delegate simply reported on the present situation within Japan. Greece is continued its active role at the second meeting, which was held in near earthquake country Israel in November 2009, and offered to host the third meeting to be attended by other countries including Japan.

Relations with its neighbor Turkey were improved when a Greek rescue team was dispatched to Turkey after the earthquake that occurred in its northwest in August 1999. Then one month later a Turkish rescue team was dispatched to Greece following the earthquake there. These rescue activities may be seen as a diplomatic tool utilizing cultural heritage disasters within the same earthquake zone.

Putting all these factors together, Greece does not need any technical or financial assistance from any specific countries, but does need to accept the regional assistance with its conservation projects as a culturally developed European country. It also needs to coordinate its activities with international organizations like UNESCO, emphasizing its prestigious position in the international community, as well as developing friendly relations with neighboring countries through cultural heritage protection from disasters. In its relations with Japan, Greece is presently promoting first an increase in the numbers of good quality tourists to its heritage sites, second mutual exchange of scientific and technical knowledge concerning heritage protection as a similar seismic country, and third solidarity in formulating more advanced international frameworks, including the development of a disaster risk management plan for the sustainable protection of world cultural heritages under the umbrella of UNESCO.

6-2 Suggestions

Based on these conclusion, we would like to make the following tangible suggestions.

1. In relation to the 3rd point in above, most urgent action for Japan would be announce Japanese cooperation in organizing the 3rd UNESCO World Heritage workshop on 'Disaster Risk Reduction to Cultural Heritage' in 2010. The first of these workshops was held in Olympia, Greece, in 2008 and the second in Acre, Israel, in 2009. The meeting in 2010 is expected to be held in Asian Pacific region with the support of Japan.

In the East Asia region, Korea may organize a large expert meeting on cultural heritage risk reduction related with its memorial of the restoration of the Sungnyemun (Namdaemun) gate building in Seoul after its fire in 2008.Thus, some joint co-organization between Korea and Japan may be interesting. Alternatively, as the Tsunami, climate change and intangible heritage protection, etc., have not been deeply discussed in former meetings, these issues, e.g., in relation to Samoa, might be treated in the Pacific region with Japanese cooperation. For the Japan Consortium for International Cooperation in Cultural Heritage, these meetings might be good opportunities to organize such international expert meeting with foreign organizations outside Japan under the umbrella of UNESCO.

The Japanese government has already proposed to the international society at Seville World Heritage Committee in 2009 to organize a large international meeting in 2012 in commemorating the 40-years anniversary of UNESCO World Heritage Convention. The Japan Consortium for International Cooperation in Cultural Heritage, supported by both Ministry of Foreign Affairs and Agency for Cultural Affairs, may be able to co-organize above expert meeting, as a kind of preparatory meeting for the large meeting in 2012.

2. Secondly, development of mutual exchange of experts in scientific and technical fields between Greece and Japan should be encouraged. Both countries are located in earthquake zones, and have a strong need to develop measures of Risk Management Plan for Cultural Heritage, especially for earthquakes. Joint research activities by both the stone masonry architecture culture and wooden timber architecture culture may be able to develop universal protection measures. These research fields may be very different, but research could yield significant results very soon, so they need to be hurried.

• The experiences and knowledge being accumulated in the Greek cultural heritage preservation society should be cross-

fertilized with Japanese same domain society, especially highlighting the goal, the methodology and the passions.

• Greek experiences of fire fighting under multiple simultaneous terrible fires should be exchanged with Japanese professionals and administrators of cultural heritages.

¹ http://www.oasp.gr

³ http://www.itsak.gr

- ⁵ http://www.gscp.gr/ggpp/site/home/ws.csp
- ⁶ http://www.fireservice.gr/pyr/site/home.csp (in Greek)

⁷ http://www.astynomia.gr/index.php?option=ozo_content&perf orm=view&id=34&Itemid=13&lang=EN

⁸ http://www.yptp.gr/main.php?lang=EN

⁹ Such buildings from the Medieval did not attract much attention from researchers at that time, and some of them were broken down when they became obstacles of excavations of older buildings—such as Parthenon, Library of Hadrianus (Roland et François Etienne, 1995).

¹⁰ http://www.sacred-destinations.com/greece/daphni-monastery

¹¹ Johann Joachim Winckelmann (1717 - 1768), German art historian and archeologist, who in initiating the "Greek revival" deeply influence the rise of the neoclassical movement during the late 18th century. He was one of the founders of scientific archaeology and first applied the categories of style on a large, systematic basis to the history of art. Many consider him to be the father of the discipline of art history. Winckelmann crystallized his famous concept of the essence of Greek art – the idea of "Noble simplicity and quiet grandeur" and the definitive assertion, "The one way for us to become great, perhaps inimitable, is by imitating the ancients."- in Thoughts on the Imita-tion of Greek Works in Painting and Sculpture (1755). (Roland et François Etienne, 1995)

¹² Othon (*Otto in German*), who was second son of King of Bavaria, was elected the first king of Greece in 1829, which implied the ties between Greece and Germany. This relationship lead to the collaboration for the excavation and restoration of historic sites afterward.

¹³ The first results were published in the big five–volume work "*OLYMPIA*".

¹⁴ The results were published in the two-volume work *ALT-OLYMPIA*.

¹⁵ The journal, which has been published by German Archaeological Institute since 1944, can be referred in the URL below.

² http://www.civilprotection.gr/

⁴ http://www.gein.noa.gr

http://www.dainst.org/index_34eed562bb1f14a14689001 7f0000011_de.html

¹⁶ The modern restoration in Greece started in 1894, during which a big earthquake occurred in Athens and affected the big buildings of ancient Greece which were already half destroyed. Nikolaos Balanos, who was assigned to restore the Acropolis of Athens, had taken a major role in the restoration activities in Greece for four decades until World War II. He also introduced the anastylosis, which is an archaeological term for a reconstruction technique used for the construction at Acropolis, to an Athens meeting in which the Greek word "anastylosis " was adapted as-is in the Athens charter. Therefore, Balanos was widely known as well as the anastylosis. The Venice Charter of 1964 added the details of criteria for anastylosis. Anastylosys is the combined word of ana: again and stylos: column, translated to "reconstruction of column" in modern Greek, which is associated with the symbolic architectural term of the erection of columns and from which its intent to rebuild from the original materials was derived. In fact, the word "anastylosys" was present in ancient Greek with similar intent: setting up of monuments (Shuji Matsumoto, 2000).

¹⁷ http://www.twges.de/

¹⁸ The Elgin Marbles, also known as the Parthenon Marbles, are a collection of classical Greek marble sculptures, inscriptions and architectural members that originally were part of the Parthenon and other buildings on the Acro-polis of Athens. Thomas Bruce, 7th Earl of Elgin, the British ambassador to the Ottoman Empire from 1799-1803, had obtained a controversial permission from the Ottoman authorities to remove pieces from the Acropolis. From 1801 to 1812 Elgin's agents removed about half of the surviving sculptures of the Parthenon, as well as architectural members and sculpture from the Propylaea and Erechtheum. The Marbles were transported by sea to Britain. In Britain, the acquisition of the collection was supported by some, while many critics compared Elgin's actions to vandalism or looting. Following a public debate in Parliament and subsequent exoneration of Elgin's actions, the marbles were purchased by the British Government in 1816 and placed on display in the British Museum, where they stand now on view in the purposebuilt Duveen Gallery. The legality of the removal has been questioned and the debate continues as to whether the Marbles should remain in the British Museum or be returned to Athens.

- ¹⁹ A type of fire suppressant system.
- ²⁰ Appendix8 in this report.
- ²¹ Appendix7 in this report.
- ²² Appendix8 in this report.

Chapter 3 Assignments for the Future

Learning from the cultural heritage restoration case studies presented in Chapter 2, this Chapter considers the role of international cooperation and discusses related issues and prospects. First, based on the countries' case studies, the status of damage to cultural heritage, restoration responses and related international cooperation are summarized below.

	China	Thailand	n done sia			ran	Greece	
			Aceh	Central Java	West Sumatra		Monasteries of Daphni	Archaeological Site of Olympia
Status of disaster affecting cultural heritage	control challenge and cut the seamic control of the Schuan earthquake ware heavily damaged. People from the and above concentred about the damage of watchwers about the damage of watchwers about the admage of watchwers about the start, the World Hertage buildings in Dujangan.	The second secon	collapsed and documents were swept collapsed and documents were swept away by the isunami.	Borobudur site. The Phanhanan of Temple Compounds and surrounding Temple Compounds and surrounding A wooden structure within the Royal A wooden structure within the Royal A wooden structure site and surround surround surve twas completed by destroyed. Brick masonry buildings were also damaged.	oth were damaged, hange was oth were damaged. Damage was concentrated in large-scale public misseums and archives collapsed. The library was totally destroyed two months later.	Softs more a luidings in the old uban district 6 Ban. Cay collapsed including catastrophic damage to Ang- e Bam. The static function static statistic function of waterway. Winch Bam Cdry recess to a stativa subor and angold. Bam and tis stativa subor and angold. Bam and tis statistic function of the statistic of under the List of World Heritage in Danger after the earthquake.	to the samfuke, stell frame support and a vasi amount of restoration work was necessary.	Mitered by the forest from 4 2007, fils atore materials surrow/secapod damage. Its surrowindings including the sucret mountain behind the site were boak burn out.
Respons to disaste cultural heritage heritage	In contrast calls and vertical and communication in cultural properties with olisesun, diseased in properties away because, diseased in the Principation within one work of the within one work of the within one work of the within one work of the averticulate, the State Administration of Cultural Heritage enteries on contract and started recovery work. Name the astrongenies was accelerated. Restoration work is aimed to be accelerated. Restoration work is aimed to be completed within two years.	The day of the edity of the edity of the difference of the differe	cample of activities and being carried out such as the construction of additional contraction of materials, digitation of manuscripts, review of archive facilities and restoration of manuscripts.	President Vurdivyono valent hea arthoutake, President Vurdivyono valent hea Ermanbarana Tempa Econnouruds. Damage aurwa, and restoration work has been carried out.	concorp bans have been form dated theinty by central goven ment and the concel government of West Sumatra. Reconstruction and Rehabilitation Authority was also established.	Reasonation work was carried out at the for straight after the earthquake.	an ensure to provent excessive cracking of masony walls and to cracking the falling of mosaic pieces, work to hijed hydraulic lime grout is ongoing.	A number of chines are brong activities are brong activities are brong the activities are though and the activities where a chines are the channel. Recurring where the channel, securing where the channels are resources, strengthroning disaster resources transing.
al suppor	 UNESCO contributed 15 million yuann NUESCO contributed 15 million yuann Hentage sits (Dirpotheng-stan hill Hentage sits (Dirpotheng-stan hill Hentage sits (Dirpotheng-stan hill a stated). The French government (Ilechnical Inspected Lingbasoki-yuan in happended by French operations) Lapan (Ilechnological exchange) The provided by French operations and angle and inspection releases for collural Hertage which coused on Cultural Hertage which coused on Cultural Hertage which coused on collural thertage which coused on the feature and the collections, was held on February, 2003. 	in the second of	international organizations where international organizations whom call and only governmental organizations whom power mental organizations whom power mental and power the metal organizations whom the metal power that and power mental and power that and power mental and power that power and reason that the power power and the power that and power that power that and power that power and the power and th	as-paori (technical and material support) cultural heritage for (basaterial cultural heritage) for National cultural heritage) for National cultural heritage) for National properties. Topyo as a project Agency, Itosia di Calitral Agency, Itosia di Calitral as as subsequenti y taken over by the University of Take and continues the University of Take and continues a gass-roots grant from the Ministry of a grass-roots grant from the Ministry of a grass-roots grant from the Ministry of the University of Takes exchance and provide and on meneral the sampage was carried cultural the sampage was arrend the sampage was realed the sampout provided was conference was held. - Holland (francial ad) Financial ad receivatirus it alcory/ the manufacture and sale of traditional the manufacture and sale of traditional traditional and traditional and traditional and traditional an	Wite Scott (enclast support) (NESCO) (enclast support) Request was made to British to carry affected museums. A request was affected museums. A request was affected museums. A request was affected museums was approximately buildings and city planning. Based on non-appearation in the fund result of the support the indonesian Hentage Trust.	The "hereacide Conference on Earthen Achilecture" was held just before the sample and many spearts visited Ban so this situation accurrent while all so severe to closed on Barn. Due to this, international support provided manatoria UNESCO. Therhan Cluster Office was visited. The international and and and thermational conference and activities and conference activities and activities and activities and activities and activities and activities and activities activities activities and activities activities activities activities and activities ac	for easy studies presented, there w for eggn country. • EU Ernergrency provision of financial suppo	as no support provided by a specific trand frenggrung arroart.

The following items are listed as points the national case studies had in common.

- Emergency support is provided chiefly by governments. Emergency support methods mainly include financial aid, technological exchange or providing advice (i.e. damage assess rents of cultural heritage) and there are a few examples of technical cooperation. For example, while China received offers of international cooperation from a number of foreign countries and organizations, emergency support provided was limited to financial aid from UNESCO, technical advice from the French government, and technological exchange with the Japanese government.
- As for continuous support, this tended to be provided by non-governmental support organizations with a higher percentage of technical cooperation. For example, dating back to before the disaster in Indonesia, support for Acehnese literary cultural property has been provided in the form of surveys and research by the Tokyo University of Foreign Studies.
- Demand for a system of cooperation existing in non-disaster times is high among countries where emergency support was not carried
 out. For example, although Thailand made no appeals for support when a disaster struck, they have expressed a request to carry out
 joint research relating to future disaster prevention measures, organizations engaging in cultural property disaster prevention, public
 information systems, and the use of GIS databases. For Greece also, where the case study did not report any specific support from
 overseas, exchange of academic knowledge and exchanges between experts in the fields of disaster prevention and cultural heritage
 protection is demanded.
- When heads of states visit cultural heritage sites and provide encouragement, this has a positive effect on subsequent cultural heritage restoration work. For example, in China, it is said that the people at the scene of the disaster were encouraged by a visit from the Director of the State Administration of Cultural Heritage, enabling them to fulfill their difficult duty while torn between humanitarian relief and cultural heritage relief activities. Further, on the day following the earthquake in the central part of Java, Indonesia, President Yudhoyono of Indonesia visited the Prambanan Temple Compounds so damage affecting the site was reported early.
- Countries related to disaster-affected cultural heritage tend to provide international cooperation. Lingbaoxiu-yuan, which is located in Pengzhou, China, is a Christian monastery that was built by a French missionary in 1908 so French experts provided advice for the restoration plan. In Aceh, Indonesia, grave posts marking the tombs of the Netherlands soldiers killed in the Aceh War were swept away by a tsunami, but were soon replaced due to Netherlands' support.

Based on the above items and recommendations given for each of the case studies, the following three points indicate requirements for international cooperation in the restoration of disaster-affected cultural heritage.

Non-disaster time cooperation systems

As shown by the Chinese case study, since it is necessary for overseas organizations providing cooperation to adhere to the laws of the affected country when carrying out cultural heritage protection activities, mutually acknowledging, during non-disaster time, the differences between countries' cultural heritage systems, philosophies, and technologies enable the development of specific restoration activities that encompass international cooperation. Further, when the "Forum on Risk Preparedness for the Preservation of Cultural Heritage" was held by ASEAN+3 (Japan, South Korea, and China) in January, 2009, (detailed in the Thailand case study report) it concluded and recommended that carrying out a follow-up workshop, promoting networks to strengthen disaster prevention cooperation, and publishing joint research and other research findings were necessary. This demonstrated that non-disaster rather than disaster time international cooperation is demanded. The Fine Arts Department of the Ministry of Culture in Thailand also expressed its wish to carry out joint research on earthquake disaster prevention with the vastly experienced Japan. Since humanitarian activities and infrastructure reconstruction are prioritized during an emergency, it is crucial to adhere to notions of "prevention" that seek to minimize action needed when a disaster strikes, and to build systems of cooperation such as carrying out non-disaster time joint research and joint projects. Further, nondisaster time systems of cooperation can improve the continuity of projects. As shown by the Indonesian case study, the Aceh project was enabled by relationships of trust developed through studies and research that had been carried out by the Tokyo University of Foreign Studies since before the tsunami disaster. Considering that international cooperation in the restoration of disaster-affected cultural heritage tends to be limited to emergency support, this point is particularly worth noting and, indeed, underlines the effectiveness of nondisaster time systems of cooperation.

The importance of information-sharing

One thing that became clear from this study was the unique character of each country's disaster-time communication and command systems. For example, in China, information submitted to the government was gathered in line with the country's own vertical command system. There were also countries such as Indonesia On the other hand, with some countries such as Indonesia, it is effective to share information not only with government but also with NGOs. By creating non-disaster time systems of information-sharing rooted in a country's individual institutions, effective information-sharing could also be achieved at times of disaster, allowing countries to examine whether their support is being used to full advantage by their counterparts. Further, judging when to provide international support for disaster-affected cultural heritage is a difficult problem but information-sharing between countries enables them to time support best suited to certain situations.

Long-term support plans

As stated previously, the long-term support provided by the Tokyo University of Foreign Studies, as shown in the Indonesian case study, is something particularly worth noting considering that international cooperation to restore disaster-affected cultural heritage tends to be limited to emergency support. Because the Tokyo University of Foreign Studies had from the beginning pursued long-term research plans in its inherent capacity as an organization of research, it had been carrying out research in Indonesia dating back to before the disaster struck. While government support is provided in response to requests, support by research organizations is motivated by the research activities of that organization. Therefore, if one were to compare emergency support; which is provided chiefly by government organizations, it is feasible to think that including experts and research organizations that have had a cooperative relationship with disaster-affected regions and countries in support delegations could enable the presentation of short, medium and long-term support plans to cooperative partners. In this respect, one could argue that the role of the Japan Consortium for International Cooperation in Cultural Heritage with its extensive network of domestic and overseas experts is to praivide information for best suited people for requests.

Based on the above, when providing international cooperation for disaster-affected cultural heritage, the future role that Japan should play is extremely significant. For example, one could argue that a definite prospect is holding workshops to promote non-disaster time systems of cooperation and information-sharing. Japan has already achieved success through the "Japan-China Workshop on Earthquake Resistance Measures for Cultural Heritage" held in February, 2009. Also, "Forum on Risk Preparedness for the Preservation of Cultural Heritage" held by ASEAN+3 (Japan, South Korea, and China)in January, 2009 concluded and recommended ① carrying out a follow-up workshop, ② promoting networks to strengthen disaster prevention cooperation, ③ presenting joint research ④ creating a communication tool such as website which help these three goals. According to these two workshops, it is clear that people hope to have opportunities to share information, such as of preventing disasters, conservation philosophy, how-to use databases like GIS, and distributing information in an emergency, In addition, the Greek case study reported that collaboration is required in the international community to form a more advanced international framework, and that the formulation of crisis management programs aimed at the sustainable protection of the World Heritage under the umbrella of UNESCO are required. Moreover, Japan has great experience for these research fields; architecture, civil engineering, and meteorology, and those thematic themes are also important to be considered in workshops. When such workshops or similarly-themed workshops are held in the future, the Japan Consortium for International Cooperation in Cultural Heritage will do its best to dispatch experts and collect information.

Also, we consider the role of the consortium with a wide network of specialist from home and abroad is collecting data of researches and specialists in the field of cultural heritage, and provide opportunities to share information between different areas for effective international cooperation.

This study was unfortunately unable to identify collaboration with other support-providing countries such as those in Europe, and information showing the international cooperation policies of support-providing countries is limited. However, it is necessary to constantly gather information relating to how these countries time their actions and the kind of support they aim to provide. It is also necessary to obtain information at international conferences relating to what happens after support has been provided. To grasp what kind of contribution Japan can make in the future, it will be necessary to carry out studies not only in disaster-affected counties but also in other countries that provide support. This could help to strengthen cooperation and collaboration and enable more effective international cooperation. Further, it is hoped that comparing systems between Japan and other support-providing countries could clarify issues that Japan, as one of the support-providing countries not examined in this study, will need to improve upon in the future.

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List of Interviewees

China (order of interview)
 ZHAO, Chuanrong, Vice Director, Cultural Relics Bureau of Sichuan Province
 LI, Bei, Director, Cultural Relics Bureau of Sichuan Province, Museums Division
 ZHU, Xiaonan, Director, Cultural Relics Bureau of Sichuan Province, Cultural Relics Protection Division
 WANG, Fengjun, Vice Director, Chengdu Municipal Bureau of Culture
 MIAO, Yongshu, Director, Chengdu Municipal Bureau of Culture, Cultural Relics Division
 KA, Zaibin, Vice Director, Cultural Relics Bureau of Dujiangyan
 XU, Jun, Bureau Officer, Cultural Relics Bureau of Dujiangyan
 WANG, Yi, Museum Director, Chengdu Jinsha Site Museum
 ZHOU, Kuiying, Director, Cultural Relics Bureau of Shaanxi Province, Cultural Relics Division
 ZHAO, Qiang, Vice Director, Cultural Relics Bureau of Shaanxi Province, Cultural Relics Division
 ZHAO, Qiang, Director, Chinese Academy of Cultural Heritage, Technical Research Institute for Cultural Relics Protection
 XU, Yan, Director, People's Republic of China, State Administration of Cultural Heritage, Cultural Relics Protection Division

2. Thailand

[Office of Archaeology, Fine Arts Department, Ministry of Culture] Tharapong Surischat, Director, Office of Archaeology, Fine Arts Department Sudchai Phansuwan, Civil Engineer, Office of Archaeology, Fine Arts Department Vasu Poshyanandana, Architect, Office of Archaeology, Fine Arts Department Manatchaya Wajvisoot, Architect, Office of Archaeology, Fine Arts Department) * Thailand representative Surayoot Wiriyadamrong, Architect, Office of Archaeology, Fine Arts Department Patiwat Tul-on, Architect, Office of Archaeology, Fine Arts Department Sitthichai Pooddee, Archaeologist, Office of Archaeology, Fine Arts Department Wirayar Chamnanpol, Computer Technical Officer, Office of Archaeology, Fine Arts Department [8th Regional Office of Fine Arts, Fine Arts Department, Ministry of Culture] Sahawat Naenna, Director, 8th Regional Office of Fine Arts in Chiang Mai, Fine Arts Department, Ministry of Culture [Department of Mineral Resources] Somjai Yensabai, Director, Office of Environmental Geology, Department of Mineral Resources, Ministry of Natural Resources and Environment

3. Indonesia

[Jogjakarta] Jogjakarta Archaeological Heritage Preservation Office Central Java Archaeological Heritage Preservation Office Borobudur Archaeological Heritage Preservation Institute Gadjah Mada University

[Aceh]

PKPM (Pusat Kajian Pendidikan dan Masyarakat)
Harun Kuchik Leumiek, Pak. Harun Kuchik Leumiek
Ali Hasjmi Education Foundation (Yayasan Pendidikan Ali Hasjmi)
Aceh Documentation and Information Center (PDIA (Pusat Dokumentasi dan Informasi Aceh))
Research Center for the Study of History and Traditional Values (Balai Kjian Sejarah dan Nilai Traditional)
Aceh Provincial Museum (Museum Negeri Propinsi)
Provincial archives (Badan Arsip)

List of Interviewees

Provincial library (Perpustakaan Daerah) International Centre for Aceh and Indian Ocean Studies (ICAIOS)

[Jakarta]

National Library of Indonesia (Perpustakaan National) Directorate General of History and Archaeology, Ministry of Culture and Tourism UNESCO Jakarta Office Titik Pudjiastuti, former chairperson of the Indonesian Association for Nusantara Manuscripts (MANASSA)

[Padang]

Mesjid Raya Mudiak Padang / Surau Tandikek Mesjid Raya VII Koto Ampalu Surau Ampalu Tinggi Surau Baru Bintungan Tinggi Surau Paseban Surau Darussalam Surau Darussalam Batusangkar Archaeological Heritage Preservation Office (BP3 Batusangkar) West Sumatra Provincial Museum (Museum Negeri Propinsi) Provincial archives (Badan Arsip)

4. Iran

Watanabe, Kunio, Professor, Saitama University (Analysis of soil and building material; Information of Mission)
Mehrdad Hejazi, Professor, Isfahan University (Traditional construction of Iran; Proposal of restoration)
Taniguchi, Junko, Program specialist of UNESCO Tehran cluster office (UNESCO Information)
Eskandar Mokhtari, Director, Bam Base Tehran Office (Official information of Bam)
Arash Boustani, Secretary General, ICOMOS Iran (General information of cultural heritage in Iran)
Mohammed H.Talebian, Former director of Bam project (Conservation of national level)
Rasool Vatandoust, Former director of RCCCR (ICOMOS matter)
Abe, Masamichi, Director, Japan Information and Culture Center (Comment from Japanese Embassy; Request of Iran)

5. Greece

Elena Korka, Director of Prehistoric and Classical Antiquities, Hellenic Ministry of Culture Harris P. Mouzakis, Assistant Professor, National Technical University of Athens (NTUA) Konstantinos Antonopoulos, Head of local service at Olympia, Hellenic Ministry of Culture Maria Ioannidou, Director of the Acropolis Restoration Service (YSMA), Civil Engineer of NTUA (National Technical University of Athens) Miltiadou-Fezans, Directorate of Technical Research for Restoration, Hellenic Ministry of Culture

N. Delinikolas, Head of the Section for Restoration Studies on Byzantine monuments, Hellenic Ministry of Culture Nikos Ninis, Head of the Engineering Division, Finance Management Fund for Archaeological Projects, Hellenic Ministry of Culture

Dispense with the Mr. and Mrs.

Appendix

Appendix 1: Thailand 1

Mark Petersen, Stephen Harmsen, Charles Mueller, Kathleen Haller, James Dewey, Nicholas Luco, Anthony Crone, Davide Lidke, and Kenneth Rukstales (2007): Documentation for the Southeast Asia Seismic Hazard Maps, Administrative Report September 30, 2007. U.S.Department of the Interior, U. S. Geological Survey (Extraxt)

Faults in Thailand

Even though no surface-faulting earthquakes have been documented in Thailand in the past 700 yr (Bott and others, 1997; Fenton and others, 1997), wide spread evidence of Holocene surface deformation has been recognized for nearly two decades. These intraplate faults have tectonic histories that are complex (*i.e.*, Morley, 2002); their origin, distribution, and tectonic history are driven by distant convergent-plate motions. In northern Southeast Asia, a broad zone of generally east-west, sub-parallel, well-defined sinistral faults extend from the Burma coast eastward into Vietnam and China. These faults, join with the Himalayan deformation zone, and define an arc of the India-Asia collision belt. The strike-slip faults of northern and western Thailand give way to transtensional, normal faults in the northeastern corner of the country. The normal faults share striking similarities to faults in the Basin and Range Province of the Western United States (Fenton and others, 1997, 2003). They bound Tertiary basins that reflect similar origin, style of faulting, spatial distribution, and rates of activity as faults in the Basin and Range Province; similarly, northern Thailand is undergoing east-west to northwest-southeast extension (Fenton and others, 1999). Thailand, like vast regions of the Basin and Range, has not had a historic large-magnitude earthquake and therefore is not generally considered seismically active. The geologic record, however, suggests that these generally quiescent faults have been the source of large earthquakes and if earthquake processes are comparable to those in the Basin and Range Province, earthquakes as large as M7.1 (1915 Pleasant Valley, Nevada) to M7.3 (Hebgen Lake, Montana) may occur. The faults we included in our model are long enough to support earthquakes of that size.

There has been an extensive effort in Thailand to document and characterize potentially active faults (Kosuwan and others, 1999, 2000) by the Department of Mineral Resources with cooperative research studies by Chulalongkorn University, Thailand, and Akita University, Japan, that evolved from earlier compilations (Nutalaya, 1994; Hinthong, 1995). In the decade since the earliest of these compilations, many trenching investigations have been completed that identify where large-magnitude Holocene (and earlier) earthquakes have occurred.

We rely on published data to assign slip rates, and our discussions of fault parameters in the Thailand workshops illustrated that published rates vary considerably. This is not a problem unique in Thailand but is recognized worldwide; some (but not all) of the reason for this variation is that relative-dating techniques lack reproducibility. We adopted the strategy to treat each site-specific (trenching) study equally. If the published slip rate is a range of values, we use the average of those end members. Then single-study values are averaged. However, if the result of a study is based on regional comparison of geomorphology and is followed by more recent investigations including trenching, the site-specific studies supercede the regional comparison and the latter was not considered in assigning preferred slip rates.

The earliest and most extensive reconnaissance studies of faults in Thailand are by Fenton and others (1997, 2003). They evaluated the geomorphic expression of faulting; however, the study was handicapped by the absence of a well-defined late Quaternary framework. Because of the regional nature of this study, slip rates were assigned based on broad similarities between faults. We have used their findings in our analysis where they have not been superceded by fault-specific studies. Future work on the Long, Nam Pat, Phayao, and Phrae Basin faults will certainly improve our understanding of these faults. Using the same guiding philosophy, additional sources were characterized by Wong and others (2005). The Khlong Marui fault (fig. 7, Table 3) is generally poorly expressed in the landscape; it is assigned a low slip rate, suggesting recurrence of M7.5 earthquakes on the order of more than 100 k.y. Likewise the Ranong fault is assigned a slip rate similar to Fenton and others' (2003) low slip-rate faults.



7. Map of fault sources in and near Thailand.

Name	Length (km)	Dip (°)	Width	Characteristic M	Slip rate (mm/yr)	Annual probability	Recurrence interval (yr)	Reference
Khlong Marui fault	348	90	15	7.51	0.01	7.8494E-06	127,398	Wong and others, 2005
Long fault	63	50	20	7.17	0.1	6.8464E-05	14,606	Fenton and others, 2003
Mae Chan fault	154	90	15	7.51	0.7	2.4319E-04	4,112	Kosuwan and others, 2003
Mae Kuang fault	34	90	15	6.86	0.43	2.6250E-04	3,809	Rhodes and others, 2004
Mae Yom fault	27	50	20	6.74	0.47	7.6717E-04	1,303	Charusiri and others, 2006
Moei fault	226	90	15	7.51	0.36	1.8383E-04	5,439	Saithong and others, 2005
Nam Pat fault	38	50	20	6.91	0.1	1.1574E-04	8,640	Fenton and others, 2003
Phayao fault	30	50	20	6.80	0.1	1.3075E-04	7,648	Fenton and others, 2003
Phrae Basin fault	65	50	20	7.18	0.1	6.9868E-05	14,312	Fenton and others, 2003
Phrae fault	73	50	20	7.24	0.06	4.7533E-05	21,037	Udchachun and others, 2005
Pua fault	80	50	20	7.29	0.6	3.6844E-04	2,714	Fenton and others, 2003
Ranong fault	523	90	15	7.51	0.1	1.x1801E-04	8,473	Wong and others, 2005
Sri Sawat fault	209	90	15	7.51	0.6	2.8216E-04	3,544	Kosuwan and others, 2006
Thoen fault	107	50	20	7.43	0.16	9.2634E-05	10,795	Charusiri and others, 2004 Pailoplee, 2004
Three Pagodas fault	380	90	15	7.51	0.56	4.7944E-04	2,085	Charusiri and others, 2004 Kosuwan and others, 2006

Table 3. Thailand fault parameters.

1 Characteristic magnitude fixed based on worldwide analog.

The other faults in our analysis have been targets of more recent detailed paleoseismological investigations. These fault parameters were discussed at the Thailand workshops and represent the best assessment at this time. We will provide only brief remarks regarding these faults that are relevant to seismic hazard mapping. Refer to Figure 7 and Table 3.

The Mae Chan fault is an east-west left-lateral strike slip fault in northern Thailand, located near the city of Mae Chan. It extends from near the Myanmar border in the Nam Mae Kok valley eastward into Laos across the Mekong River (Fenton and others, 2003). The morphology of the Mae Chan fault demonstrates clear evidence of late Quaternary surface faulting including such features as shutter ridges, sag ponds, and beheaded gullies (Wood, 1995, 2001, Hinthong, 1995; Rymer and others, 1997). Long-term activity is evident in satellite imagery showing offset, on the scale of hundreds of meters, of active river channels. Based on assumed erosions rates Fenton and others (2003) suggest that the Mae Chan fault has a slip rate of 0.3–3 mm/yr. More recent trenching by Kosuwan and others (2003) suggest a lower slip rate of 0.7 mm/yr with possibly three surface-rupturing events occurring in the Holocene. Our assigned slip rate is based on the more recent and detailed study.

The Mae Kuang fault was first reported by Perez and others (1999) as a 30-km-long fault subparallel to and south of the Mae Chan fault and northeast of the Chain Mai basin in the Mae Tho Range. It, like the Mae Chan fault, is a strike-slip structure. Our assigned slip rate is the average of long-term rates proposed by Rhodes and others (2003) of between 0.175 and 0.7 mm/yr based on 3.5 km offset since the reversal of faulting between 5 and 20 Ma.

The Mae Yom fault strikes northeast for a distance of approximately 25 km. Recent investigations suggest multiple Holocene displacements with the most recent movement about 5 k.y. ago (Charusiri and others, 2006).

The predominately strike slip, nearly 230-km-long Moei (or Mae Ping) fault trends northwest near and paralleling the western border of Thailand. Recent studies of this fault suggest recurrence intervals measured in tens of thousands of years and a slip rate of 0.36 mm/yr (Saithong and others, 2005).

The fault with the lowest slip rate assigned in this model is the centrally located Phrae fault. The assigned slip rate is from Udchachun and others (2005). However, previously published slip rate of 0.1 mm/yr (Fenton and others, 2003) is based on regional similarities, but the basis of this slip rate is not documented. Our model suggests recurrence intervals on the order of tens of thousands of years.

The Pua fault, in the northeasternmost part of Thailand, demonstrates unmistakable evidence of recurrent and recent faulting. The range-front is abrupt and linear in satellite imagery clearly highlighting this west-dipping normal fault. Fenton and others (2003) document that the youngest and best-expressed geomorphology is found along the northern and central part of the fault. They assign a slip rate of 0.6 mm/yr to this fault based on comparative geomorphology. A more recent study by Charusiri and others (2006) does not document a slip rate for this fault, but trenching suggests that surface rupturing earthquakes have occurred 8,000, 6,000, and 2,800 yr ago. The annual rate of 3.184E-04 from our study is in agreement with the chronology documented by Charusiri and others (2006).

The west-dipping, normal Thoen fault (Fenton and others, 2003) bounds the eastern side of the Thoen, Mae Moh and Lampang basins. Recurrent activity along this fault has resulted in a series of faceted spurs reaching 250 to 350 m in height and deeply entrenched wine-glass valleys. The range front is abrupt in satellite imagery, which provides further evidence that this fault has been the source of recurrent large magnitude earthquakes. Fenton and others (2003) document 6 m offset of the active floodplain of the Mae Mai River. The absolute age of this terrace surface was not determined, but its assigned age is 10 ka. There is a general lack of wide-spread evidence of Holocene offset; therefore, the actual slip rate may be much lower as documented by later studies by Charusiri and others (2004) and Pailplee (2004) who conclude that the slip rate is 0.15 mm/yr and 0.17 mm/yr, respectively. The assigned slip rate is the average of the most recently published rates.

The Sri Sawat and Three Pagodas faults are subparallel, strike-slip faults that have similar slip rates in our model. Fault parameters are poorly known and recent studies do not concur. Fenton and others (2003) suggest a broad range of 0.5-2 mm/ yr for the Three Pagodas fault based on geomorphic input and relative dating techniques. Later studies suggest slip rates of 0.22–0.5 mm/yr (Charusiri and others, 2004) and 0.76 mm/yr (Kosuwan and others, 2006); these are the basis of our assigned slip rate. The Three Pagodas fault is especially important because it is the primary contributor to hazard in Bangkok, Thailand, because this source is closest to the city. The assigned slip rate for the Sri Sawat fault is based on studies by Kosuwan and others (2006). Their study indicates that at least one large-magnitude Holocene earthquake has occurred on this

fault.

In addition to location and slip rate, the third dimension of fault sources must also be defined. Bott and others (1977) provide a summary of seismicity in Thailand that indicates that the majority of seismicity occurs at depths of 10–20 km. Therefore, we assign an average depth (15 km). The assigned dip for the normal faults in our model reflect the default value used in the United States. All slip rates are either vertical, for normal faults, or horizontal, for strike-slip faults; therefore, the fault parallel widths (20 km) are larger on dipping faults than similar strike-slip faults. The long faults in the model (> 90 km) are assigned maximum magnitudes of M7.5 based on world-wide analogs.

Other Regional Sources

Most of the Thailand faults in our model have characteristic magnitudes with recurrence times of several thousands of years. Earthquake hazard can be influenced by faults and sources in neighboring countries; therefore, a literature search was conducted to evaluate any significant seismic sources beyond the borders of Thailand. Two faults have recurrence intervals on the order of a few hundred years: The Red River and Sagaing faults (fig. 7, Table 4). These faults cause the highest hazards in the northern portion of Southeast Asia.

The Sagaing fault in Myanmar is a major right-lateral strike-slip fault that carries some or all of the oblique plate motion related to the India-Eurasian convergence similar to the Sumatran fault on the island of Sumatra. Our assigned slip rate is based on high rates of strain accumulation suggested by GPS studies (Socquet and others 2006). Socquet and others (2006) indicate that the GPS rate is similar to rates documented in earlier geologic studies (Bertrand and others, 1998). Like the Sumatran fault we modeled the Sagaing fault with floating M7.9 earthquakes that have equal probability of rupturing along the fault.

The other source, the Red River fault in Vietnam and China (fig. 7, Table 4), is another major, long (>900 km) right-lateral strike-slip fault. Reported slip rates are 2-8 mm/yr (Allen and others, 1984) based on measured offsets between 9 m and 6 km; the average was used in this model, which agrees with data presented by (Replumaz and others, 2001; Schoenbohm and others, 2006). The slip rate of the Red River fault is poorly constrained because of the lack of radiometric age dating of offset landforms. Like the Sagaing fault, we constrain the maximum magnitude at M7.9.

Name	Length (km)	Dip (°)	Width	Characteristic M	Slip rate (mm/yr)	Annual probability	Recurrence interval (yr)			
Red River	890	90	15	7.91	5					
fault										
Sagaing fault	724	90	15	7.91	18	7.3877E-03	135			
zone										

Table 4. Regional fault parameters.

1 Characteristic magnitude fixed based on worldwide analog.

Ground Motion Models

The ground motion models are referred to as attenuation relations or ground motion prediction equations. These models predict the ground motion for a particular fault source, fault type, magnitude, distance, stress drop, Q attenuation properties of the crust, and local soil condition. We apply attenuation relations for intraplate earthquakes within stable continental regions, interplate crustal earthquakes near plate boundaries, subduction zone earthquakes on the plate interface, as well as intermediate and deep earthquakes within the subducting slab.

Crustal Intraplate Attenuation Relations

Once the earthquake sources are defined, attenuation relations relate the source characteristics of the earthquake and propagation path of the seismic waves to the ground motion at a site. Predicted ground motions are typically quantified in terms of a median value (a function of magnitude, distance, site condition, and other factors) and a probability density function of peak horizontal ground acceleration or spectral accelerations for different periods (McGuire, 2004). We apply separate attenuation relations for the interplate crustal, intraplate crustal, deep, and subduction earthquakes. Ground motion maps are produced by considering the ground motion distributions from each of the potential earthquakes that will affect the site and by calculating the ground motion with an annual rate of 1/475 or 1/2475 (10% and 2% probability of exceedance in 50 yr) for building code applications.

For the stable Sunda plate we use the crustal intraplate attenuation relations to characterize the ground motions. We have applied the following weighting scheme for these attenuation models: Toro and others (2005; wt. 0.2), Frankel and others (1996; wt. 0.1), Atkinson and Boore 140 bar stress drop (2006, 2007; wt. 0.1), Atkinson and Boore 200 bar stress drop (2006, 2007; wt. 0.1), Somerville and others (2001; wt. 0.2), Campbell (2002; wt. 0.1), Tavakoli and Pezeshk (2005; wt. 0.1), and Silva and others (2005, wt. 0.1). These models account for variable stress drops, finite faults, and cratonic attenuation properties.

The Southeast Asia seismic hazard maps are made using a reference site condition that is specified to be the boundary between NEHRP classes B and C, with an average shear-wave velocity in the upper 30 m of the crust of 760 m/s (Building Seismic Safety Council, 2003). However, some attenuation relations are not developed for this shear-wave velocity. Therefore, for the intraplate attenuation relations we have typically converted hard-rock attenuation relations to approximate ground motions for a site with shear velocity on the NEHRP B/C boundary. For several of these models the hard rock (NEHRP A) to firm rock (NEHRP – BC) conversion that we used for these maps is a simple factor for many spectral periods. These factors are: 1.74 for 0.1 s, 1.72 for 0.3 s, 1.58 for 0.5 s, and 1.20 for 2.0 s spectral acceleration (SA). Similar factors are available for PGA, 0.2 s, and 1.0 s. Another parameter that is important in ground motion simulations for the intraplate attenuation relations is stress drop, or the compactness of the earthquake rupture. Based on the recommendation of G. Atkinson, we have applied two alternative stress drops of 140 bars and 200 bars for the Atkinson and Boore (2006, 2007) model to account for epistemic uncertainty in that parameter.

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Thailand

Seismic hazard in Thailand tends to be controlled by subduction and deep seismicity at coastal sites, by faults in many parts of western inland Thailand, and by relatively infrequent background events in the stable interior. Figure 16 shows the contributors to 1-s seismic hazard at a site in Bangkok. Bangkok is relatively far from the nearest Quaternary fault in the fault model, the Three Pagodas fault. The main contributor to hazard in Bangkok is background seismicity in the stable Sunda plate. The 500-yr return time 1-s spectral acceleration is about 0.02 g in Bangkok (BC-rock site condition).

Conclusions

The USGS Southeast Asia seismic hazard maps are for use by USAID only. These are not ready for use in engineering design. Modification will be made to the maps to eliminate artifacts. An open-file report will be published in the near future will contains models useful for design.

		•			
Source Zones	Minimum magnitude	Maximum magnitude	Recurrence (cumulative a-value and area of zone – or annual recurrence for characteristic earthquake)	b-value	Weight
1. Background seismicity	-				-
Shallow (0-50 km) ¹	5.0	7.0	Smoothed seismicity	1.0	1.0
Intermediate (50-100, set at 60 km)	5.0	7.8	Smoothed seismicity	1.0	1.0
Intermediate (100-150, set at 100 k)	5.0	7.8	Smoothed seismicity	1.0	1.0
Deep (150-200 km, set at 150 km)	5.0	7.8	Smoothed seismicity	1.0	1.0
Deep (200-250 km, set at 200 km)	5.0	7.8	Smoothed seismicity	1.0	1.0
Smoothed seismicity	•				•
2a. Sunda smoothed seismicity	5.0	7.0	4.80/4,283,820 km ²	1.021	0.5
2b. Sunda constant seismicity	5.0	7.0		1.021	0.5
3. Crustal fault models					•
Thailand	5.0	Mmax-Table 3	Table 3		1.0
Indonesia	5.0	Mmax- Table 2	Table 2		0.25 for 4 models
4. Sunda subduction zone					
Java-Sumatra-Andaman (GR)	7.1	9.1	6.29/1,427,270 km ²	1.014	0.333
Java-Sumatra-Andaman (GR)	5.0	7.0			0.333
Java (GR)	7.1	9.2	6.38/578,080 km ²	1.097	0.667
Java (GR)	5.0	7.0	6.38/578,080 km ²	,	0.667
Southern Sumatra (Char)		9.2	0.003/yr		0.667
Southern Sumatra (GR)	5.0	7.0	5.48/470,340 km ²	0.936	0.667
Northern Sumatra-Andaman (Char)		9.2	0.001/yr		0.667
Northern Sumatra-Andaman (GR)	5.0	7.0	5.15/378,860 km ²	0.959	0.667
Burma (GR)	7.1	9.2	5.72/325,070 km ² 1.190		0.667
Burma (GR)	5.0	7.0	5.72/325,070 km ²	1.190	0.667

Table 1. Regional source model.

1 Shallow background seismicity (0-50 km) does not include region of the Sunda subduction zone or the Sunda plate zone. Char and GR represent characteristic and Gutenberg and Richter magnitude-frequency distributions.



Fig.16. Hazard curves for 1-Hz spectral acceleration at a site in Bangkok, Thailand.



PSHA PGA Thailand and Vicinity. PE= 10% 50 yr

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Figure D-1. Hazard map for Thailand and Malaysian peninsula showing the peak ground acceleration with a 10-percent probability of exceedance in 50-yr hazard level for firm rock site condition (Vs30=760 m/s). Low hazard areas near central Thailand are artifacts of the Sunda zone and will be modified in the near future.



PSHA 5hz Thailand & Vicinity. PE= 10% 50 yr

Figure D-2. Hazard map for Thailand and Malaysian peninsula showing the 5-Hz spectral acceleration with a 10-percent probability of exceedance in 50-yr hazard level for firm rock site condition (Vs30=760 m/s). Low hazard areas near central Thailand are artifacts of the Sunda zone and will be modified in the near future.



PSHA 1hz Thailand & Vicinity. PE= 10% 50 yr



Figure D-3. Hazard map for Thailand and Malaysian peninsula showing the 1-Hz spectral acceleration with a 10-percent probability of exceedance in 50-yr hazard level for firm rock site condition (Vs30=760 m/s). Low hazard areas near central Thailand are artifacts of the Sunda zone and will be modified in the near future.



PSHA PGA Thailand and Vicinity. PE= 2% 50 yr

Figure D-4. Hazard map for Thailand and Malaysian peninsula showing the peak ground acceleration with a 2-percent probability of exceedance in 50-yr hazard level for firm rock site condition (Vs30=760 m/s). Low hazard areas near central Thailand are artifacts of the Sunda zone and will be modified in the near future.



PSHA 5hz Thailand & Vicinity. PE= 2% 50 yr

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Figure D-5. Hazard map for Thailand and Malaysian peninsula showing the 5-Hz spectral acceleration with a 2-percent probability of exceedance in 50-yr hazard level for firm rock site condition (Vs30=760 m/s). Low hazard areas near central Thailand are artifacts of the Sunda zone and will be modified in the near future.



PSHA 1hz Thailand & Vicinity. PE= 2% 50 yr

Figure D-6. Hazard map for Thailand and Malaysian peninsula showing the 1-Hz spectral acceleration with a 2-percent probability of exceedance in 50-yr hazard level for firm rock site condition (Vs30=760 m/s). Low hazard areas near central Thailand are artifacts of the Sunda zone and will be modified in the near future.

Appendix 2: Thailand 3

Thailand Country Report 2008

Part 1: Natural Disaster Situation in Thailand

1.1. Geographical Characteristics of Thailand

Thailand is located between 5° and 21° N latitude and between 97° and 106° E longitude, bordering to the North by Laos and Myanmar, to the East by Laos and Cambodia, to the South by the Gulf of Thailand and Malaysia, and to the west by the Andaman Sea and Myanmar, and covering the area of 513,115 square kilometres. The weather is warm and rather humid with an average high temperature of 34 $^{\circ}$ c and the low of 23 $^{\circ}$ c. As of December 2008, the total population stood at 65 millions.

1.2. Administrative system

Conventional long form: Kingdom of Thailand Conventional short form: Thailand Government type: Constitutional monarchy Capital: Bangkok Administrative divisions: 76 provinces (changwat) three types of government administration: central, provincial and local.

1.3. Typical natural disaster in Thailand

Similar to neighboring countries, Thailand has been affected by natural disaster including flood, landslides, urban fire, bush fire, windstorm, drought, hunderboltinduced disaster, hail storm and epidemic. Only in 2004, the country faced for the first time in history the tsunami generated by the giant earthquake near Indonesia.

1.4. The Past Disaster Statistics

Source: Department of Disaster Prevention and Mitigation

Part 2: Disaster Management System

2.1. The Disaster Prevention and Mitigation Act 2007:

The Disaster Prevention and Mitigation Act 2007 (DPM Act) has replaced the old and outdated 1979 Civil Defence Act and the 1999 Fire Prevention and Suppression Act. Entering into force on 6 November 2007, the new Act has 4 prominent features, including 1) Introducing 3 main policy- making and planning bodies including National, Provincial and Bangkok Metropolitan, 2) Having Prime Minister or an designated Deputy Minister as the National Commander, 3) Empowering Department of Disaster Prevention and Mitigation (DDPM) as the core government department in handling national disaster management work, and 4) Authorizing local governments to take responsibility of disaster management in their respective areas, in line with the Provincial Plan.

Year	Disaster types	Frequency (time)	People Killed	Total affected people	Damaged Value (USD)
2007	Flood	13 (54 provinces)	36	2,326,179	48,224,742
2007	Fire	1901 (71 provinces)	45	9,761	25,022,623
2006	Flood	6	446	6,050,674	275,069,103
2006	Fire	1731 (66 provinces)	37	9,708	30,967,018
2005	Drought	1 (71 provinces)	-	11,147,627	216,167,461
2005	Flood	12 (57 provinces)	75	2,874,673	1,692,238

According to the new DPM Act, disaster can be classified into 3 categories namely: 1) Man-made and natural disasters; 2) Disaster resulted from air raid during wartime; and 3) Disaster resulted from sabotage or terrorist attack.

In terms of policy making, there are 3 levels: National, Provincial and Bangkok Metropolitan Administration level, which are chaired by the Prime Minister or an designated Deputy Minister, Provincial Governor, and the Bangkok Governor respectively. Each of three- policy- making organ is composed of the committee as follows:

(1) The National Disaster Prevention and Mitigation Committee (NDPMC)

Members of the committee come from various Ministries relevant to disaster management, i.e. Ministry of Interior, Ministry of Defence, Ministry of Agriculture and Cooperatives, Ministry of Transportation and Communications, Ministry of National Resources and Environment, Ministry of Information, Communication and Technology, Ministry of Public Health, Ministry of Finance, and so on. The Prime Minister or designated Deputy Prime Minister is a chairperson, and Director- General of Department of Disaster Prevention and Mitigation (DDPM) is the secretariat of the committee. The Committee has prominent tasks and responsibilities for proposing the policy to formulate the National Disaster Prevention and Mitigation Plan, and effectively integrating the development on disaster prevention and mitigation mechanism among government agencies, local administrations, and other relevant private sectors.

(2) The Provincial Disaster Prevention and Mitigation Committee

The Provincial Governor as the Provincial Director will be the person responsible for disaster prevention and mitigation in his or her own province including appointment of the Provincial Disaster Prevention and Mitigation Committee, which come from representatives from other provincial disaster management agencies. The Secretariat of the provincial committee is the Chief of Disaster Prevention and Mitigation Provincial Office. Their main duty of the provincial committee is to formulate the provincial disaster management plan under the guideline of national plan.

(3) The Bangkok Metropolitan Committee

Just the same as Provincial Director, Bangkok Metropolitan Governor as the Bangkok Director is responsible for disaster prevention and mitigation in Bangkok and to be the person to appoint the Bangkok Metropolitan Committee composing of delegates from government agencies including Bangkok Metropolitan, DDPM, Universities, and public charities and

National plan	Provincial Plan	Bangkok Metropolitan Plan
(1) Guide lines, measures and adequate budget to support disaster prevention and mitigation operations systemically and continuously	(1) The setting up of Special Command Center when ever disasters strike, that center shall be constructed and has authorities to command and oversee disaster prevention and mitigation operations and activities	(1) establishment of command center where disaster occurred for construction and authorization for disaster prevention and mitigation operation
(2) Guide lines and methods for providing aids and mitigate the impacts of disasters in both short and long term, together with evacuation procedures of effected people, government services, and other local administrations, supports effected people on their public health, public utilities and communication system	(2) Plan and procedures for local administrations for procuring tools, equipments, materials, hardware and vehicles in disaster prevention and mitigation operations	(2) plan and process to procure materials, tools equipment, and vehicle for disaster prevention and mitigation
(3) Relevant government agencies and local administrations shall proceed all operations under (1) and (2), and shall seek for availability and mobility of fund	(3) Plan and procedures for local administrations for procuring an early warning system and other equipments to inform people and communities on incoming disasters	(3) plan and process to procure signaling devices or others for notifying the occurrence and expectation of a disaster
(4) Preparedness perspectives on support personnel, equipments and other materials to deploy upon disaster prevention and mitigation operations, and capacity building of those personnel and other people shall be included	(4) Operation plan for disaster prevention and mitigation at local administrations	(4) Bangkok Disaster Prevention and Mitigation Action Operation Plan
(5) Guide line on fixing, recovery and restoration to community right after disaster	(5) Cooperation plan to other relevant public charities.	(5) Coordination Plan with Public Charity Organizations in Bangkok

Appendix

communities in Bangkok. The Committee has powers in drafting the Disaster Prevention and Mitigation Plan for Bangkok which shall be consistence to the National Disaster Prevention and Mitigation Plan, and other handling the disaster management related activities.

2.2. Disaster Prevention and Mitigation Plan

Department of Disaster Prevention and Mitigation, as the Secretariat of the National Disaster Prevention and Mitigation Committee, has the responsibility to devise the National Disaster Prevention and Mitigation Plan. This is to be done by conferring with relevant government agencies, local administrations, and private sectors. Once the National Plan is approved, it will be used as a master plan, upon which the provincial and Bangkok Metropolitan Administration will be based. The national plan will be in service for the period of 3 years. DDPM is to make sure that the new plan for the next 3 years is ready for use accordingly.

According to the National Disaster Prevention and Mitigation Act 2007, the three-level plan shall have substantial parts as shown in the table below.

2.3. National Civil Defence Plan B.E. 2548 (2005)

The National Civil Defence Plan 2005 has been developed from the same plan yearly 2002 by the National Civil Defence Sub-committee authorized to improve plan. It still serves as the master plan for agencies responsible in disaster management in providing guidelines or formulating their operational plans. The plan will be reviewed and updated by DDPM every three year before proposed for approval by the National Disaster Prevention and Mitigation Committee. The plan has two parts: the first is of disaster prevention and mitigation, and the other is Civil Defence for Security (Rear-Area Protection).

2.4. Department of Disaster Prevention and Mitigation

Department of Disaster Prevention and Mitigation (DDPM), according to the Bureaucrat Reform Act 2002, has been formed by different organizations responsible for disaster prevention and mitigation as follows:

- (1) Civil Defence Division of Department of Provincial Administration;
- (2) Department of Accelerated Rural Development;
- (3) Department of Social Welfare, Department of Community Development;

and

(4) Office of National Safety Council

In 2008, DDPM has 4,220 staffs. Among this number, 1,940 are civil servants and the rest are permanent and temporary employees.

According to Article 11 of Disaster Prevention and Mitigation Act B.E.2550, DDPM is mandated to be central government agency under the umbrella of Ministry of Interior to undertake the work on disaster prevention and mitigation at a national level. Aside its Head Office in Bangkok, DDPM also has 18 Regional Operation Centers and 75 Provincial Offices across the country.

2.5. National Safety Council of Thailand

The National Safety Council of Thailand (NSCT) is the other disaster management policy making body at a national level. Unlike the National Committee on Disaster Prevention and Mitigation, the main focus of NSCT is man-made and technological disaster management. The council has been established in 1982 on the ground of the problem of road traffic accidents in Thailand which annually resulted in the tremendous loss of lives, properties and national economy. Later on, its responsibilities have been extended to cover the prevention of chemical accident, occupational accident, accident in home and public venues, considering preventive measure of fire in high-rise building, accident prevention in subway tunnel construction, providing education of safety etc. The NSCT is chaired by the Prime Minister and the committee comprises high level government officials from concerned government agencies, president of some charitable foundations and a few scholars. The Director General of Department of Disaster Prevention and Mitigation is a member and the Secretariat of the

NSCT.

2.6. Disaster Management Approaches

To cope with the disastrous events, Thailand has prominently formulated the Disaster Prevention and Mitigation Act 2007 to be the national disaster management mechanism which is overseen by DDPM as the national coordinating organization on disaster prevention and mitigation. Moreover, DDPM in collaboration with other related organizations has dealt effectively with disastermanagement underlining the concept of Total Disaster Risk Management (TDRM)-comprising preparedness, response, recovery, and prevention and mitigation, and according to the Civil Defence Plan 2005.

Recently, DDPM has developed the effective mechanism of preparedness perspective through the following approaches:

1) Establish the Ministerial Integrated Disaster Prevention and Mitigation Action Plan on Disaster Management focusing on participation of all involved agencies at provincial and ministerial, private and government sectors, and foundation and NGOs.

2) Devise the Strategic National Action Plan (SNAP) to provide direction of the country in understanding disaster risk reduction over the next decade in line with the context of HFA.

3) Contribute the concept of Community Based Disaster Risk Management (CBDRM) to sustainable development: As the local authorities and community are direct victims of disaster and are capable to reduce the existing risks, DDPM has continuously implemented CBDRM Project together with among governmental, non-governmental, private, civil defense, and international organizations.

4) Establish Disaster Prevention and Mitigation Academy (DPMA) to be the principal training venue in the field of disaster prevention and mitigation for government and private sector staffs and for the general public.

5) Enhance the capacity of local authorities in disaster management via the following activities:

- · Training course of technical and technological know how development
- · Equipping local authorities with disaster management related equipments and tools
- · Allocating annual central budget to local authorities for disaster management
- Increasing the numbers of community based civil defence volunteers. (government official assistant). Currently, there
 are approximately 1,087,690 CDVs throughout the country to assist government officials in disaster prevention and
 mitigation undertaking.
- Providing efficient One Tambon One Search and Rescue Team (OTOS), each SAR team comprises of 10 members, in every Thailand's tambon all over the country (7,255 tambons).

6) Set up Emergency Response Team (ERT) for each type of large-scale hazards or incidents to operationally coordinate with Director at the provincial level and officers of the Ad-Hoc Directing Center in case of disaster occurring. Each ERT will consist of 10 members, including one (1) team leader, three (3) for planning, and six (6) for operation.

7) Formulate Evacuation Plan, and Drill, in accordance with the Provincial Civil Defence Plan, every province in Thailand will have to formulate "Provincial Evacuation Plan" which is corresponding to types of threatening disaster within the provinces, and have to conduct evacuation drill at least twice a year.

8) Provide the updated information on disaster risk areas for disaster risk reduction strategy planning.

(H.M. the King signet)

Disaster Prevention and Mitigation Act

B.E. 2550 [A.D. 2007]

BHUMIPOL ADULYADEJ, REX: Given on the 28 Day of August, B.E. 2550 [2007] Being the 62nd Year of the Present Reign.

His Majesty the King Bhumibol Adulyadej is graciously pleased to proclaim that;

Whereas, it is expedient to have the law on Disaster Prevention and Mitigation.

Be it, therefore, enacted by the King, by and with the advice and consent of the National Legislative Assembly as follows;

Section 1: This act is called "Disaster Prevention and Mitigation Act, B.E. 2550 [A.D. 2007]"

Section 2: This act shall come into force as from the day following the date of its publication in the Royal Gazette¹.

Section 3: These following acts shall be repealed and replaced by this act;

(1) Civil Defense Act, B.E. 2522 [A.D. 1979]

(2) Fire Defense Act, B.E. 2542 [A.D. 1999]

Section 4: Herein the act;

"Disaster" means any of these disasters; fire, storm, strong wind, flood, drought, epidemic in human, epidemic in animals, epidemic in aquaculture, and epidemic in plants and other public disaster either natural disasters or human-made disasters, accidents or all other incidents that effect to life, body or properties of the people, of the government. And in this regards, air threats and sabotages are also included.

"Air threat" means any disasters affected from strikes or attacks in the air by terrorists or alien nations.

"Sabotage" means any disasters affected from any activities aim to destroy to private or government properties, public utilities, or activities of offensive, deterrence, delay to any operations including of any harmful actions toward persons which will create a political, economical and social disturbance or damage to national security as a whole.

"Government agency" means any government services, state enterprises, national public organizations, or other government units; excludes local administrations or municipal governments.

"Local administration" means any Tambon² administrations, municipalities, Pattaya city government, or other local administrations by law; excludes provincial governments and Bangkok Metropolitan government.

"Province" means any provinces throughout the Kingdom of Thailand; excludes Bangkok.

¹ Published in the Royal Gazette Vol. 124, Part 52 A (n), dated on 7 September B.E. 2550 [A.D. 2007]

² There is also mentioned as "sub-district"

"District" means any districts and minor districts³ throughout the Kingdom of Thailand; excludes districts in Bangkok.

"District governor" means any district governors and any assistant district governors who are in charge to all minor districts are also included.

"Local governor" mean any governors in Tambons, municipality governors, Governor of Pattaya, and other chiefs or governors of other local administrations.

"Commander in chief" means the chief who is in charge on National Disaster Prevention and Mitigation Operation.

"Director" means any directors in central, provinces, districts, local administrations and Bangkok is also included.

"Officer" mean any designated officials for disaster prevention and mitigation operation in any relevant area of works by this law.

"Volunteer" means any Disaster Prevention and Mitigation volunteers.

"Director-General" means Director-General of Department of Disaster Prevention and Mitigation.

"Minister" means respective minister who has been authorized by this law.

Section 5: Minister of Interior shall be having authorities to define relevant ministerial regulations, regulations, and other announcements to be enforced by this law, but not before those regulations or announcements have been published in the Royal Gazette.

CHAPTER 1

General Provisions

Section 6: There shall be a National Disaster Prevention and Mitigation Committee (NDPMC)⁴, consisting of Prime Minister or designated Deputy Prime Minister as a chairperson, Ministry of Interior as first vice chairperson, Permanent Secretary for Interior as second vice chairperson, and Permanent Secretary for Defense, Permanent Secretary for Social Development and Human Security, Permanent Secretary for Agriculture and Cooperatives, Permanent Secretary for Transportation and Communications, Permanent Secretary for National Resources and Environment, Permanent Secretary for Information and Communication Technology, Permanent Secretary for Public Health, Direct-General of The Bureau of Budget, Commissioner-General of Royal Thai Police, Supreme Commander, Commandant of Royal Thai Army, Commandant of Royal Thai Navy, Commandant of Royal Thai Air Force, Director-General of National Security Council, and together with others but not more than five intellectuals who are experienced in city planning, and disaster prevention and mitigation shall be appointed by the Cabinet as members.

Director-General of Department of Disaster Prevention and Mitigation as the secretariat of the committee, and not more than other two officials in Department Disaster Prevention and Mitigation shall be appointed as an assistant secretary.

Section 7: The committee shall have the powers and duties as follows;

- (1) Propose the policy to formulate the National Disaster Prevention and Mitigation plan.
- (2) Determine and preapproval the plan under Section 11 (1) before submitting the plan to the Cabinet.

³ There is also mentioned as "King Amphoe" in Thai

⁴ Thai Abbreviation of the committee is "ກປກ. ໆ"

- (3) To integrate the development on disaster prevention and mitigation mechanism among Government agencies, Local administrations, and other relevant private sectors effectively.
- (4) To recommend, support and promote on any disaster prevention and mitigation activities.
- (5) To propose regulations on remuneration, recompenses, and other expenses related to disaster prevention and mitigation operations, and those regulations shall be in accordance to rules and regulations of Ministry of Finance.
- (6) To perform other duties according to this and other laws as may be required by the Minister.

Regarding to the operations of the committee in paragraph one, the committee shall have their rights to appoint a sub-committee to perform tasks on their behalf, and the sub-committee shall adapt Section 10 to regulate their meetings.

To have more benefit from the committee according to paragraph one, the committee shall have authority to demand other government services, local administrations, or other private agencies to provide, to illuminate any relevant information to their meetings.

Section 8: The appointed intellectual members of the committee shall be performing their duties for a term of four years.

In case of any appointed intellectual members vacate before their term, or a new or an additional member appointed by the Cabinet, the appointee shall be resumed in their duties not more than the remaining of the term.

Any members who vacate office upon termination of the term shall maintain their duties until the newly appointed members take their office.

The appointed intellectual members could be reappointed but they are not allowed to be in their office more than two terms continuously.

Section 9: In addition the vacation of their office upon termination of the term according to Section 8, the appointed members would vacate their office upon;

- (1) Death
- (2) Resignation by proposing the resignation letter to the chairperson
- (3) Being dismissed by the Minister
- (4) Being a bankrupt
- (5) Being an incompetent or a quasi-incompetent person
- (6) Being imprisoned by a final judgment or a lawful order to a term of imprisonment, except for an offence committed through negligence or petty offence.

Section 10: The constituted quorum meeting of the committee shall have not less than one-half of the total members.

For any meetings, the chairperson of the committee shall preside over the meeting. If the chairperson absence, or unable to perform his or her duties, the vice chairperson shall be resumed the function as the chairperson respectively. Otherwise, one of the present members shall be selected as the chairperson.

Any decisions of meeting shall be judged by majority of the votes, based on one member one vote basis. In case of equality of votes, the chairperson who is presiding over the meeting shall have an additional vote as a casting vote.

Section 11: Department of Disaster Prevention and Mitigation shall be the central government unit to operate any related activities on national disaster prevention and mitigation, and shall have powers and authorities as follows;

(1) Formulates the National Disaster Prevention and Mitigation Plan for the committee to seek for an approval by the Cabinet

- (2) Organizes and researches on procedures and measures to prevent and mitigate all impacts of disasters effectively
- (3) Operates, cooperates, supports and assists other government services, local administrations, and other relevant private sectors on disaster prevention and mitigation. And provides aids to disaster effected people
- (4) Guides, and provides consultancy, and train other government services, local administrations and other private sectors on disaster prevention and mitigation
- (5) Follow-up, assesses and evaluates all activities related to disaster prevention and mitigation at all levels
- (6) Perform other duties in accordance to this and other law or as may required by Commander in Chief, Prime Minister, the Committee or the Cabinet

After the plan in paragraph one has been approved, other related government services and local administrations shall operate all of their activities according to the plan.

During the process of formulating the prevention and mitigation plan in paragraph one, Department of Disaster Prevention and Mitigation shall confer with relevant government agencies, local administrations. In this regards, private sectors shall be able to be included into this conferring for their opinions.

For benefit of any operations under Section 10 (3), (4), (5) and (6), there shall be Disaster Prevention and Mitigation Center in some provinces. Those centers shall operate in the area of province and neighboring provinces as necessary. And there shall be Disaster Prevention and Mitigation Offices to oversee and support any disaster prevention and mitigation activities at provinces level or as required by Director.

Section 12: The Disaster Prevention and Mitigation Plan under Section 11 (1) shall have substantial parts as follows;

- (1) Guide lines, measures and adequate budget to support disaster prevention and mitigation operations systemically and continuously
- (2) Guide lines and methods for providing aids and mitigate the impacts of disasters in both short and long term, together with evacuation procedures of effected people, government services, and other local administrations, supports effected people on their public health, public utilities and communication system
- (3) Relevant government agencies and local administrations shall proceed all operations under (1) and (2), and shall seek for availability and mobility of fund
- (4) Preparedness perspectives on support personnel, equipments and other materials to deploy upon disaster prevention and mitigation operations, and capacity building of those personnel and other people shall be included
- (5) Guide line on fixing, recovery and restoration to community right after disaster

Those activities on paragraph one shall be preceded based on prioritization of hazard risks and vulnerabilities of disasters. And if there is any necessities to update, to correct laws or regulations or propositions of the Cabinet, those necessities shall be included into the National Disaster Prevention and Mitigation Plan.

Section 13: Designated Minister as Commander in Chief shall have power to control and oversee on disaster prevention and mitigation throughout the Kingdom according to this law. And the minister shall have power to command or demand to Directors, Deputy Directors, Assistant Directors, Officers, and Volunteers throughout the Kingdom.

The Permanent Secretary for Interior as Deputy Commander in Chief assists the Commander, shall perform any duties as my required by the Commander. He or she shall have delegated power to command the operations under paragraph one.

Section 14: The Director-General as Central Director, shall have power to control and oversee operations of other Directors, Deputy Directors, Assistant Directors, Officers, and Volunteers on disaster prevention and mitigation throughout the Kingdom.

Section 15: Provincial Governor as Provincial Director shall responsible for disaster prevention and mitigation of their own province. He or she shall have power as follows;

- (1) Formulate the Provincial Disaster Prevention and Mitigation Plan in accordance to the national plan
- (2) Oversee and train all volunteers of local administration in the province
- (3) Oversee and investigate all local administrations on preparing of disaster prevention and mitigation equipments, materials, vehicles and other related hardware for their own use in accordance to Provincial plan
- (4) Operate as a government service unit at local administration level to provide basic support to disasters affected people, and other activities related to disaster prevention and mitigation
- (5) Support local administrations on any related activities of disaster prevention and mitigation
- (6) Perform other duties as may be required by the Commander in Chief or the Central Director

For benefit of operations under Section 15 (3), (4), and (5), Provincial Director shall have power to demand other government agencies and other local administrations in their own province to cooperate to Provincial Disaster Prevention and Mitigation Plan and shall have power to control and oversee activities of Officers and Volunteers in according to this law.

Section 16: Provincial Disaster Prevention and Mitigation Plan under Section 15 (1) shall have substantial parts as follow;

- (1) The setting up of Special Command Center when ever disasters strike, that center shall be constructed and has authorities to command and oversee disaster prevention and mitigation operations and activities
- (2) Plan and procedures for local administrations for procuring tools, equipments, materials, hardware and vehicles in disaster prevention and mitigation operations
- (3) Plan and procedures for local administrations for procuring an early warning system and other equipments to inform people and communities on incoming disasters
- (4) Operation plan for disaster prevention and mitigation at local administrations
- (5) Cooperation plan to other relevant public charities.

Section 17: For formulating Provincial Disaster Prevention and Mitigation Plan, Provincial Governor shall appoint a committee. That committee shall be consisted of these following members;

- (1) Provincial Governor as chairperson
- (2) Designated Deputy Provincial Governor as a vice chairperson
- (3) Commander of Army Circle, or Commander of Provincial Army base or their representative as a vice chairperson
- (4) Provincial Administrator as a vice chairperson
- (5) Other members shall be consisted of these following;
 - (a) Representatives from provincial government services appointed by Provincial Governor at any appropriated numbers as members
 - (b) Seven representatives from local administrations consisting of two persons from municipalities and other five persons from Tambon Administrations as members
 - (c) Representatives from public charities shall be appointed by Provincial Governor in any appropriated numbers as member
- (6) Chief Officer of Disaster Prevention and Mitigation Office or representative from Department of Disaster Prevention and Mitigation as secretary

In case of higher education institutes or universities located in that province, president or rector of each institute shall be appointed by Provincial Governor at any appropriated numbers as members or consultants.

The committee under paragraph one shall formulate their Disaster Prevention and Mitigation Plan and propose to their Provincial Governor for executing of the plan.

Responsibilities and meeting procedures of committee under paragraph one shall be assigned by Provincial Governor.

Section 18: Provincial Administrator as Deputy Provincial Director shall assist Provincial Director on disaster prevention and mitigation operations, and shall perform other duties as may be required by Provincial Director.

Section 19: District governor as District Director, shall perform duties on disaster prevention and mitigation in their home-land and shall perform other duties as may be required by Provincial director.

For any operations of District Director under paragraph one, the director shall have power to demand other government agencies, relevant local administrations in their area of works to operate the Provincial Disaster Prevention and Mitigation Plan, and shall have power to command, control and oversee all activities of relevant Officers and Volunteers on their operations in accordance to this law.

Section 20: Local Administration as Local Director shall perform their duties on disaster prevention and mitigation in their areas of works. Local administrators shall perform duties as Local Director, and shall assist Provincial Director and District Director in performing other duties as requested.

For any operations of Local Director under paragraph one, the director shall have power to control, and oversee local Officers, local Volunteers activities according to this law.

The Administrative assistants shall perform their duties as Assistant Local Director on disaster prevention and mitigation and other duties as may be required by Local Director.

CHAPTER 2 Disaster Prevention and Mitigation

Section 21: In any occurrence or expected to occur of disasters in local administration area, that Local Director has to proceed the disaster prevention and mitigation operation at once, and he or she shall report to District Director, and Provincial Director immediately.

For the operations on paragraph one, the Local Director shall have power to;

- (1) Demand any local civil servants, local government employee, local government service servants, local government officers, volunteers, and other relevant personnel to perform any necessity actions for prevention and mitigation of that disasters
- (2) Utilize any materials, tools, equipments, and vehicles of the government, or of private sectors in affected areas as necessary to prevent and mitigate that disasters
- (3) Utilize communication devices of the government, or of private sectors in affected area or neighboring areas
- (4) Request other local administrations to support that disaster prevention and mitigation operation
- (5) Order any people to enter or leave the areas, buildings or any specific locations
- (6) Provide aid and support to effected people radically and expeditiously

Section 22: If there is an incident or event in paragraph one, District Director and Provincial Director shall have their authorities equal to Local Director. District Directors shall oversee in their district, and Provincial Directors shall function in their provinces respectively.

In case of that Local Director require a support from other government agencies or other government agents outside the areas, he or she has to request to District Director or Provincial Director to demand other relevant agencies to response rapidly.

Section 23: When a disaster occurs in any local administrations, other neighboring Local Directors shall have to support to that Local Director on the prevention and mitigation operations.

Section 24: When a disaster occurs, local Officers in those affected area shall have to deploy the mitigation operation at once, and report to Local Director in their area of works for further operation immediately. And in some unavoidable cases, those Officers shall have power to implement any operations to protect or save life of those effected people.

Section 25: In any occurring disasters or expected to occur, the Director shall have authorities to command other Offices to modify, destroy, move or remove any obstacle, structures, materials of any private properties to mitigate the impacts of disaster. But any actions shall be limited to protect or to resolve any damages from disasters.

Any actions in paragraph one shall be allowed to operate upon necessities to community relatively.

If there is any modifications, destroying, or talking out of structures, materials or properties that will lead to more disaster dilation to other neighboring areas that Local Director shall not allow operating under paragraph one or two, except that operation is under supervision of Provincial Director.

Section 26: When any Officers shall be able to enter into private own buildings or properties or places near to area of disaster for prevention and mitigation purpose, those Officers shall get permitted by the owner before taking any actions or operations, except that operation is under supervision of Directors, even there is no owner presenting over, those Officer shall be granted.

In some cases under paragraph one; some belongings or materials inside those properties shall be able to active a disaster, those Officers shall have power to order the owner to bring their belongings out of that building.

If the owner or proprietor ignore or unable to compile the order, those Officers under paragraph two shall have authority to take those belongings out of the properties or building. However, those authorizations shall be limited to any necessity for disaster prevention and mitigation only. And those Officers shall not be blamed to any damages.

Section 27: In the disaster mitigation operations, Director or designated Officers shall have power to;

- (1) Build some temporary shelters for living or getting first aid, and properties care taking to effected people
- (2) Manage the traffic arrangement in the disaster impact areas and neighboring areas
- (3) Keep out the disaster impact areas and neighboring areas for preventing unauthorized people
- (4) Provide security measures to prevent plunderers or thief to through the area
- (5) Support effected people to move their moveable properties and belongings from disaster impact area to secured neighboring areas as requested

The Director or designated Officers shall prepare tools or signals for displaying working status or purpose on specific locations or actions under paragraph one

In any operation under (2), (3), (4), and (5), either Director or Officer shall be proceeding by themselves or shall be able to delegate their authorities to other appropriated government official or local police department to assist or proceed on their behalf. Under (5), other public charities shall be included to assist this operation.

Section 28: When disaster occur or expected to occur, in any local areas and people in that area shall be affected by disaster, or will be obstacles to disaster prevention and mitigation. Commander in Chief, Deputy Commander in Chief, Central Director, Director, District Director and Local Director shall be able to order those effected people to evacuate to other areas as necessary to disaster prevention and mitigation operations.

Section 29: When disaster occurs or expected to occur in any areas, and there shall raise more violent for staying or continuing normal living activities. Commander in Chief, Deputy Commander in Chief, Provincial Director, District Director and, Local Administration Director under the approval from District Director shall be able to make an announcement to disallow any people to entry, or to do other business in that area. That announcement shall be in specific period of time as necessary.

Section 30: Local Director shall responsible for damaged assessment of disaster, and those effected people, and properties shall be recorded or certified on that assessment. A proof of affected or a certificate shall be given to those people for recovering and compensation.

Proof of affected under paragraph one shall have entitlement details to get restoration and compensation from the government, name and contact information of relevant government agency. Anyhow, the required information shall be defined by the Director-General.

If those effected people lost their official or legal documents, those people shall request or inform their local administration at effected area or at their homeland. That local administration shall notify to other relevant government agencies. Those relevant government agencies shall renew and delivery that documents to effected people or the local administration. All charges and fees shall be waived for these renewing services, even there shall be charged legally.

When those affected people or owner of damages properties request other support or services, that Local Director shall issue assessment certificate in accordance the regulations of Ministry of Interior.

Section 31: In case of severe drought occurring, Prime Minister or designated Minister shall have power to demand the Commander in Chief, Directors, government agencies and related local administrations to deploy disaster prevention and mitigation, including of providing supports to the people in affected areas. The Commander in Chief shall have power further to Section 13 and Directors shall have power further to Section 21 and other duties under Section 25, 28 and 29 shall be granted to the Commander in Chief, Deputy Command in Chief, Directors, Deputy Director, Assistant Director and other Officers respectively.

If any government employees abandon their duties, deny compiling any commands from Prime Minister or designated Deputy Prime Minister, shall be charged as highest disciplinary violation or improperly operation at highest degree.

CHAPTER 3

Disaster Prevention and Mitigation in Bangkok Metropolitan

Section 32: Bangkok Metropolitan Governor as Bangkok Director shall be responsible for Bangkok Disaster Prevention and Mitigation shall have power as follows;

- (1) Formulate the Disaster Prevention and Mitigation Plan for Bangkok, which shall be consistence to the National Disaster Prevention and Mitigation Plan
- (2) Oversee and train Volunteers in Bangkok
- (3) Procure materials, equipments, tools, vehicles and others, as necessary to Disaster Prevention and Mitigation as stated in Disaster Prevention and Mitigation Plan for Bangkok
- (4) Provide basic recovery to disaster effected people or victims, and shall provide security and any disaster prevention and mitigation actions
- (5) Support and assist local administrations and their neighboring in disaster prevention and mitigation

(6) Perform any related duties as may required by the Central Director

For most benefits from conforming (3) (4) and (5), Bangkok Director shall have power to command government services and Bangkok services, and coordinate other government agencies and other relevant local administration in disaster prevention and mitigation operation in Bangkok in accordance to Bangkok Disaster Prevention and Mitigation Plan, and shall have power to command, control and oversee all operations of Bangkok Officers and Volunteer in accordance to this law.

Section 33: Bangkok Disaster Prevention and Mitigation Plan. As stated under Section 32 (1) there shall be substantial subjects according to Section 12 as follows:

- (1) Establish Command Center where disaster occurred, there shall be constructed and authorized for disaster prevention and mitigation operations
- (2) Plan and process to procure materials, equipments tools and vehicles for disaster prevention and mitigation operation
- (3) Plan and process to procure signaling devices or others for notifying the occurrence or expectation of a disaster
- (4) Bangkok Disaster Prevention and Mitigation Action Operation Plan
- (5) Coordination plan with public charity organizations in Bangkok

Section 34: For formulating the Bangkok Disaster Prevention and Mitigation Plan, Bangkok Governor shall appoint a committee that consisting of:

- (1) Bangkok Governor as chairperson
- (2) Permanent Secretary for Bangkok as vice chairperson
- (3) Other members of the committee consisting of:
 - (a) Appropriate number of delegates from government agencies or offices in Bangkok
 - (b) Representatives from Department of Disaster Prevention and Mitigation
 - (c) Appropriate number of delegates from public charities in Bangkok
 - (d) Appropriate number of delegates from communities in Bangkok

The Bangkok Governor shall appoint appropriate number of representatives from Ministry of Defense and universities as consultants or committee members.

The committee in paragraph one shall formulate the Bangkok Disaster Prevention and Mitigation Plan and propose to Bangkok Governor for further promulgation.

The committee in paragraph one shall perform and arrange meetings as defined by Bangkok Governor accordingly.

Section 35: Permanent Secretary for Bangkok as vice chairperson to assist Bangkok Director in disaster prevention and mitigation operations and others duties as my required by Bangkok Director. The powers and authorities as described under Section 32, paragraph 2 shall be adapted to his or her duties, if appreciable.

Responsibilities and authorities of Permanent Secretary for Bangkok as Bangkok Deputy Director shall be described under paragraph one. Permanent Secretary for Bangkok's authorities and duties shall be able to be delegated to Assistant Permanent Secretary.

Section 36: Each Bangkok District Directors as Assistant Bangkok Director to assist Bangkok Director in responsible and perform duties on disaster prevention and mitigation in each districts and other duties as may be required by Bangkok Director.

As described under paragraph one, the Assistant Bangkok Director shall be authorized to command government services and Bangkok services to assist or cooperate on disaster prevention and mitigation over affected areas in Bangkok where those authorities appreciable for controlling and supervision to Officers and Volunteers to perform their duties to this law accordingly.

Responsibilities and authorities of District Director as Assistant Bangkok Director as described in paragraph one and two shall be able to be delegated to Assistant District Directors to perform duties on their behalf, if appreciable.

Section 37: In any occurrences or expected to occur of disasters, Assistant Bangkok Director shall immediately proceed the disaster prevention and mitigation operation, and notify the Bangkok Director and Assistant Bangkok Director at once.

The prescription under Section 21 paragraph two, Section 22 paragraph three and four, Section 24, Section 25, Section 26, Section 27, Section 28, Section 29 and Section 30 shall be adapted for Bangkok disaster prevention and mitigation accordingly.

Section 38: In case of further assistance from other government services is required to perform disaster prevention and mitigation in Bangkok, the Bangkok Director shall request those agencies. And depending on the requests, those informed government officials shall immediately perform their duties as requested over disaster prevention and mitigation operation in Bangkok.

CHAPTER 4

Officers and Volunteers

Section 39: Directors shall have powers and authorities to appoint Officers as follows:

- (1) Central Director shall has authority to appoint Officers for performing their duties throughout the Kingdom
- (2) Province Director shall has authority to appoint Officers for performing their duties at province level
- (3) District Director shall has authority to appoint Officers for performing their duties at district level
- (4) Local Director shall has authority to appoint Officers for performing their duties at local region
- (5) Bangkok Director shall has authority to appoint Officers for performing their duties throughout Bangkok Metropolitan

Rules and regulations of Ministry of Interior shall be applied for appointing and operations of Officers at each level.

Section 40: If there are any places or buildings, or materials or parts inside or outside of buildings or places, could be a cause of a disaster easily. Those Directors or Officers who know shall inform relevant authorities for further investigation.

Section 41: Directors shall conduct to set up Volunteer unit in their responsible area to perform duty as follows:

- (1) Assist Officers in disaster prevention and mitigation operations
- (2) Perform other duties as my required by Director and according to rules and regulations of Ministry of Interior

The administration and management, selection, training, rights, duties and disciplines of Volunteers shall be followed rules and regulation of Ministry of Interior accordingly.

Section 42: In the case of any public charities or persons assist the Officers during disaster event, Director or designated Officer shall delegate their duties or area of work to those persons appropriately.

For efficiency disaster recovery, the Director shall notify relevant public charities, and person in that affected area. They shall be informed on coordination procedures and operation details of Provincial Disaster Prevention and Mitigation plan or Bangkok Disaster Prevention and Mitigation plan.

CHAPTER 5 Miscellaneous

Section 43: Commander in Chief, Deputy Commander in Chief, Director, Deputy Director, and other Officers who perform their duties in accordance to this Disaster Prevention and Mitigation Act shall be designated officials under Criminal Laws. And any those performed operations with properness and carefulness upon their authorities and functions according to this act; there shall be no guilty and shall be acquitted.

Any actions under paragraph one, if there are any direct damages to properties of one, except that disaster itself. The government shall compensate to that damages subject to ministerial regulations and procedures.

Section 44: In case of any changes of disaster prevention and mitigation facts as specified in disaster prevention and mitigation plans under this act, or if those plans have been used for five years. Those responsible persons who oversee the formulating of plan shall have to revise or review that plan rapidly.

Section 45: There shall be a uniform, badge and identify card for Officers and Volunteers to declare themselves whilst disaster prevention and mitigation operation.

That uniform, badge and identify card shall be specified by Ministry of Interior.

In the case of the Commander in Chief, Deputy Commander in Chief, Director or Deputy Director prefer to attire in uniform, and shall be specified by Ministry of Interior accordingly.

Section 46: Any operations under Section (21), (22), (25), (28) or (29), if there would be executed in military areas, related to military missions and personnel, or affected to military properties and assets. Those operations shall be an agreement between the military commandant in that area and Provincial Director or Bangkok Director.

Section 47: All fines according to this act shall be settled into local administration for spending on their local disaster prevention and mitigation operation.

Section 48: Those personal and officials who related to disaster prevention and mitigation operation shall not use any confidential information for their own interests, or shall not expose the information that would be able to effect to other persons or their professions without an authority.

CHAPTER 6

Penalties

Section 49: Any persons who are not observance or impede to any official operations of Director under Section 21 shall be imprisoned not more than three months or shall be fined not more than six thousand Baht or both.

Section 50: Any persons who impede any operations of the Officers under Section 24 or violate to any commands of Director under Section 25, or impede any operations of the Officers under Section 26, shall be imprisoned not more than one year or fined not more than twenty thousand Baht or both.

Section 51: Unauthorized entry to keep out disaster area under Section 37 (3) shall be imprisoned not more than three months or fined not more than six thousand Baht or both.

In the case of the violation under paragraph one has been made by the owner or holder of those properties under Section 27 (3). Director or designated Officer shall state a warning instead of prosecution.

Section 52: Any persons who violate to an evacuation order under Section 28, if that order would be prevent the interfering of disaster prevention and mitigation operations, or behave against Section 29 shall be imprisoned not more than one month or fined not more than two thousand Baht or both.

Section 53: Whilst the occurrence of public disaster, any persons who wear uniform or badge of the Volunteer or the public charity in order to belie others shall be imprisoned not more than three months or fined not more than six thousand Baht or both.

Section 54: Any persons who dishonestly collect or look for themselves or others by appearing to be a Volunteer, Officer or any related services concerning to disaster prevention and mitigation operation shall be imprisoned not more than one year or fined not more than twenty thousand Bath or both.

Section 55: Any persons who violent to Section 48 shall imprisoned not more than six months or fined not more than two thousand Baht or both.

Transitory Provisions

Section 56: All related personal or government agencies shall finish the formulating of their Disaster Prevention and Mitigation Plan in accordance to this Act within two years after this Act is enforced. Until the formulating of the plan finish, all disaster prevention and mitigation activities shall be operated in accordance to the existing plans.

Section 57: All Disaster Prevention and Mitigation Regional Centers in Department of Disaster Prevention and Mitigation shall be Disaster Prevention and Mitigation Centers established under Section 22 paragraph 11 of this Act.

Section 58: All ministerial regulations, disciplines, notices or orders of Civil Defense Act B.E. 2522 [1979] and Fire Defense Act B.E. 2542 [1999] shall be enforced upon acquiesce to this Act.

Countersigned by

General Surayuth Chulanont, Prime Minister of Thailand

<u>Remarks:</u> The reasons for promulgation of this act is follows; in reference to the establishment of Department of Disaster Prevention and Mitigation under Ministry of Interior according to Bureaucracy Improvement for Ministries, Bureaus, Departments Act B.E. 2545 [A.D. 1998] The main mission of the department is for oversee disaster prevention, mitigation and recovery, and including of accidents. As of this, all disasters and accidents related administrations that used to be under supervision by two agencies, The Civil Defense Division in Department of Local Administration, Ministry of Interior and The National Safety Council, Office of Permanent Secretary for Prime Minister Office shall be in charged by a single department. Moreover, the law of Fire Defense is described in details on fire prevention and mitigation, and the responsible agency of both Fire Defense Act and Civil Defense Act is the same, then for the effective, consistency and unity of disaster risk reduction management and operations, these two laws shall be aggregated into this Disaster Prevention and Mitigation Act.

(Unofficial translated by Khun Usa BANYEN, Khun Sirikorn KITIWONG, DDPM and Khun Pairach HOMTONG, UNDP)

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พระราชบัญญัติ ป้องกันและบรรเทาสาธารณภัย พ.ศ. ๒๕๕๐

ภูมิพลอดุลยเดช ป.ร.

ให้ไว้ ณ วันที่ ๒๘ สิงหาคม พ.ศ. ๒๕๕๐ เป็นปีที่ ๖๒ ในรัชกาลปัจจุบัน

พระบาทสมเด็จพระปรมินทรมหาภูมิพลอดุลยเดช มีพระบรมราชโองการโปรดเกล้า ฯ ให้ประกาศว่า

้โดยที่เป็นการสมควรมีกฎหมายว่าด้วยการป้องกันและบรรเทาสาธารณภัย

จึงทรงพระกรุณาโปรคเกล้า ๆ ให้ตราพระราชบัญญัติขึ้นไว้โคยคำแนะนำและยินยอม ของสภานิติบัญญัติแห่งชาติ คังต่อไปนี้

มาตรา ๑ พระราชบัญญัตินี้เรียกว่า "พระราชบัญญัติป้องกันและบรรเทาสาธารณภัย พ.ศ. ๒๕๕๐"

มาตรา ๒ พระราชบัญญัตินี้ให้ใช้บังคับเมื่อพ้นกำหนดหกสิบวันนับแต่วันประกาศใน ราชกิจจานุเบกษาเป็นต้นไป

มาตรา ๓ ให้ยกเลิก

(๑) พระราชบัญญัติป้องกันภัยฝ่ายพลเรือน พ.ศ. ๒๕๒๒

(๒) พระราชบัญญัติป้องกันและระงับอัคคีภัย พ.ศ. ๒๕๔๒

มาตรา ๔ ในพระราชบัญญัตินี้

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"สาธารณภัย" หมายความว่า อัคคีภัย วาตภัย อุทกภัย ภัยแล้ง โรคระบาคในมนุษย์ โรคระบาคสัตว์ โรคระบาคสัตว์น้ำ การระบาคของศัตรูพืช ตลอคจนภัยอื่น ๆ อันมีผลกระทบต่อ สาธารณชน ไม่ว่าเกิดจากธรรมชาติ มีผู้ทำให้เกิดขึ้น อุบัติเหตุ หรือเหตุอื่นใด ซึ่งก่อให้เกิดอันตราย แก่ชีวิต ร่างกายของประชาชน หรือความเสียหายแก่ทรัพย์สินของประชาชน หรือของรัฐ และให้ หมายความรวมถึงภัยทางอากาศ และการก่อวินาศกรรมด้วย

"ภัยทางอากาศ" หมายความว่า ภัยอันเกิดจากการโจมตีทางอากาศ

"การก่อวินาศกรรม" หมายความว่า การกระทำใด ๆ อันเป็นการมุ่งทำลายทรัพย์สินของ ประชาชนหรือของรัฐ หรือสิ่งอันเป็นสาธารณูปโภค หรือการรบกวน ขัดขวางหน่วงเหนี่ยวระบบ การปฏิบัติงานใด ๆ ตลอดจนการประทุษร้ายต่อบุคคลอันเป็นการก่อให้เกิดความปั่นป่วนทางการเมือง การเศรษฐกิจและสังคมแห่งชาติ โดยมุ่งหมายที่จะก่อให้เกิดความเสียหายต่อความมั่นคงของรัฐ

"หน่วยงานของรัฐ" หมายความว่า ส่วนราชการ รัฐวิสาหกิจ องค์การมหาชนและหน่วยงาน อื่นของรัฐ แต่ไม่หมายความรวมถึงองค์กรปกครองส่วนท้องถิ่น

"องค์กรปกครองส่วนท้องถิ่น" หมายความว่า องค์การบริหารส่วนตำบล เทศบาล องค์การ บริหารส่วนจังหวัด เมืองพัทยา กรุงเทพมหานคร และองค์กรปกครองส่วนท้องถิ่นอื่นที่มีกฎหมาย จัดตั้ง

"องค์กรปกครองส่วนท้องถิ่นแห่งพื้นที่" หมายความว่า องค์การบริหารส่วนตำบล เทศบาล เมืองพัทยา และองค์กรปกครองส่วนท้องถิ่นอื่นที่มีกฎหมายจัดตั้ง แต่ไม่หมายความรวมถึงองค์การ บริหารส่วนจังหวัด และกรุงเทพมหานคร

"จังหวัด" ไม่หมายความรวมถึงกรุงเทพมหานคร

"อำเภอ" หมายความรวมถึงกิ่งอำเภอ แต่ไม่หมายความรวมถึงเขตในกรุงเทพมหานคร

"นายอำเภอ" หมายความรวมถึงปลัดอำเภอผู้เป็นหัวหน้าประจำกิ่งอำเภอ

"ผู้บริหารท้องถิ่น" หมายความว่า นายกองค์การบริหารส่วนตำบล นายกเทศมนตรี นายก เมืองพัทยา และหัวหน้าผู้บริหารขององค์กรปกครองส่วนท้องถิ่นแห่งพื้นที่อื่น

"ผู้บัญชาการ" หมายความว่า ผู้บัญชาการป้องกันและบรรเทาสาธารณภัยแห่งชาติ "ผู้อำนวยการ" หมายความว่า ผู้อำนวยการกลาง ผู้อำนวยการจังหวัด ผู้อำนวยการอำเภอ ผู้อำนวยการท้องถิ่น และผู้อำนวยการกรุงเทพมหานคร

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"เจ้าพนักงาน" หมายความว่า ผู้ซึ่งได้รับแต่งตั้งให้ปฏิบัติหน้าที่ในการป้องกันและบรรเทา สาธารณภัยในพื้นที่ต่าง ๆ ตามพระราชบัญญัตินี้

"อาสาสมัคร" หมายความว่า อาสาสมัครป้องกันภัยฝ่ายพลเรือนตามพระราชบัญญัตินี้ "อธิบดี" หมายความว่า อธิบดีกรมป้องกันและบรรเทาสาธารณภัย

"รัฐมนตรี" หมายความว่า รัฐมนตรีผู้รักษาการตามพระราชบัญญัตินี้

มาตรา ๕ ให้รัฐมนตรีว่าการกระทรวงมหาดไทยรักษาการตามพระราชบัญญัตินี้และให้มี อำนาจออกกฎกระทรวง ระเบียบ ข้อบังคับและประกาศเพื่อปฏิบัติการตามพระราชบัญญัตินี้ กฎกระทรวงนั้น เมื่อได้ประกาศในราชกิจจานุเบกษาแล้วให้ใช้บังคับได้

> หมวด ๑ บททั่วไป

มาตรา ๖ ให้มีคณะกรรมการป้องกันและบรรเทาสาธารณภัยแห่งชาติ เรียกโดยย่อว่า "กปภ.ช." ประกอบด้วย นายกรัฐมนตรีหรือรองนายกรัฐมนตรีซึ่งนายกรัฐมนตรีมอบหมาย เป็นประธานกรรมการ รัฐมนตรีว่าการกระทรวงมหาดไทย เป็นรองประธานกรรมการคนที่หนึ่ง ปลัดกระทรวงมหาดไทย เป็นรองประธานกรรมการคนที่สอง ปลัดกระทรวงกลาโหม ปลัดกระทรวง การพัฒนาสังคมและความมั่นคงของมนุษย์ ปลัดกระทรวงเกษตรและสหกรณ์ ปลัดกระทรวงคมนาคม ปลัดกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม ปลัดกระทรวงเทคโนโลยีสารสนเทศและ การสื่อสาร ปลัดกระทรวงสาธารณสุข ผู้อำนวยการสำนักงบประมาณ ผู้บัญชาการตำรวจแห่งชาติ ผู้บัญชาการทหารสูงสุด ผู้บัญชาการทหารบก ผู้บัญชาการทหารเรือ ผู้บัญชาการทหารอากาศ เลขาธิการสภาความมั่นคงแห่งชาติ และผู้ทรงคุณวุฒิอีกไม่เกินห้าคนซึ่งคณะรัฐมนตรีแต่งตั้งจากผู้มี ความรู้ ความเชี่ยวชาญ หรือประสบการณ์ที่เกี่ยวข้องกับการผังเมือง และการป้องกันและบรรเทา สาธารณภัย เป็นกรรมการ

ให้อธิบดีเป็นกรรมการและเลขานุการ และให้แต่งตั้งข้าราชการในกรมป้องกันและบรรเทา สาธารณภัยจำนวนไม่เกินสองคนเป็นผู้ช่วยเลขานุการ

มาตรา 🖒 ให้ กปภ.ช. มีอำนาจหน้าที่ ดังต่อไปนี้

(๑) กำหนดนโยบายในการจัดทำแผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติ

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(๒) พิจารณาให้ความเห็นชอบแผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติ ตามมาตรา ๑๑ (๑) ก่อนเสนอคณะรัฐมนตรี

(๓) บูรณาการพัฒนาระบบการป้องกันและบรรเทาสาธารณภัย ระหว่างหน่วยงานของรัฐ องค์กรปกครองส่วนท้องถิ่น และหน่วยงานภาคเอกชนที่เกี่ยวข้องให้มีประสิทธิภาพ

(๔) ให้คำแนะนำ ปรึกษาและสนับสนุนการปฏิบัติหน้าที่ในการป้องกันและบรรเทา สาธารณภัย

(๕) วางระเบียบเกี่ยวกับค่าตอบแทน ค่าทดแทน และค่าใช้จ่ายในการดำเนินการป้องกัน และบรรเทาสาธารณภัย โดยความเห็นชอบของกระทรวงการคลัง

(๖) ปฏิบัติการอื่นใดตามที่บัญญัติไว้ในพระราชบัญญัตินี้หรือกฎหมายอื่น หรือตามที่
 กณะรัฐมนตรีมอบหมาย

ในการปฏิบัติการตามอำนาจหน้าที่ในวรรคหนึ่ง กปภ.ช. จะแต่งตั้งคณะอนุกรรมการเพื่อ ปฏิบัติการอย่างหนึ่งอย่างใดแทนหรือตามที่มอบหมายก็ได้ ทั้งนี้ ให้นำบทบัญญัติในมาตรา ๑๐ มาใช้บังคับกับการประชุมของคณะอนุกรรมการโดยอนุโลม

เพื่อประโยชน์ในการปฏิบัติการตามอำนาจหน้าที่ตามวรรคหนึ่ง กปภ.ช. อาจเรียกให้ หน่วยงานของรัฐ องค์กรปกครองส่วนท้องถิ่น หรือหน่วยงานของภาคเอกชนที่เกี่ยวข้องมาร่วมประชุม หรือชี้แจงหรือให้ข้อมูลก็ได้

มาตรา ๙ ให้กรรมการผู้ทรงกุณวุฒิอยู่ในตำแหน่งกราวละสี่ปี

ในกรณีที่กรรมการผู้ทรงคุณวุฒิพ้นจากตำแหน่งก่อนวาระ หรือในกรณีที่คณะรัฐมนตรี แต่งตั้งกรรมการผู้ทรงคุณวุฒิเพิ่มขึ้นในระหว่างที่กรรมการผู้ทรงคุณวุฒิซึ่งแต่งตั้งไว้แล้วยังมีวาระอยู่ใน ตำแหน่ง ให้ผู้ได้รับแต่งตั้งให้ดำรงตำแหน่งแทน หรือเป็นกรรมการผู้ทรงคุณวุฒิเพิ่มขึ้นอยู่ในตำแหน่ง เท่ากับวาระที่เหลืออยู่ของกรรมการผู้ทรงคุณวุฒิซึ่งได้แต่งตั้งไว้แล้ว

เมื่อครบกำหนดตามวาระดังกล่าวในวรรคหนึ่ง หากยังมิได้มีการแต่งตั้งกรรมการผู้ทรงคุณวุฒิใหม่ ให้กรรมการผู้ทรงคุณวุฒิซึ่งพ้นจากตำแหน่งตามวาระนั้น อยู่ในตำแหน่งเพื่อดำเนินงานต่อไป จนกว่าจะมีการแต่งตั้งกรรมการผู้ทรงคุณวุฒิใหม่

กรรมการผู้ทรงคุณวุฒิ ซึ่งพ้นจากตำแหน่งตามวาระอาจได้รับการแต่งตั้งอีกได้ ทั้งนี้ ไม่เกิน สองวาระติดต่อกัน
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ເດ່ມ	୭୭୯	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ാച്ചെത

มาตรา ៩ นอกจากการพ้นจากตำแหน่งตามวาระตามมาตรา ๙ กรรมการผู้ทรงกุณวุฒิ พ้นจากตำแหน่งเมื่อ

(๑) ตาย

(๒) ลาออก โดยยื่นหนังสือลาออกต่อประธานกรรมการ

(๓) คณะรัฐมนตรีให้ออก

(๔) เป็นบุคคลล้มละลาย

(๕) เป็นคนไร้ความสามารถ หรือคนเสมือนไร้ความสามารถ

(๖) ได้รับโทษจำกุกโดยคำพิพากษาถึงที่สุดให้จำกุก เว้นแต่เป็นโทษสำหรับความผิดที่ได้
กระทำโดยประมาทหรือกวามผิดลหุโทษ

มาตรา ๑๐ การประชุมของ กปภ.ช. ด้องมีกรรมการมาประชุมไม่น้อยกว่ากึ่งหนึ่ง ของจำนวนกรรมการทั้งหมด จึงจะเป็นองค์ประชุม

ในการประชุมคราวใด ถ้าประธานกรรมการไม่อยู่ในที่ประชุมหรือไม่สามารถปฏิบัติหน้าที่ได้ ให้รองประธานกรรมการคนที่หนึ่งเป็นประธานในที่ประชุม ถ้ารองประธานคนที่หนึ่งไม่อยู่ในที่ ประชุมหรือไม่สามารถปฏิบัติหน้าที่ได้ ให้รองประธานคนที่สองเป็นประธานในที่ประชุม ถ้าประธาน กรรมการและรองประธานกรรมการทั้งสองไม่อยู่ในที่ประชุม หรือไม่สามารถปฏิบัติหน้าที่ได้

ให้กรรมการซึ่งมาประชุมเลือกกรรมการคนหนึ่งเป็นประธานในที่ประชุมสำหรับการประชุมคราวนั้น การวินิจฉัยชี้ขาดของที่ประชุมให้ถือเสียงข้างมาก กรรมการคนหนึ่งให้มีเสียงหนึ่งในการ ลงคะแนน ถ้าคะแนนเสียงเท่ากัน ให้ประธานในที่ประชุมออกเสียงเพิ่มขึ้นอีกเสียงหนึ่งเป็นเสียงซึ้งาด

มาตรา ๑๑ ให้กรมป้องกันและบรรเทาสาธารณภัยเป็นหน่วยงานกลางของรัฐ ในการ คำเนินการเกี่ยวกับการป้องกันและบรรเทาสาธารณภัยของประเทศ โดยมีอำนาจหน้าที่ ดังต่อไปนี้

(๑) จัดทำแผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติเสนอ กปภ.ช. เพื่อขออนุมัติ ต่อกณะรัฐมนตรี

(๒) จัดให้มีการศึกษาวิจัยเพื่อหามาตรการในการป้องกันและบรรเทาสาธารณภัยให้มี ประสิทธิภาพ

(๓) ปฏิบัติการ ประสานการปฏิบัติ ให้การสนับสนุน และช่วยเหลือหน่วยงานของรัฐ องค์กรปกครองส่วนท้องถิ่น และหน่วยงานภาคเอกชน ในการป้องกันและบรรเทาสาธารณภัย และให้ การสงเคราะห์เบื้องต้นแก่ผู้ประสบภัย ผู้ได้รับภยันตราย หรือผู้ได้รับความเสียหายจากสาธารณภัย

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ເລ່ນ	୭୭୯	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ാച്ചെത്

(๔) แนะนำ ให้คำปรึกษา และอบรมเกี่ยวกับการป้องกันและบรรเทาสาธารณภัย แก่หน่วยงานของรัฐ องค์กรปกครองส่วนท้องถิ่น และหน่วยงานภาคเอกชน

(๕) ติดตาม ตรวจสอบ และประเมินผลการดำเนินการตามแผนการป้องกันและบรรเทา สาธารณภัยในแต่ละระดับ

 (๖) ปฏิบัติการอื่นใดตามที่บัญญัติไว้ในพระราชบัญญัตินี้หรือกฎหมายอื่นหรือตามที่ ผู้บัญชาการ นายกรัฐมนตรี กปภ.ช. หรือคณะรัฐมนตรีมอบหมาย

เมื่อคณะรัฐมนตรีอนุมัติแผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติตาม (๑) แล้ว ให้หน่วยงานของรัฐและองค์กรปกครองส่วนท้องถิ่นที่เกี่ยวข้องปฏิบัติการให้เป็นไปตามแผนคังกล่าว

ในการจัดทำแผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติตาม (๑) ให้กรมป้องกันและ บรรเทาสาธารณภัยร่วมกับหน่วยงานของรัฐที่เกี่ยวข้องและตัวแทนองค์กรปกครองส่วนท้องถิ่นแต่ละ ประเภทมาปรึกษาหารือและจัดทำ ทั้งนี้ จะจัดให้หน่วยงานภากเอกชนเสนอข้อมูลหรือความเห็นเพื่อ ประกอบการพิจารณาในการจัดทำแผนด้วยก็ได้

เพื่อประโยชน์ในการปฏิบัติหน้าที่ตาม (๑) (๔) (๕) และ (๖) กรมป้องกันและบรรเทา สาธารณภัยจะจัดให้มีศูนย์ป้องกันและบรรเทาสาธารณภัยขึ้นในบางจังหวัดเพื่อปฏิบัติงานในจังหวัดนั้น และจังหวัดอื่นที่อยู่ใกล้เกียงกันได้ตามความจำเป็น และจะให้มีสำนักงานป้องกันและบรรเทาสาธารณภัย จังหวัดขึ้น เพื่อกำกับดูแลและสนับสนุนการปฏิบัติการป้องกันและบรรเทาสาธารณภัยในจังหวัด หรือตามที่ผู้อำนวยการจังหวัดมอบหมายด้วยก็ได้

มาตรา ๑๒ แผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติตามมาตรา ๑๑ (๑) อย่างน้อย ต้องมีสาระสำคัญดังต่อไปนี้

(๑) แนวทาง มาตรการ และงบประมาณที่จำเป็นต้องใช้ในการป้องกันและบรรเทาสาธารณภัย อย่างเป็นระบบและต่อเนื่อง

(๒) แนวทางและวิธีการในการให้ความช่วยเหลือและบรรเทาความเดือดร้อนที่เกิดขึ้นเฉพาะ หน้าและระยะยาวเมื่อเกิดสาธารณภัย รวมถึงการอพยพประชาชน หน่วยงานของรัฐ และองค์กร ปกครองส่วนท้องถิ่น การสงเคราะห์ผู้ประสบภัย การดูแลเกี่ยวกับการสาธารณสุข และการแก้ไข ปัญหาเกี่ยวกับการสื่อสารและการสาธารณูปโภค

(๓) หน่วยงานของรัฐและองค์กรปกครองส่วนท้องถิ่นที่รับผิดชอบในการคำเนินการตาม (๑) และ (๒) และวิธีการให้ได้มาซึ่งงบประมาณเพื่อการคำเนินการดังกล่าว

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					หน้า ๗			
ເລ່່ມ	୭୭୦	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ഠമമതി

(๔) แนวทางในการเตรียมพร้อมค้านบุคลากร อุปกรณ์ และเครื่องมือเครื่องใช้และจัดระบบ การปฏิบัติการในการคำเนินการป้องกันและบรรเทาสาธารณภัย รวมถึงการฝึกบุคลากรและประชาชน

(๕) แนวทางในการซ่อมแซม บูรณะ ฟื้นฟู และให้ความช่วยเหลือประชาชนภายหลัง ที่สาธารณภัยสิ้นสุด

การกำหนดเรื่องตามวรรกหนึ่ง จะต้องกำหนดให้สอดกล้องและกรอบกลุมถึงสาธารณภัยต่าง ๆ โดยอาจกำหนดตามกวามจำเป็นแห่งกวามรุนแรงและกวามเสี่ยงในสาธารณภัยด้ำนนั้น และในกรณี ที่มีกวามจำเป็นต้องมีการแก้ไขหรือปรับปรุงกฎหมาย ระเบียบ ข้อบังกับ หรือมติของกณะรัฐมนตรี ที่เกี่ยวข้อง ให้ระบุไว้ในแผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติด้วย

มาตรา ๑๓ ให้รัฐมนตรีเป็นผู้บัญชาการมีอำนาจควบคุมและกำกับการป้องกันและบรรเทา สาธารณภัยทั่วราชอาณาจักรให้เป็นไปตามแผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติและ พระราชบัญญัตินี้ ในการนี้ ให้มีอำนาจบังคับบัญชาและสั่งการผู้อำนวยการ รองผู้อำนวยการ ผู้ช่วย ผู้อำนวยการ เจ้าพนักงาน และอาสาสมัครได้ทั่วราชอาณาจักร

ให้ปลัดกระทรวงมหาดไทยเป็นรองผู้บัญชาการมีหน้าที่ช่วยเหลือผู้บัญชาการในการป้องกัน และบรรเทาสาธารณภัย และปฏิบัติหน้าที่ตามที่ผู้บัญชาการมอบหมายโดยให้มีอำนาจบังคับบัญชาและ สั่งการตามวรรคหนึ่งรองจากผู้บัญชาการ

มาตรา ๑๔ ให้อธิบดีเป็นผู้อำนวยการกลางมีหน้าที่ป้องกันและบรรเทาสาธารณภัย ทั่วราชอาณาจักร และมีอำนาจควบคุมและกำกับการปฏิบัติหน้าที่ของผู้อำนวยการ รองผู้อำนวยการ ผู้ช่วยผู้อำนวยการ เจ้าพนักงาน และอาสาสมัคร ได้ทั่วราชอาณาจักร

มาตรา ๑๕ ให้ผู้ว่าราชการจังหวัดเป็นผู้อำนวยการจังหวัด รับผิดชอบในการป้องกันและ บรรเทาสาธารณภัยในเขตจังหวัด โดยมีอำนาจหน้าที่ดังต่อไปนี้

(๑) จัดทำแผนการป้องกันและบรรเทาสาธารณภัยจังหวัด ซึ่งต้องสอดคล้องกับแผนการ ป้องกันและบรรเทาสาธารณภัยแห่งชาติ

(๒) กำกับดูแลการฝึกอบรมอาสาสมัครขององค์กรปกครองส่วนท้องถิ่น

(๓) กำกับดูแลองค์กรปกครองส่วนท้องถิ่นให้จัดให้มีวัสดุ อุปกรณ์ เครื่องมือเครื่องใช้ ยานพาหนะ และสิ่งอื่น เพื่อใช้ในการป้องกันและบรรเทาสาธารณภัยตามที่กำหนดในแผนการป้องกัน และบรรเทาสาธารณภัยจังหวัด

					หน้า ๘			
ເລ່່ມ	୭୭୦	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ഠമമതി

(๔) ดำเนินการให้หน่วยงานของรัฐและองค์กรปกครองส่วนท้องถิ่นให้การสงเคราะห์
เบื้องต้นแก่ผู้ประสบภัย หรือผู้ได้รับภยันตรายหรือเสียหายจากสาธารณภัยรวมตลอดทั้งการรักษา
ความสงบเรียบร้อยและการปฏิบัติการใด ๆ ในการป้องกันและบรรเทาสาธารณภัย

(๕) สนับสนุนและให้ความช่วยเหลือแก่องค์กรปกครองส่วนท้องถิ่นในการป้องกันและ บรรเทาสาธารณภัย

(๖) ปฏิบัติหน้าที่อื่นตามที่ผู้บัญชาการและผู้อำนวยการกลางมอบหมาย

เพื่อประโยชน์ในการปฏิบัติหน้าที่ตาม (๑) (๔) และ (๕) ให้ผู้อำนวยการจังหวัดมีอำนาจสั่ง การหน่วยงานของรัฐและองค์กรปกครองส่วนท้องถิ่นซึ่งอยู่ในจังหวัด ให้ดำเนินการในการป้องกันและ บรรเทาสาธารณภัยตามแผนการป้องกันและบรรเทาสาธารณภัยจังหวัด และมีอำนาจสั่งการ ควบคุม และกำกับดูแลการปฏิบัติหน้าที่ของเจ้าพนักงานและอาสาสมัครให้เป็นไปตามพระราชบัญญัตินี้

มาตรา ๑๖ แผนการป้องกันและบรรเทาสาธารณภัยจังหวัดตามมาตรา ๑๕ (๑) อย่างน้อย ต้องมีสาระสำคัญตามมาตรา ๑๒ และสาระสำคัญอื่นดังต่อไปนี้

(๑) การจัดตั้งศูนย์อำนวยการเฉพาะกิจเมื่อเกิดสาธารณภัยขึ้น โครงสร้างและผู้มีอำนาจสั่งการ ด้านต่าง ๆ ในการป้องกันและบรรเทาสาธารณภัย

(๒) แผนและขั้นตอนขององค์กรปกครองส่วนท้องถิ่น ในการจัคหาวัสดุ อุปกรณ์ เครื่องมือ เครื่องใช้ และยานพาหนะ เพื่อใช้ในการป้องกันและบรรเทาสาธารณภัย

(๓) แผนและขั้นตอนขององค์กรปกครองส่วนท้องถิ่น ในการจัคให้มีเครื่องหมายสัญญาณ หรือสิ่งอื่นใด ในการแจ้งให้ประชาชนได้ทราบถึงการเกิดหรือจะเกิดสาธารณภัย

(๔) แผนปฏิบัติการในการป้องกันและบรรเทาสาธารณภัยขององค์กรปกครองส่วนท้องถิ่น

(๕) แผนการประสานงานกับองค์การสาธารณกุศล

มาตรา ๑๙ ในการจัดทำแผนการป้องกันและบรรเทาสาธารณภัยจังหวัด ให้ผู้ว่าราชการ จังหวัดแต่งตั้งคณะกรรมการขึ้นคณะหนึ่ง ประกอบด้วย

(๑) ผู้ว่าราชการจังหวัด เป็นประธานกรรมการ

(๒) รองผู้ว่าราชการจังหวัดซึ่งผู้ว่าราชการจังหวัดมอบหมาย เป็นรองประธานกรรมการ

(๓) ผู้บัญชาการมณฑลทหารบกหรือผู้บังคับการจังหวัดทหารบกหรือผู้แทนเป็นรองประธาน กรรมการ

(๔) นายกองค์การบริหารส่วนจังหวัด เป็นรองประธานกรรมการ

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					หน้า ธ			
ເລ່ນ	୭୭୯	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	രച്ചതി

(๕) กรรมการอื่น ประกอบด้วย

(ก) ผู้แทนหน่วยงานของรัฐที่ประจำอยู่ในพื้นที่จังหวัดตามจำนวนที่ผู้ว่าราชการ จังหวัดเห็นสมกวรแต่งตั้ง

(ข) ผู้แทนองค์กรปกครองส่วนท้องถิ่นแห่งพื้นที่จำนวนเง็คคน ซึ่งประกอบด้วยผู้แทน เทศบาลจำนวนสองคนและผู้แทนองค์การบริหารส่วนตำบลจำนวนห้าคน

(ค) ผู้แทนองค์การสาธารณกุศลในจังหวัดตามจำนวนที่ผู้ว่าราชการจังหวัด เห็นสมควรแต่งตั้ง

(๖) หัวหน้าสำนักงานป้องกันและบรรเทาสาธารณภัยจังหวัด หรือผู้แทนกรมป้องกันและ
บรรเทาสาธารณภัย เป็นกรรมการและเลขานุการ

ในกรณีที่จังหวัดใดเป็นที่ตั้งของสถาบันการศึกษาระดับอุดมศึกษา ให้พิจารณาแต่งตั้ง ผู้บริหารของสถาบันการศึกษานั้น เป็นที่ปรึกษาหรือกรรมการตามจำนวนที่ผู้ว่าราชการจังหวัด เห็นสมควร

ให้คณะกรรมการตามวรรคหนึ่งมีหน้าที่จัดทำแผนการป้องกันและบรรเทาสาธารณภัยจังหวัด เสนอผู้ว่าราชการจังหวัดเพื่อประกาศใช้ต่อไป

การปฏิบัติหน้าที่และการประชุมของคณะกรรมการตามวรรคหนึ่ง ให้เป็นไปตามที่ผู้ว่า ราชการจังหวัดกำหนด

ในกรณีที่กรมป้องกันและบรรเทาสาธารณภัยเห็นว่าแผนการป้องกันและบรรเทาสาธารณภัย จังหวัดไม่สอดคล้องกับแผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติ ให้แจ้งให้ผู้ว่าราชการจังหวัด ทราบเพื่อดำเนินการแก้ไขให้แล้วเสร็จภายในสามสิบวันนับแต่วันที่ได้รับแจ้ง

มาตรา ๑๙ ให้นายกองค์การบริหารส่วนจังหวัดเป็นรองผู้อำนวยการจังหวัด มีหน้าที่ ช่วยเหลือผู้อำนวยการจังหวัดในการป้องกันและบรรเทาสาธารณภัย และปฏิบัติหน้าที่อื่นตามที่ ผู้อำนวยการจังหวัดมอบหมาย

มาตรา ๑៩ ให้นายอำเภอเป็นผู้อำนวยการอำเภอ รับผิดชอบและปฏิบัติหน้าที่ในการ ป้องกันและบรรเทาสาธารณภัยในเขตอำเภอของตน และมีหน้าที่ช่วยเหลือผู้อำนวยการจังหวัดตามที่ ได้รับมอบหมาย

ในการปฏิบัติหน้าที่ของผู้อำนวยการอำเภอตามวรรกหนึ่ง ให้ผู้อำนวยการอำเภอ มีอำนาจสั่งการ หน่วยงานของรัฐและองค์กรปกครองส่วนท้องถิ่นที่เกี่ยวข้องซึ่งอยู่ในเขตอำเภอให้คำเนินการในการ

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					หน้า ๑๐			
ເດ່ມ	୭୭୯	ตอนที่	දූල	ก	ราชกิจจานุเบกษา	ග	กันยายน	ഠമ്മയി

ป้องกันและบรรเทาสาธารณภัยตามแผนการป้องกันและบรรเทาสาธารณภัยจังหวัด และมีอำนาจสั่งการ ควบคุม และกำกับดูแลการปฏิบัติหน้าที่ของเจ้าพนักงานและอาสาสมัครให้เป็นไปตามพระราชบัญญัตินี้

มาตรา ๒๐ ให้องค์กรปกครองส่วนท้องถิ่นแห่งพื้นที่มีหน้าที่ป้องกันและบรรเทาสาธารณภัย ในเขตท้องถิ่นของตน โดยมีผู้บริหารท้องถิ่นขององค์กรปกครองส่วนท้องถิ่นแห่งพื้นที่นั้นเป็น ผู้รับผิดชอบในฐานะผู้อำนวยการท้องถิ่น และมีหน้าที่ช่วยเหลือผู้อำนวยการจังหวัดและผู้อำนวยการ อำเภอตามที่ได้รับมอบหมาย

ในการปฏิบัติหน้าที่ของผู้อำนวยการท้องถิ่นตามวรรคหนึ่ง ให้ผู้อำนวยการท้องถิ่นมีอำนาจสั่งการ ควบคุม และกำกับดูแลการปฏิบัติหน้าที่ของเจ้าพนักงานและอาสาสมัครให้เป็นไปตามพระราชบัญญัตินี้

ให้ปลัดองค์กรปกครองส่วนท้องถิ่นขององค์กรปกครองส่วนท้องถิ่นแห่งพื้นที่นั้นเป็น ผู้ช่วยผู้อำนวยการท้องถิ่น รับผิดชอบและปฏิบัติหน้าที่ในการป้องกันและบรรเทาสาธารณภัย ในเขตท้องถิ่นของตนและมีหน้าที่ช่วยเหลือผู้อำนวยการท้องถิ่นตามที่ได้รับมอบหมาย

> หมวด ๒ การป้องกันและบรรเทาสาธารณภัย

มาตรา ๒๑ เมื่อเกิดหรือคาดว่าจะเกิดสาธารณภัยขึ้นในเขตขององค์กรปกครอง ส่วนท้องถิ่นแห่งพื้นที่ใด ให้ผู้อำนวยการท้องถิ่นขององค์กรปกครองส่วนท้องถิ่นแห่งพื้นที่นั้น มีหน้าที่เข้าดำเนินการป้องกันและบรรเทาสาธารณภัยโดยเร็ว และแจ้งให้ผู้อำนวยการอำเภอ ที่รับผิดชอบในเขตพื้นที่นั้นและผู้อำนวยการจังหวัดทราบทันที

ในการปฏิบัติหน้าที่ตามวรรคหนึ่ง ให้ผู้อำนวยการท้องถิ่นมีอำนาจหน้าที่ ดังต่อไปนี้ (๑) สั่งข้าราชการฝ่ายพลเรือน พนักงานส่วนท้องถิ่น เจ้าหน้าที่ของหน่วยงานของรัฐ เจ้าพนักงาน อาสาสมัคร และบุคคลใด ๆ ในเขตองค์กรปกครองส่วนท้องถิ่นแห่งพื้นที่ที่เกิดสาธารณภัย ให้ปฏิบัติการอย่างหนึ่งอย่างใดตามความจำเป็นในการป้องกันและบรรเทาสาธารณภัย

(๒) ใช้อาการ สถานที่ วัสดุ อุปกรณ์ เกรื่องมือเกรื่องใช้ และยานพาหนะของหน่วยงาน ของรัฐและเอกชนที่อยู่ในเขตองก์กรปกกรองส่วนท้องถิ่นแห่งพื้นที่ที่เกิดสาธารณภัยเท่าที่จำเป็น เพื่อการป้องกันและบรรเทาสาธารณภัย

					หน้า ๑๑			
ເຄ່່ມ	୦୭୯	ตอนที่	ය්ම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ഠമ്മി

(๓) ใช้เครื่องมือสื่อสารของหน่วยงานของรัฐหรือเอกชนทุกระบบที่อยู่ในเขตองค์กรปกครอง ส่วนท้องถิ่นแห่งพื้นที่ที่เกิดสาธารณภัยหรือท้องที่ที่เกี่ยวเนื่อง

(๔) ขอความช่วยเหลือจากองค์กรปกครองส่วนท้องถิ่นอื่นในการป้องกันและบรรเทา สาธารณภัย

(๕) สั่งห้ามเข้าหรือให้ออกจากพื้นที่ อาการหรือสถานที่ที่กำหนด

(๖) จัดให้มีการสงเคราะห์ผู้ประสบภัยโดยทั่วถึงและรวดเร็ว

Appendix

มาตรา ๒๒ เมื่อมีกรณีตามมาตรา ๒๑ เกิดขึ้น ให้ผู้อำนวยการอำเภอ และผู้อำนวยการ จังหวัดมีอำนาจหน้าที่เช่นเดียวกับผู้อำนวยการท้องถิ่น โดยในกรณีผู้อำนวยการอำเภอ ให้สั่งการได้ สำหรับในเขตอำเภอของตน และในกรณีผู้อำนวยการจังหวัด ให้สั่งการได้สำหรับในเขตจังหวัด แล้วแต่กรณี

ในกรณีที่ผู้อำนวยการท้องถิ่นมีความจำเป็นต้องได้รับความช่วยเหลือจากเจ้าหน้าที่ของรัฐหรือ หน่วยงานของรัฐที่อยู่นอกเขตขององก์กรปกครองส่วนท้องถิ่นแห่งพื้นที่ของตน ให้แจ้งให้ผู้อำนวยการ อำเภอหรือผู้อำนวยการจังหวัด แล้วแต่กรณี เพื่อสั่งการโดยเร็วต่อไป

ในกรณีจำเป็นเพื่อประโยชน์ในการป้องกันและบรรเทาสาธารณภัยใด ผู้อำนวยการจังหวัดจะ สั่งการให้หน่วยงานของรัฐ องค์กรปกครองส่วนท้องถิ่น เจ้าหน้าที่ของรัฐ หรือบุคคลใดกระทำหรือ งดเว้นการกระทำใดที่มีผลกระทบต่อการป้องกันและบรรเทาสาธารณภัยนั้นก็ได้ คำสั่งดังกล่าวให้มีผล บังคับเป็นระยะเวลาตามที่กำหนดในคำสั่ง แต่ต้องไม่เกินยี่สิบสี่ชั่วโมง ในกรณีที่มีความจำเป็นต้องให้ คำสั่งดังกล่าวมีผลบังคับเกินยี่สิบสี่ชั่วโมง ให้เป็นอำนาจของผู้บัญชาการที่จะสั่งการได้ตามความจำเป็น แต่ต้องไม่เกินเจ็ดวัน

ในกรณีที่พื้นที่ที่เกิดหรือจะเกิดสาธารณภัยตามวรรคหนึ่งอยู่ในความรับผิดชอบของ ผู้อำนวยการท้องถิ่นหลายคน ผู้อำนวยการท้องถิ่นคนหนึ่งคนใด จะใช้อำนาจหรือปฏิบัติหน้าที่ตาม มาตรา ๒๑ ไปพลางก่อนก็ได้ แล้วให้แจ้งผู้อำนวยการท้องถิ่นอื่นทราบโดยเร็ว

มาตรา ๒๓ เมื่อเกิดสาธารณภัยขึ้นในเขตพื้นที่ขององค์กรปกครองส่วนท้องถิ่นแห่งพื้นที่ใด ให้เป็นหน้าที่ของผู้อำนวยการท้องถิ่นซึ่งมีพื้นที่ติดต่อหรือใกล้เคียงกับองค์กรปกครองส่วนท้องถิ่น แห่งพื้นที่นั้น ที่จะสนับสนุนการป้องกันและบรรเทาสาธารณภัยที่เกิดขึ้น

มาตรา ๒๔ เมื่อเกิดสาธารณภัย ให้เป็นหน้าที่ของเจ้าพนักงานที่ประสบเหตุต้องเข้า ดำเนินการเบื้องต้นเพื่อระงับสาธารณภัยนั้น แล้วรีบรายงานให้ผู้อำนวยการท้องถิ่นที่รับผิดชอบในพื้นที่

					หน้า ด๒			
ເລ່ມ	୭୭୦	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ෆ	กันยายน	രച്ചതി

นั้นเพื่อสั่งการต่อไป และในกรณีจำเป็นอันไม่อาจหลีกเลี่ยงได้ ให้เจ้าพนักงานมีอำนาจคำเนินการใด ๆ เพื่อกุ้มครองชีวิตหรือป้องกันภยันตรายที่จะเกิดแก่บุคคลได้

มาตรา ๒๕ ในกรณีที่เกิดสาธารณภัยและภยันตรายจากสาธารณภัยนั้นใกล้จะถึง ผู้อำนวยการมีอำนาจสั่งให้เจ้าพนักงานดัดแปลง ทำลาย หรือเคลื่อนย้ายสิ่งก่อสร้าง วัสดุ หรือ ทรัพย์สินของบุคคลใดที่เป็นอุปสรรคแก่การบำบัดปัดป้องภยันตรายได้ ทั้งนี้ เฉพาะเท่าที่จำเป็น แก่การยับยั้งหรือแก้ไขความเสียหายที่จะเกิดขึ้นจากสาธารณภัยนั้น

ความในวรรคหนึ่งให้ใช้บังคับกับกรณีมีความจำเป็นต้องคำเนินการเพื่อป้องกันภัยต่อส่วนรวม ด้วยโดยอนุโลม

ในกรณีที่การคัคแปลง ทำลาย หรือเคลื่อนย้ายสิ่งก่อสร้าง วัสคุ หรือทรัพย์สินจะมีผลทำให้เกิด สาธารณภัยขึ้นในเขตพื้นที่อื่นหรือก่อให้เกิดความเสียหายเพิ่มขึ้นแก่เขตพื้นที่อื่น ผู้อำนวยการท้องถิ่น จะใช้อำนาจตามวรรคหนึ่งหรือวรรคสองมิได้ เว้นแต่จะได้รับความเห็นชอบจากผู้อำนวยการจังหวัด

มาตรา ๒๖ เมื่อมีกรณีที่เจ้าพนักงานจำเป็นต้องเข้าไปในอาคารหรือสถานที่ที่อยู่ใกล้เคียง กับพื้นที่ที่เกิดสาธารณภัยเพื่อทำการป้องกันและบรรเทาสาธารณภัย ให้กระทำได้เมื่อได้รับอนุญาตจาก เจ้าของหรือผู้ครอบครองอาการหรือสถานที่แล้ว เว้นแต่ไม่มีเจ้าของหรือผู้ครอบครองอยู่ในเวลานั้น หรือเมื่ออยู่ภายใต้การควบคุมของผู้อำนวยการ ก็ให้กระทำได้แม้เจ้าของหรือผู้ครอบครองจะไม่ได้ อนุญาต

ในกรณีที่ทรัพย์สินที่อยู่ในอาคารหรือสถานที่ตามวรรคหนึ่ง เป็นสิ่งที่ทำให้เกิดสาธารณภัย ได้ง่าย ให้เจ้าพนักงานมีอำนาจสั่งให้เจ้าของหรือผู้ครอบครองขนย้ายทรัพย์สินนั้นออกจากอาคารหรือ สถานที่ดังกล่าวได้

ในกรณีที่เจ้าของหรือผู้ครอบครองไม่ปฏิบัติตามคำสั่งของเจ้าพนักงานตามวรรคสอง ให้เจ้าพนักงานมีอำนาจขนย้ายทรัพย์สินนั้นได้ตามความจำเป็นแก่การป้องกันและบรรเทาสาธารณภัย โดยเจ้าพนักงานไม่ต้องรับผิดชอบบรรคาความเสียหายอันเกิดจากการกระทำดังกล่าว

มาตรา ๒๙ ในการบรรเทาสาธารณภัย ผู้อำนวยการและเจ้าพนักงานซึ่งได้รับมอบหมาย จากผู้อำนวยการมีอำนาจหน้าที่ดำเนินการดังต่อไปนี้

 (๑) จัดให้มีสถานที่ชั่วคราวเพื่อให้ผู้ประสบภัยอยู่อาศัยหรือรับการปฐมพยาบาล และการรักษา ทรัพย์สินของผู้ประสบภัย

					หน้า ๑๓			
ເດ່ມ	୭୭୦	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ാച്ചെയി

(๒) จัคระเบียบการจราจรชั่วคราวในพื้นที่ที่เกิคสาธารณภัยและพื้นที่ใกล้เคียงเพื่อประโยชน์ ในการป้องกันและบรรเทาสาธารณภัย

(๓) ปิดกั้นมิให้ผู้ไม่มีส่วนเกี่ยวข้องเข้าไปในพื้นที่ที่เกิดสาธารณภัยและพื้นที่ใกล้เคียง

(๔) จัดให้มีการรักษาความสงบเรียบร้อยและป้องกันเหตุโจรผู้ร้าย

Appendix

(๕) ช่วยเหลือผู้ประสบภัย และช่วยขนย้ายทรัพย์สินในพื้นที่ที่เกิดสาธารณภัยและพื้นที่ ใกล้เคียง เมื่อเจ้าของหรือผู้ครอบครองทรัพย์สินร้องขอ

ผู้อำนวยการหรือเจ้าพนักงานซึ่งได้รับมอบหมายจากผู้อำนวยการจะจัดให้มีเครื่องหมายหรือ อาณัติสัญญาณเพื่อใช้ในการกำหนดสถานที่หรือการดำเนินการใดตามวรรคหนึ่งก็ได้

ในการคำเนินการตาม (๒) (๓) (๔) และ (๕) ผู้อำนวยการหรือเจ้าพนักงานจะคำเนินการเอง หรือมอบหมายให้พนักงานฝ่ายปกครองหรือตำรวจในพื้นที่เป็นผู้คำเนินการ หรือช่วยคำเนินการก็ได้ และในกรณีตาม (๕) จะมอบหมายให้องค์การสาธารณกุศลเป็นผู้คำเนินการหรือช่วยคำเนินการค้วยก็ได้

 และ เนกรณฑาม ((a) จะมอบกมายากจุกการกายารณภูกแบบผู้ทาเนนการการขรรงคาเนนการครอกการ มาตรา ๒๙ เมื่อเกิดหรือใกล้จะเกิดสาธารณภัยขึ้นในพื้นที่ใด และการที่ผู้ใดอยู่อาศัยใน พื้นที่นั้นจะก่อให้เกิดภยันตรายหรือกีดขวางต่อการปฏิบัติหน้าที่ของเจ้าพนักงาน ให้ผู้บัญชาการ รองผู้บัญชาการ ผู้อำนวยการ และเจ้าพนักงานซึ่งได้รับมอบหมายมีอำนาจสั่งอพยพผู้ซึ่งอยู่ในพื้นที่นั้น ออกไปจากพื้นที่ดังกล่าว ทั้งนี้ เฉพาะเท่าที่จำเป็นแก่การป้องกันและบรรเทาสาธารณภัย

มาตรา ๒៩ เมื่อเกิดหรือใกล้จะเกิดสาธารณภัยขึ้นในพื้นที่ใดและการอยู่อาศัยหรือคำเนิน กิจการใด ๆ ในพื้นที่นั้นจะเป็นอันตรายอย่างร้ายแรง ผู้บัญชาการ รองผู้บัญชาการ ผู้อำนวยการกลาง ผู้อำนวยการจังหวัด ผู้อำนวยการอำเภอ และผู้อำนวยการท้องถิ่นโดยความเห็นชอบของผู้อำนวยการ อำเภอ จะประกาศห้ามมิให้บุคคลใด ๆ เข้าไปอยู่อาศัยหรือดำเนินกิจการใดในพื้นที่ดังกล่าวก็ได้ ประกาศดังกล่าวให้กำหนดระยะเวลาการห้ามและเขตพื้นที่ที่ห้ามตามที่จำเป็นไว้ด้วย

มาตรา ๑๐ ให้ผู้อำนวยการในเขตพื้นที่ที่รับผิดชอบสำรวจความเสียหายจากสาธารณภัย ที่เกิดขึ้นและทำบัญชีรายชื่อผู้ประสบภัยและทรัพย์สินที่เสียหายไว้เป็นหลักฐาน พร้อมทั้งออกหนังสือ รับรองให้ผู้ประสบภัยไว้เป็นหลักฐานในการรับการสงเคราะห์และฟื้นฟู

หนังสือรับรองตามวรรคหนึ่งต้องมีรายละเอียดเกี่ยวกับการสงเคราะห์และการฟื้นฟูที่ ผู้ประสบภัยมีสิทธิได้รับจากทางราชการ พร้อมทั้งระบุหน่วยงานที่เป็นผู้ให้การสงเคราะห์หรือฟื้นฟู และสถานที่ติดต่อของหน่วยงานนั้นไว้ด้วย ทั้งนี้ ตามแบบที่อธิบดีกำหนด

					หน้า ๑๔			
ເດ່ນ	୭୭୯	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ഠമ്മയി

บรรคาเอกสารราชการของผู้ประสบภัยที่สูญหายหรือเสียหายเนื่องจากสาธารณภัยที่เกิดขึ้น เมื่อผู้ประสบภัยร้องขอต่อองก์กรปกครองส่วนท้องถิ่นแห่งพื้นที่ที่เกิดสาธารณภัย หรือที่เป็นภูมิลำเนา ของผู้ประสบภัย ให้เป็นหน้าที่ขององก์กรปกครองส่วนท้องถิ่นแห่งพื้นที่นั้นแจ้งให้หน่วยงานของรัฐ และองก์กรปกครองส่วนท้องถิ่นที่เกี่ยวข้องทราบ และให้หน่วยงานของรัฐและองก์กรปกครอง ส่วนท้องถิ่นที่เกี่ยวข้องออกเอกสารทางราชการคังกล่าวให้ใหม่ตามหลักฐานที่อยู่ในความครอบครองของตน ส่งมอบให้แก่ผู้ประสบภัยหรือส่งมอบผ่านทางองก์กรปกครองส่วนท้องถิ่นแห่งพื้นที่ที่เป็นผู้แจ้ง ทั้งนี้ โดยผู้ประสบภัยไม่ต้องเสียก่าธรรมเนียมหรือค่าบริการ แม้ว่าตามกฎหมายที่เกี่ยวกับการออกเอกสาร ราชการคังกล่าวจะกำหนดให้ต้องเสียก่าธรรมเนียมหรือค่าบริการกี่ตาม

ในกรณีที่ผู้ประสบภัยหรือเจ้าของหรือผู้ครอบครองทรัพย์สินร้องขอหลักฐานเพื่อรับการ สงเคราะห์หรือบริการอื่นใด ให้ผู้อำนวยการในเขตพื้นที่ที่รับผิดชอบ ออกหนังสือรับรองให้ตาม ระเบียบที่กระทรวงมหาดไทยกำหนด

มาตรา ๑๑ ในกรณีที่เกิดสาธารณภัยร้ายแรงอย่างยิ่ง นายกรัฐมนตรีหรือรอง นายกรัฐมนตรีซึ่งนายกรัฐมนตรีมอบหมายมีอำนาจสั่งการผู้บัญชาการ ผู้อำนวยการ หน่วยงานของรัฐ และองค์กรปกครองส่วนท้องถิ่นให้คำเนินการอย่างหนึ่งอย่างใคเพื่อป้องกันและบรรเทาสาธารณภัย รวมตลอดทั้งให้ความช่วยเหลือแก่ประชาชนในพื้นที่ที่กำหนดก็ได้ โดยให้มีอำนาจเช่นเดียวกับ ผู้บัญชาการตามมาตรา ๑๓ และผู้อำนวยการตามมาตรา ๒๑ และมีอำนาจกำกับและควบคุมการปฏิบัติ หน้าที่ของผู้บัญชาการ รองผู้บัญชาการ ผู้อำนวยการ รองผู้อำนวยการ ผู้ช่วยผู้อำนวยการ และ เจ้าพนักงานในการคำเนินการตามมาตรา ๒๕ มาตรา ๒๘ และมาตรา ๒៩ ด้วย

เจ้าหน้าที่ของรัฐผู้ใดไม่ปฏิบัติตามกำสั่งของนายกรัฐมนตรี หรือรองนายกรัฐมนตรี ตามวรรคหนึ่ง ให้ถือว่าเป็นการปฏิบัติหน้าที่โดยไม่ชอบหรือเป็นความผิดวินัยอย่างร้ายแรง แล้วแต่กรณี

> หมวด ๑ การป้องกันและบรรเทาสาธารณภัยในเขตกรุงเทพมหานคร

มาตรา ๗๒ ให้ผู้ว่าราชการกรุงเทพมหานครเป็นผู้อำนวยการกรุงเทพมหานครรับผิดชอบ ในการป้องกันและบรรเทาสาธารณภัยในเขตกรุงเทพมหานคร และมีอำนาจหน้าที่ ดังต่อไปนี้

					หน้า ๑๕			
ເດ່ນ	ରାଜ୍ଦ	ตอนที่	අල	ก	ราชกิจจานเบกษา	ග	กันยายน	ම ්දීර

(๑) จัคทำแผนการป้องกันและบรรเทาสาธารณภัยกรุงเทพมหานคร ซึ่งต้องสอดคล้องกับ แผนการป้องกันและบรรเทาสาธารณภัยแห่งชาติ

(๒) กำกับดูแลการฝึกอบรมอาสาสมัครของกรุงเทพมหานคร

Appendix

(๓) จัดให้มีวัสดุ อุปกรณ์ เครื่องมือเครื่องใช้ ยานพาหนะ และสิ่งอื่น เพื่อใช้ในการ ป้องกันและบรรเทาสาธารณภัยตามที่กำหนดในแผนการป้องกันและบรรเทาสาธารณภัย กรุงเทพมหานคร

(๔) ดำเนินการให้การสงเคราะห์เบื้องต้นแก่ผู้ประสบภัย หรือผู้ได้รับภยันตราย หรือ
เสียหายจากสาธารณภัย รวมตลอดทั้งการรักษาความสงบเรียบร้อย และการปฏิบัติการใด ๆ ในการ
ป้องกันและบรรเทาสาธารณภัย

(๕) สนับสนุนและให้ความช่วยเหลือแก่องค์กรปกครองส่วนท้องถิ่นซึ่งมีพื้นที่ติดต่อหรือ ใกล้เกียงในการป้องกันและบรรเทาสาธารณภัย

(๖) ปฏิบัติหน้าที่อื่นตามที่ผู้บัญชาการและผู้อำนวยการกลางมอบหมาย

เพื่อประโยชน์ในการปฏิบัติหน้าที่ตาม (๑) (๔) และ (๕) ให้ผู้อำนวยการกรุงเทพมหานคร มีอำนาจสั่งการส่วนราชการและหน่วยงานของกรุงเทพมหานคร รวมทั้งประสานกับหน่วยงานของรัฐ และองค์กรปกครองส่วนท้องถิ่นที่เกี่ยวข้องในการป้องกันและบรรเทาสาธารณภัย เพื่อให้เป็นไปตาม แผนการป้องกันและบรรเทาสาธารณภัยกรุงเทพมหานคร และมีอำนาจสั่งการ ควบคุม และกำกับดูแล การปฏิบัติหน้าที่ของเจ้าพนักงานและอาสาสมัครของกรุงเทพมหานครให้เป็นไปตามพระราชบัญญัตินี้

มาตรา ๑๓ แผนการป้องกันและบรรเทาสาธารณภัยกรุงเทพมหานครตามมาตรา ๑๒ (๑) อย่างน้อยต้องมีสาระสำคัญตามมาตรา ๑๒ และสาระสำคัญอื่นคังต่อไปนี้

(๑) การจัดตั้งศูนย์อำนวยการเฉพาะกิจเมื่อเกิดสาธารณภัยขึ้น โครงสร้างและผู้มีอำนาจสั่งการ
ด้านต่าง ๆ ในการป้องกันและบรรเทาสาธารณภัย

(๒) แผนและขั้นตอนในการจัดหาวัสดุ อุปกรณ์ เครื่องมือเครื่องใช้ และยานพาหนะเพื่อใช้ ในการป้องกันและบรรเทาสาธารณภัย

(๓) แผนและขั้นตอนในการจัดให้มีเครื่องหมายสัญญาณ หรือสิ่งอื่นใด ในการแจ้งให้ ประชาชนได้ทราบถึงการเกิดหรือจะเกิดสาธารณภัย

(๔) แผนปฏิบัติการในการป้องกันและบรรเทาสาธารณภัยในเขตกรุงเทพมหานคร

(&) แผนการประสานงานกับองค์การสาธารณกุศลในเขตกรุงเทพมหานคร

					หน้า ๑๖			
ເດ່ນ	ചെയര	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ෙනිනම

มาตรา ๓๔ ในการจัดทำแผนการป้องกันและบรรเทาสาธารณภัยกรุงเทพมหานคร ให้ผู้ว่า ราชการกรุงเทพมหานครแต่งตั้งคณะกรรมการขึ้นคณะหนึ่ง ประกอบด้วย

(๑) ผู้ว่าราชการกรุงเทพมหานคร เป็นประธานกรรมการ

(๒) ปลัดกรุงเทพมหานคร เป็นรองประธานกรรมการ

(๓) กรรมการอื่น ประกอบด้วย

(ก) ผู้แทนส่วนราชการหรือหน่วยงานของกรุงเทพมหานครตามจำนวนที่ผู้ว่าราชการ กรุงเทพมหานครเห็นสมควรแต่งตั้ง

(ง) ผู้แทนกรมป้องกันและบรรเทาสาธารณภัย

(ค) ผู้แทนองค์การสาธารณกุศลในเขตกรุงเทพมหานครตามจำนวนที่ผู้ว่าราชการ กรุงเทพมหานครเห็นสมควรแต่งตั้ง

(ง) ผู้แทนชุมชนในเขตกรุงเทพมหานครตามจำนวนที่ผู้ว่าราชการกรุงเทพมหานคร เห็นสมควรแต่งตั้ง

ให้แต่งตั้งผู้แทนกระทรวงกลาโหมและผู้แทนสถาบันการศึกษาระดับอุดมศึกษาเป็นที่ปรึกษา หรือกรรมการตามจำนวนที่ผู้ว่าราชการกรุงเทพมหานกรเห็นสมควรแต่งตั้ง

ให้คณะกรรมการตามวรรคหนึ่งมีหน้าที่จัดทำแผนการป้องกันและบรรเทาสาธารณภัย กรุงเทพมหานครเสนอผู้ว่าราชการกรุงเทพมหานครเพื่อประกาศใช้ต่อไป

การปฏิบัติหน้าที่และการประชุมของคณะกรรมการตามวรรคหนึ่ง ให้เป็นไปตามที่ผู้ว่า ราชการกรุงเทพมหานครกำหนด

มาตรา ๑๕ ให้ปลัดกรุงเทพมหานครเป็นรองผู้อำนวยการกรุงเทพมหานครมีหน้าที่ ช่วยเหลือผู้อำนวยการกรุงเทพมหานครในการป้องกันและบรรเทาสาธารณภัย และปฏิบัติหน้าที่อื่น ตามที่ผู้อำนวยการกรุงเทพมหานครมอบหมาย และให้นำความในวรรคสองของมาตรา ๑๒ มาใช้ บังคับกับการปฏิบัติหน้าที่ของรองผู้อำนวยการกรุงเทพมหานครด้วยโดยอนุโลม

ความรับผิดชอบ และอำนาจหน้าที่ของปลัดกรุงเทพมหานครในฐานะรองผู้อำนวยการ กรุงเทพมหานครตามวรรคหนึ่ง ปลัดกรุงเทพมหานครจะมอบหมายให้รองปลัดกรุงเทพมหานคร เป็นผู้ช่วยปฏิบัติด้วยก็ได้

					หน้า ๑๗			
ເຄ່່ມ	୭୭୯	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	രമ്മയി

มาตรา ๑๖ ให้ผู้อำนวยการเขตในแต่ละเขตของกรุงเทพมหานคร เป็นผู้ช่วยผู้อำนวยการ กรุงเทพมหานครรับผิดชอบและปฏิบัติหน้าที่ในการป้องกันและบรรเทาสาธารณภัยในเขตของตน และ มีหน้าที่ช่วยเหลือผู้อำนวยการกรุงเทพมหานครตามที่ได้รับมอบหมาย

ในการปฏิบัติหน้าที่ของผู้ช่วยผู้อำนวยการกรุงเทพมหานครตามวรรคหนึ่ง ให้ผู้ช่วย ผู้อำนวยการกรุงเทพมหานคร มีอำนาจสั่งการส่วนราชการและหน่วยงานของกรุงเทพมหานครที่อยู่ใน เขตพื้นที่ให้ช่วยเหลือหรือร่วมมือในการป้องกันและบรรเทาสาธารณภัยตามแผนการป้องกันและ บรรเทาสาธารณภัยกรุงเทพมหานคร และมีอำนาจสั่งการ ควบคุม และกำกับดูแลการปฏิบัติหน้าที่ของ เจ้าพนักงานและอาสาสมัครของกรุงเทพมหานครให้เป็นไปตามพระราชบัญญัตินี้

ความรับผิดชอบ และอำนาจหน้าที่ของผู้อำนวยการเขตในฐานะผู้ช่วยผู้อำนวยการ กรุงเทพมหานครตามวรรคหนึ่งและวรรคสอง ผู้อำนวยการเขตจะมอบหมายให้ผู้ช่วยผู้อำนวยการเขต เป็นผู้ช่วยปฏิบัติด้วยก็ได้

มาตรา ๑๙ เมื่อเกิดหรือคาดว่าจะเกิดสาธารณภัยขึ้นในเขตกรุงเทพมหานคร ให้ผู้ช่วย ผู้อำนวยการกรุงเทพมหานครมีหน้าที่เข้าดำเนินการป้องกันและบรรเทาสาธารณภัยโดยเร็ว และแจ้งให้ ผู้อำนวยการกรุงเทพมหานครและรองผู้อำนวยการกรุงเทพมหานครทราบทันที

ให้นำความในมาตรา ๒๑ วรรคสอง มาตรา ๒๒ วรรคสามและวรรคสี่ มาตรา ๒๔ มาตรา ๒๕ มาตรา ๒๖ มาตรา ๒๓ มาตรา ๒๘ มาตรา ๒៩ และมาตรา ๓๐ มาใช้บังคับกับการ ป้องกันและบรรเทาสาธารณภัยในเขตกรุงเทพมหานครด้วยโดยอนุโลม

มาตรา ๑๙ ในกรณีที่มีความจำเป็นที่จะต้องได้รับความช่วยเหลือจากเจ้าหน้าที่ของรัฐผู้ใด หรือหน่วยงานของรัฐใดในการป้องกันและบรรเทาสาธารณภัยที่เกิดขึ้นในเขตกรุงเทพมหานคร ให้ผู้อำนวยการกรุงเทพมหานครแจ้งให้เจ้าหน้าที่ของรัฐผู้นั้นหรือหน่วยงานของรัฐนั้นทราบ และเมื่อ เจ้าหน้าที่ของรัฐผู้นั้นหรือหน่วยงานของรัฐนั้น แล้วแต่กรณี ได้รับแจ้งแล้ว ให้เป็นหน้าที่ที่จะต้อง ดำเนินการให้ความช่วยเหลือในการป้องกันและบรรเทาสาธารณภัยที่เกิดขึ้นในเขตกรุงเทพมหานคร ตามที่ได้รับแจ้งโดยเร็ว

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					หน้า ๑๘			
ເຄ່່ມ	ରାଜ୍ୟ	ตอนที่	දීම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ഠമ്മയി

หมวด ๔ เจ้าพนักงานและอาสาสมัคร

มาตรา ๓៩ ให้ผู้อำนวยการมีอำนาจแต่งตั้งเจ้าพนักงานเพื่อปฏิบัติหน้าที่ดังต่อไปนี้

(๑) ผู้อำนวยการกลาง มีอำนาจแต่งตั้งเจ้าพนักงานให้ปฏิบัติหน้าที่ได้ทั่วราชอาณาจักร

(๒) ผู้อำนวยการจังหวัด มีอำนาจแต่งตั้งเจ้าพนักงานให้ปฏิบัติหน้าที่ได้ในเขตจังหวัด

(๓) ผู้อำนวยการอำเภอ มีอำนาจแต่งตั้งเจ้าพนักงานให้ปฏิบัติหน้าที่ได้ในเขตอำเภอ

(๔) ผู้อำนวยการท้องถิ่น มีอำนาจแต่งตั้งเจ้าพนักงานให้ปฏิบัติหน้าที่ได้ในเขตองค์กร ปกครองส่วนท้องถิ่นแห่งพื้นที่

(๕) ผู้อำนวยการกรุงเทพมหานคร มีอำนาจแต่งตั้งเจ้าพนักงานให้ปฏิบัติหน้าที่ได้ในเขต กรุงเทพมหานคร

หลักเกณฑ์การแต่งตั้งและการปฏิบัติหน้าที่ของเจ้าพนักงานให้เป็นไปตามระเบียบที่ กระทรวงมหาดไทยกำหนด

มาตรา ๔๐ ในกรณีที่ผู้อำนวยการหรือเจ้าพนักงานพบเห็นว่าอาคารหรือสถานที่ใคมีสภาพ ที่อาจก่อให้เกิคสาธารณภัยได้โดยง่ายหรือมีวัสดุหรือสิ่งของใดในอาคารหรือสถานที่ใดที่อาจก่อให้เกิด สาธารณภัยได้ ให้แจ้งพนักงานเจ้าหน้าที่ตามกฎหมายว่าด้วยการนั้นทราบเพื่อตรวจสอบตามอำนาจ หน้าที่ต่อไป

มาตรา ๔๑ ให้ผู้อำนวยการจัดให้มีอาสาสมักรในพื้นที่ที่รับผิดชอบ เพื่อปฏิบัติหน้าที่ ดังต่อไปนี้

(๑) ให้ความช่วยเหลือเจ้าพนักงานในการป้องกันและบรรเทาสาธารณภัย

(๒) ปฏิบัติหน้าที่อื่นตามที่ผู้อำนวยการมอบหมายและตามระเบียบที่กระทรวงมหาดไทย กำหนด

การบริหารและกำกับดูแลอาสาสมัคร การคัคเลือก การฝึกอบรม สิทธิ หน้าที่และวินัยของ อาสาสมัคร ให้เป็นไปตามระเบียบที่กระทรวงมหาดไทยกำหนด

มาตรา ๔๒ ในกรณีที่องค์การสาธารณกุศลหรือบุคคลใคเข้ามาช่วยเหลือการปฏิบัติหน้าที่ ของเจ้าพนักงานในระหว่างเกิดสาธารณภัย ให้ผู้อำนวยการหรือเจ้าพนักงานที่ได้รับมอบหมายมีอำนาจ

					หน้า ๑៩			
ເຄ່່ມ	୭୭୯	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ഠമ്മയി

มอบหมายภารกิจหรือจัดสถานที่ให้องก์การสาธารณกุศลและบุกคลดังกล่าวในการให้ความช่วยเหลือได้ ตามที่เห็นสมควร

เพื่อให้การช่วยเหลือหรือบรรเทาสาธารณภัยเป็นไปอย่างมีประสิทธิภาพ ให้ผู้อำนวยการ แจ้งให้องค์การสาธารณกุศลและบุคคล ที่มีวัตถุประสงค์ในการให้ความช่วยเหลือผู้ประสบภัยที่อยู่ใน พื้นที่ที่รับผิดชอบ ทราบถึงแนวทางการปฏิบัติตามแผนการป้องกันและบรรเทาสาธารณภัยจังหวัด หรือแผนการป้องกันและบรรเทาสาธารณภัยกรุงเทพมหานคร และวิธีการประสานงานในการปฏิบัติหน้าที่

หมวด ๕ เบ็ดเตล็ด

มาตรา ๔๓ ให้ผู้บัญชาการ รองผู้บัญชาการ ผู้อำนวยการ รองผู้อำนวยการ ผู้ช่วย ผู้อำนวยการ และเจ้าพนักงานซึ่งปฏิบัติการตามหน้าที่ในการป้องกันและบรรเทาสาธารณภัยตาม พระราชบัญญัตินี้ เป็นเจ้าพนักงานตามประมวลกฎหมายอาญา และในการปฏิบัติการตามหน้าที่ ดังกล่าว หากได้ดำเนินการไปตามอำนาจหน้าที่ และได้กระทำไปพอสมควรแก่เหตุและมิได้ประมาท เลินเล่ออย่างร้ายแรง ให้ผู้กระทำการนั้นพ้นจากความผิดและความรับผิดทั้งปวง

ในการคำเนินการตามวรรคหนึ่ง หากเกิดความเสียหายแก่ทรัพย์สินของผู้ใดซึ่งมิใช่เป็นผู้ได้รับ ประโยชน์จากการบำบัดภยันตรายจากสาธารณภัยนั้น ให้ทางราชการชดเชยความเสียหายที่เกิดขึ้น ให้แก่ผู้นั้นตามหลักเกณฑ์และวิธีการที่กำหนดในกฎกระทรวง

มาตรา ๔๔ ในกรณีที่ข้อเท็จจริงเกี่ยวกับสาธารณภัยหรือการป้องกันและบรรเทาสาธารณภัย ที่ได้กำหนดไว้ในแผนต่าง ๆ ตามพระราชบัญญัตินี้เปลี่ยนแปลงไปหรือแผนดังกล่าวได้ใช้มาครบ ห้าปีแล้ว ให้เป็นหน้าที่ของผู้ซึ่งรับผิดชอบในการจัดทำแผน ปรับปรุง หรือทบทวนแผน ที่อยู่ใน ความรับผิดชอบของตนโดยเร็ว

มาตรา ๔๕ ให้มีเครื่องแบบ เครื่องหมาย และบัตรประจำตัว สำหรับเจ้าพนักงานและ อาสาสมัครเพื่อแสดงตัวขณะปฏิบัติหน้าที่ในการป้องกันและบรรเทาสาธารณภัย

					หน้า ๒๐			
ເດ່ມ	୭୭୯	ตอนที่	අූම	ก	ราชกิจจานุเบกษา	ග	กันยายน	ഠച്ചതി

เครื่องแบบ เครื่องหมาย และบัตรประจำตัวตามวรรคหนึ่ง ให้เป็นไปตามแบบที่ กระทรวงมหาดไทยกำหนด

ในกรณีที่ผู้บัญชาการ รองผู้บัญชาการ ผู้อำนวยการ หรือผู้ช่วยผู้อำนวยการประสงค์จะแต่ง เครื่องแบบ ก็ให้กระทำได้ตามแบบที่กระทรวงมหาดไทยกำหนด

มาตรา ๔๖ การดำเนินการตามมาตรา ๒๑ มาตรา ๒๒ มาตรา ๒๕ มาตรา ๒๘ หรือ มาตรา ๒៩ ภายในเขตทหารหรือที่เกี่ยวกับกิจการ เจ้าหน้าที่ หรือทรัพย์สินในราชการทหารให้เป็นไป ตามความตกลงเป็นหนังสือร่วมกันระหว่างผู้อำนวยการจังหวัดหรือผู้อำนวยการกรุงเทพมหานคร และผู้บังกับบัญชาของทหารในเขตพื้นที่ที่เกี่ยวข้อง เว้นแต่เป็นกรณีการสั่งการของนายกรัฐมนตรี หรือรองนายกรัฐมนตรี ตามมาตรา ๓๑

มาตรา ๔๙ บรรคาค่าปรับตามพระราชบัญญัตินี้ให้เป็นรายได้ของท้องถิ่น เพื่อนำไปใช้ จ่ายเกี่ยวกับการป้องกันและบรรเทาสาธารณภัยของท้องถิ่นนั้น

มาตรา ๔๘ ห้ามมิให้บุคคลที่ปฏิบัติหน้าที่ในการป้องกันและบรรเทาสาธารณภัย นำเอา ความลับ ซึ่งตนได้มาในฐานะนั้น ๆ ไปใช้เพื่อประโยชน์ส่วนตัว หรือเปิดเผยความลับนั้นแก่ผู้อื่นโดย ไม่มีอำนาจโดยชอบด้วยกฎหมายในประการที่น่าจะเกิดความเสียหายแก่ผู้หนึ่งผู้ใด หรือแก่การ ประกอบอาชีพของผู้นั้น

หมวด ๖ บทกำหนดโทษ

มาตรา ๔៩ ผู้ใดไม่ปฏิบัติตามกำสั่งหรือขัดขวางการปฏิบัติหน้าที่ของผู้อำนวยการตาม มาตรา ๒๑ ต้องระวางโทษจำคุกไม่เกินสามเดือน หรือปรับไม่เกินหกพันบาท หรือทั้งจำทั้งปรับ มาตรา ๕๐ ผู้ใดขัดขวางการคำเนินการของเจ้าพนักงานตามมาตรา ๒๔ หรือการปฏิบัติ ตามกำสั่งของผู้อำนวยการตามมาตรา ๒๕ หรือขัดขวางการปฏิบัติหน้าที่ของเจ้าพนักงานตามมาตรา ๒๖

วรรคสาม ต้องระวางโทษจำคุกไม่เกินหนึ่งปี หรือปรับไม่เกินสองหมื่นบาท หรือทั้งจำทั้งปรับ มาตรา ๕๑ ผู้ใคเข้าไปในพื้นที่ที่ปีคกั้นตามมาตรา ๒๙ (๑) โดยไม่มีอำนาจหน้าที่ตาม กฎหมายหรือตามคำสั่งของผู้อำนวยการ ต้องระวางโทษจำคุกไม่เกินสามเดือน หรือปรับไม่เกินหกพันบาท หรือทั้งจำทั้งปรับ

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ในกรณีที่ผู้กระทำความผิดตามวรรคหนึ่งเป็นเจ้าของหรือผู้ครอบครองอาการหรือสถานที่ที่อยู่ ในพื้นที่ที่ปิดกั้นตามมาตรา ๒๙ (๑) ผู้อำนวยการหรือเจ้าพนักงานซึ่งได้รับมอบหมายจากผู้อำนวยการ จะเรียกบุกคลดังกล่าวมาตักเตือนแทนการดำเนินกดีก็ได้

มาตรา ๕๒ ผู้ใดฝ่าฝืนหรือไม่ปฏิบัติตามกำสั่งอพยพบุคคลออกจากพื้นที่ตามมาตรา ๒๘ ถ้าคำสั่งอพยพนั้นเพื่อเป็นการป้องกันการกีดขวางการปฏิบัติหน้าที่ในการป้องกันและบรรเทาสาธารณภัย หรือฝ่าฝืนกำสั่งตามมาตรา ๒៩ ต้องระวางโทษจำคุกไม่เกินหนึ่งเดือน หรือปรับไม่เกินสองพันบาท หรือทั้งจำทั้งปรับ

มาตรา ๕๓ ในขณะเกิดสาธารณภัย ผู้ใดแต่งเครื่องแบบหรือประดับเครื่องหมายของ อาสาสมัครหรือขององค์การสาธารณกุศล และเข้าไปในพื้นที่ที่เกิดสาธารณภัย โดยมิได้เป็น อาสาสมัครหรือสมาชิกองค์การสาธารณกุศลดังกล่าว เพื่อให้บุคคลอื่นเชื่อว่าตนเป็นบุคคลดังกล่าว ต้องระวางโทษจำคุกไม่เกินสามเดือน หรือปรับไม่เกินหกพันบาท หรือทั้งจำทั้งปรับ

มาตรา ๕๔ ผู้ใคเรี่ยไรหรือหาประโยชน์อื่นใคสำหรับตนเองหรือผู้อื่นโคยมิชอบโดย แสดงตนว่าเป็นอาสาสมักร เจ้าพนักงานหรือผู้ดำรงตำแหน่งอื่นใดในหน่วยงานที่เกี่ยวกับการป้องกัน และบรรเทาสาธารณภัย หรือใช้ชื่อของหน่วยงานที่เกี่ยวกับการป้องกันและบรรเทาสาธารณภัยในการ

ดำเนินการดังกล่าว ต้องระวางโทษจำคุกไม่เกินหนึ่งปี หรือปรับไม่เกินสองหมื่นบาท หรือทั้งจำทั้งปรับ มาตรา ๕๕ ผู้ใดฝ่าฝืนมาตรา ๔๘ ต้องระวางโทษจำคุกไม่เกินหกเดือน หรือปรับไม่เกิน สองพันบาท หรือทั้งจำทั้งปรับ

บทเฉพาะกาล

มาตรา ๕๖ ให้หน่วยงานหรือบุคคลที่มีหน้าที่จัดทำแผนการป้องกันและบรรเทาสาธารณภัย ตามพระราชบัญญัตินี้ ดำเนินการจัดทำแผนการป้องกันและบรรเทาสาธารณภัยตามพระราชบัญญัตินี้ ให้แล้วเสร็จภายในสองปีนับแต่วันที่พระราชบัญญัตินี้ใช้บังกับ การดำเนินการป้องกันและบรรเทา สาธารณภัยในระหว่างที่ยังจัดทำแผนดังกล่าวไม่แล้วเสร็จให้เป็นไปตามแผนที่เกี่ยวข้องที่ใช้บังกับอยู่ใน วันก่อนวันที่พระราชบัญญัตินี้ใช้บังกับ

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มาตรา ๕๓ ให้บรรคาศูนย์ป้องกันและบรรเทาสาธารณภัยเขต กรมป้องกันและบรรเทา สาธารณภัย เป็นศูนย์ป้องกันและบรรเทาสาธารณภัยที่จัดตั้งขึ้นตามมาตรา ๑๑ วรรคสี่ แห่งพระราชบัญญัตินี้

มาตรา ๕๘ บรรดากฎกระทรวง ระเบียบ ข้อบังคับ ประกาศ หรือคำสั่งที่ออกตาม พระราชบัญญัติป้องกันภัยฝ่ายพลเรือน พ.ศ. ๒๕๒๒ และพระราชบัญญัติป้องกันและระงับอัคคีภัย พ.ศ. ๒๕๔๒ ซึ่งใช้บังคับอยู่ในวันที่พระราชบัญญัตินี้ใช้บังคับ ให้ยังใช้บังคับได้ต่อไปเท่าที่ไม่ขัด หรือแย้งกับบทบัญญัติแห่งพระราชบัญญัตินี้

ผู้รับสนองพระบรมราชโองการ พลเอก สุรยุทธ์ จุลานนท์ นายกรัฐมนตรี

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Appendix

<u>หมายเหตุ</u> :- เหตุผลในการประกาศใช้พระราชบัญญัติฉบับนี้ คือ เนื่องจากการปฏิรูประบบราชการตาม พระราชบัญญัติปรับปรุง กระทรวง ทบวง กรม พ.ศ. ๒๕๔๕ ได้จัดตั้งกรมป้องกันและบรรเทาสาธารณภัย ขึ้นเป็นส่วนราชการสังกัดกระทรวงมหาดไทย มีภารกิจหลักในการคำเนินการป้องกัน บรรเทา ฟื้นฟูสาธารณภัย และอุบัติภัย ซึ่งมีผลทำให้งานด้านสาธารณภัยและงานด้านอุบัติภัย ที่เดิมดำเนินการโดยกองป้องกันภัยฝ่าย พลเรือน กรมการปกครอง กระทรวงมหาดไทย และสำนักงานคณะกรรมการป้องกันอุบัติภัยแห่งชาติ สำนักงานปลัดสำนักนายกรัฐมนตรี สำนักนายกรัฐมนตรี มารวมอยู่ในความรับผิดชอบของหน่วยงานเดียวกัน นอกจากนี้กฎหมายว่าด้วยการป้องกันและระงับอัคดีภัย เป็นกฎหมายที่มีสาระสำคัญและรายละเอียดเกี่ยวกับ การป้องกันและบรรเทาสาธารณภัยในด้านของอักดีภัย รวมทั้ง หน่วยงานที่จะต้องปฏิบัติเพื่อให้เป็นไปตาม กฎหมายดังกล่าวก็เป็นหน่วยงานเดียวกัน เพื่อให้การปฏิบัติงานเป็นไปอย่างมีประสิทธิภาพและแนวทาง เดียวกัน ตลอดจนเพื่อให้เกิดความเป็นเอกภาพในการอำนวยการและบริหารจัดการเกี่ยวกับการป้องกันและ บรรเทาสาธารณภัย จึงเห็นสมกวรนำกฎหมายว่าด้วยการป้องกันภัยฝ่ายพลเรือน และกฎหมายว่าด้วย การป้องกันและระงับอักดีภัย มาบัญญัติไว้รวมกัน จึงจำเป็นด้องตราพระราชบัญญัตินี้

Appendix 4: Thailand 4

ACT ON ANCIENT MONUMENTS, ANTIQUES, OBJECTS OF ART AND NATIONAL MUSEUMS, B.E.2504 (1961), Thailand.

ACT ON ANCIENT MONUMENTS, ANTIQUES, OBJECTS OF ART AND NATIONAL MUSEUMS, B.E.2504 (1961)¹

BHUMIBOL ADULYADEJ, REX.

Given on the 2nd Day of August, B.E.2504; Being the 16th Year of the Present Reign.

His Majesty King Bhumibol Adulyadej is graciously pleased to proclaim that:

Whereas it is expedient to revise the law on ancient monuments, antiques, objects of art and national museums; Be it, therefore, enacted by the King, by and with the advice and consent of the Constituent Assembly acting as the National Assembly, as follows:

Section 1. This Act is called the "Act on Ancient Monuments, Antiques, Objects of Art and National Museums, B.E.2504 (1961)".

Section 2. This Act shall come into force after the expiration of thirty days from the date of its publication in the Government Gazette².

Section 3. The following shall be repealed:

(1) The Act on Ancient Monuments, Objects of Art, Antiques and National Museums, B.E.2477; and

(2) The Act on Ancient Monuments, Objects of Art, Antiques and National Museums (No.2), B.E.2486

All other laws, by-laws and regulations in so far as they deal with matters provided herein or are contrary hereto or inconsistent herewith shall be replaced by this Act. 1 As last amended by the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992) (published in the Government Gazette Vol.109, Part 38, dated 5th April B.E.2535 (1992)) 2 Published in the Government Gazette Vol.78, Part 66 dated 29th August B.E.2504 (1961)

Section 4. In this Act:

"ancient monument"³ means an immovable property which, by its age or architectural characteristics or historical evidence, is useful in the field of art, history or archaeology and shall included places which are archaeological sites, historic sites and historic parks;

"antique" means an archaic movable property, whether produced by man or by nature, or being any part of ancient monument or of human skeleton or animal carcass which, by its age or characteristics of production or historical evidence, is useful in the field of art, history or archaeology;

"object of art"⁴ means a thing skillfully produced by craftsmanship which is high valuable in the field of art; "duplicate antique"⁵ means a thing which is a duplicate of an antique or a particular part of an antique registered under this Act or which is in the possession of the Department of Fine Arts;

¹ As last amended by the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992) (published in the Government Gazette Vol.109, Part 38, dated 5th April B.E.2535 (1992))

² Published in the Government Gazette Vol.78, Part 66 dated 29th August B.E.2504 (1961)

³ As amended by section 3 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

⁴ As amended by section 4 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

⁵ As added by section 5, ibid.

"duplicate object of art"⁶ means a thing which is a duplicate of object of art or a particular part of object of art registered under this Act or which is in the possession of the Department of Fine Arts;

"duplicate"⁷ means imitate, replicate or reproduce by any means in order to be like or similar to the original object regardless of its original size, features or material; "competent official" means the person appointed by the Minister for the execution of this Act;

"Director-General" means the Director-General of the Department of Fine Arts; "Minister" means the Minister having charge and control of the execution of this Act.

Section 5.⁸ The Director-General may, in regard to the issuence of permit or licence by him under this Act, entrust a government official of the Department of Fine Arts in a position not lower than a Director or its equivalent to act on his behalf of the Changwat Governor of any locality to act on his behalf in such locality. Such entrustment shall be published in the Government Gazette.

After the publication of entrustment of authority to the Changwat Governor of any locality according to paragraph one, the application for permit or licence shall be filed with the *Changwat* Governor of such locality.

Section 6.⁹ The Minister of Education shall have charge and control of the execution of this Act, and shall have the power to appoint competent officials, issue Ministerial Regulations prescribing fees not exceeding the rates provided in the shedules hereto attached, granting exemption from fees, and prescribing other activities for the execution of this Act.

Such Ministerial Regulation shall come into force upon their publication in the Government Gazette.

CHAPTER I

Ancient Monuments

Section 7. The Director-General shall, for the purpose of keeping, maintaining and controlling ancient monuments under this Act, have the power to cause, by means of notification in the Government Gazette, any ancient monument as he thinks fit to be registered, and to determine such area of land as he thinks fit to be its compound; which area shall also be considered as ancient monument. Cancellation and modification of the same may likewise be made.

If the ancient monument to be registered under the foregoing paragraph is owned or lawfully possessed by any person, the Director-General shall notify in writing the owner or possessor thereof. The owner or possessor shall, if not satisfied therewith, be entitled within thirty days from the date of his or her being aware of the Director-General's notification to apply for an order of the Court requiring the Director-General to stop registration and/or determination of such area of land as ancient monuments, as the case may be. If the owner or possessor fails to apply for the order of the Court or the Court gives, when the case is final, the order rejecting the application, the Director-General shall proceed with the registration.

Section 7 bis.¹⁰ No person shall construct any building according to the law on the control of building construction within the compound of ancient monument registered by the Director-General except permit has been obtained from the Director-General.

In the case where the building being constructed without permit, the Director-General shall have the power to stop the construction and to demolish the building or a part of the building within sixty days from the date of the receipt of the order.

Any person who refuses to stop the construction or to demolish the building or a part of building according to order of the Director-General shall be liable to the offence of refusing the order of official. The Director-General shall demolish the building or a part of that building and the owner, the occupier or the constructor shall have no right to claim damages or proceed with the case whatsoever against the persons executing that demolition.

If the owner does not remove the demolished materials from the ancient monument's compound within fifteen days from the date of the completion of the demolition, the Director-General shall sell such materials by auction. Proceeds of sale after

⁶ ibid.

⁷ ibid.

⁸ As amended by section 6, ibid.

⁹ As amended by section 6, ibid.

¹⁰ As added by clause 1 of the Announcement of the National Executive Council No.308, dated 13th December B.E.2515 (1972)

deduction of demolition and sales expenses shall return to the owner of such materials.

Section 8. All ancient monuments listed and published in the Government Gazette by the Director-General under the law on ancient monuments, objects of art, antiques and national museums before the day of the coming into force of this Act shall also be taken as registered ancient monuments under this Act.

Section 9. In case the registered ancient monument owned and lawfully possessed by any person is deteriorating, dilapidating or being damaged by any means whatsoever, the owner or possessor thereof shall inform the Director-General of the deterioration, dilapidation or damage within thirty days from the date of his or her being aware of its occurrence.

Section 9 bis.¹¹ The ancient monument under section 9 which display to the public for collecting admission fee or any other fees as regular business or yield any benefits whatsoever from such ancient monument, the owner or possessor thereof shall bear the expense of repair, in total or in part, as prescribed by the Director-General.In determining the expense of repair under paragraph one, the Director-General shall appoint a committee of not less than three persons and the owner or possessor shall also be a member.

Section 10.¹² No person shall repair, modify, alter, demolish, add to, destroy, remove any ancient monument or its parts or excavate for anything or construct any building within the compound of ancient monument, except by order of the Director-General, or permit has been obtained from the Director-General. If the permit contains any conditions, they shall be complied with.

Section 10 bis.¹³ The competent official shall have the power to enter any ancient monument for the purpose of inspection as to whether there has been any repair, modification, alteration, demolition, addition, destruction, removal of ancient monument or its parts or any excavation or construction of building within the compound of ancient monument. The competent official shall have the power, for this purpose, to seize or attach any object which is reasonably suspected of excavation within the compound of ancient monument.

The inspection, seizure or attachment under paragraph one shall be made between sunrise and sunset. After an inspection, seizure or attachment has taken place in the Bangkok Metropolitan area, a report shall be made to the Director-General and in other Changwats to the Changwat Governors and the Director-General.

Section 11. The Director-General shall have the power in regard to any registered ancient monument even owned or lawfully possessed, to order the competent official or any person to make a repair or to do by any means whatsoever for restoration or preservation of its original condition; provided that its owner or possessor has first to be notified thereof.

Section 12. In case of transfer of the registered ancient monument, the transferor shall give the Director-General within thirty days from the date of transfer a written information specifying the transferee's name and residence as well as the date of transfer.

The person who acquires ownership of a registered ancient monument by inheritance or by will shall inform the Director-General of such acquisition within sixty days from the date of the acquisition. In case there are many persons acquiring ownership of the same ancient monument and one of the co-owners entrusted to give information of the acquisition of

ownership has given the information within the said period, it shall be taken that all co-owners have given such information.

Section 13.¹⁴ When it is deemed appropriate for preserving the condition, safety, cleanliness and tidiness of the registered ancient monument, the Minister shall have the power to issue a Ministerial Regulation on conducts of visitors during their visit; and may fix admission fee or any other fees. The organizing of visits to ancient monument owned or lawfully possessed by any individual who charge admission fee or any other fees shall be notified in writing prior to the Director-General and shall be complied with the rules, procedure and conditions notified by the Director-General in the Government Gazette.

¹¹ As added by section 7 of the Act on Ancient Monuments, Antiques, Objects of Art and National Meseums (No.2), B.E.2535 (1992)

¹² As amended by section 8, ibid.

¹³ As amended by section 9, ibid.

¹⁴ As amended by section 10 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

Section 13 bis.¹⁵ When it is deemed appropriate for promoting education and publicizing culture and arts, the Director-General shall have the power to give a written permit to an individual to carry out any activity that gain benefit form the compound of registered ancient monument not owned or lawfully possessed by any individual. The person receiving the permit shall bear all expenses incurred in that activity and shall pay ownership fees, remittances, and other fees to the Department of Fine Arts. The payment received shall benefit the Archaeological Fund in accordance with rules notified by the Director-General in the Government Gazette.

CHAPTER II

Antiques and Objects of Art

Section 14.¹⁶ The Director-General shall have the power, if he deems that any antique or object of art not being in the possession of the Department of Fine Arts is useful or of special value in the field of art, history or archaeology, to cause, by means of notification in the Government Gazette, such antique or object of art to be registered. The Director-General shall have the power, if he deems that any antique whether it is registered or not, or any registered object of art should be conserved as a national property, to cause, by means of notification in the Government Gazette, such antique or object of art not to be traded. If he deems that they should become a national property, the Director-General shall have the power or purchase such antique or object of art.

Section 14 bis.¹⁷ When it its deemed appropriate for preservation and registration of antiques or objects of art dating from Ayudhya and earlier periods, the Director-General shall have the power to cause, by means of notification in the Government Gazette, any locality to be an area of survey for a particular antique or object of art. In such cases, the owner or possessor shall inform the numbers, appearances and places at which such antiques or objects of art stored to the Director-General in accordance with the rules, procedure and conditions notified by the Director-General.

When a notification under paragraph one has been made, the Director-General or a person entrusted by him or her shall have the power to enter a dwelling place of an owner or possessor or a place at which antiques or objects of art are stored between sunrise and sunset or during working hours for the benefit of registration. In the case where it is deemed that any antique or object of art is useful or of special value in the field of art, history or archaeology, the Director-General shall have the power under section 14.

Section 15. No person shall repair, modify or alter any registered antique or object of art, unless permit has been obtained form the Director-General. If the permit contains any conditions, they shall be complied with.

Section 16.¹⁸ In case the registered antique or object of art is deteriorating, dilapidating or being damaged or lost or removed from the place at which it is stored, the possessor of such antique or object of art shall inform the Director-General of the deterioration, dilapidation, damage, lose or removal within thirty days from the date of his or her being aware of its occurrence.

Section 17. In case of transfer of the registered antique or object of art, the transferor shall give the Director-General within thirty days from the date of transfer a written information specifying the transferee's name and residence as well as the date of transfer.

The person who acquires ownership of a registered antique or object of art by inheritance or by will shall inform the Director-General of such acquisition within sixty days from the date of the acquisition. In case there are many persons acquiring ownership of the same antique or object of art and one of the co-owners entrusted to give information of the acquisition of ownership has given the information within the said period, it shall be taken that all co-owners have given such information.

¹⁵ As added by section 11, ibid.

¹⁶ As amended by section 12, ibid.

¹⁷ As added by section 13, ibid.

¹⁸ As amended by section 14 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

Section 18.¹⁹ Antiques or objects of art which are the State property and under the custody and care of the Department of Fine Arts are inalienable, except by virtue of law. However, if the number of certain similar antiques or objects of art is in excess of need, the Director-General may permit to transfer them by means of sale or exchange for the benefit of national museums or give them to the excavators as rewards or for a consideration of their service in compliance with rules notified by the Director-General in the Government Gazette.

Section 18 bis.²⁰ Antiques or objects of art which are under the possession of the Department of Fine Arts or are registered and are useful or of special value in the field of art, history or archaeology, the Minister shall have the power to cause, by means of notification in the Government Gazette, such antiques or objects of art to control the duplication.

When a notification under paragraph one has been made, the productions, trade or possession in a place of business of a duplicate antique or duplicate object of art under duplication control thereof shall be complied with the rules, procedure and conditions notified by the Director-General in the Government Gazette. The person who wishes to produce a duplicate antique or duplicate object of art under such duplication control shall inform a list of items to the Director-General and show a sign of duplication on each produced item.

After being informed according to paragraph two, the Director- General shall notify lists of producers and duplicate antiques and duplicate objects of art under duplication control to the Director-General of the Customs Department for the benefit of export or take out of the Kingdom.

Section 19.²¹ Any person wishing to engage in the business of antiques and objects of art not to be traded under section 14 paragraph two must obtain a licence from the Director-General.

The application for a licence and the grant thereof shall be in accordance with the rules, procedure and conditions prescribed in the Ministerial Regulation.

In case the Director-General grants the application, he shall notify the list of the licensees in the Government Gazette. In case the Director-General refuses to grant the application, the applicant is entitled to lodge an appeal in writing to the Minister within thirty days from the date of his or her being aware of such order.

The decision of the Minister shall be final.

Section 19 bis.²² Any person wishing to display antiques and objects of art to public for collecting admission fee or any other fees shall submit prior notification in writing to the Director-General and shall comply with the rules, procedure and conditions notified by the Director-General in the Government Gazette.

Section 19 ter.²³ The licence issued under section 19 shall be valid until 31st December of the year of its issuance. If the licensee wishes to apply for a renewal of his or her licence, he or she shall file an application to the Director-General before the expiration thereof. Having filed the application, he or she may carry on his or her business until such time when the Director-General makes an order refusing the application.

The application for a renewal of licence and the grant thereof shall be in accordance with the rules, procedure and conditions prescribed in the Ministerial Regulation.

In case the Director-General grants the application, he shall notify the list of the licensees in the Government Gazette.

In case the Director-General refuses to grant the application, the applicant is entitled to lodge an appeal in writing to the Minister within thirty days from the date of his or her being aware of such order.

The decision of the Minister shall be final.

If there is an appeal for a renewal of the licence under paragraph three before the decision is made by the Minister, the Minister may give the permission that the appellant may carry on his or her business if he or she so requests.

Section 20.²⁴ The licensee under section 19 shall produce the licence in the conspicuous place of his or her business

¹⁹ As amended by section 15, ibid.

²⁰ As added by section 16, ibid.

²¹ As amended by section 17 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

²² As amended by section 18, ibid.

²³ As added by section 19, ibid.

²⁴ As amended by section 20, ibid.

and he or she shall make a list of the antiques or objects of art or duplicate antiques or duplicate objects of art which are in his or her possession and keep such list within such place in compliance with rules notified by the Director-General in the Government Gazette.

Section 21.²⁵ The competent official shall have the power to enter any place of production, business, exhibition or storage of antiques or objects of art or duplicate antiques or duplicate objects of art between sunrise and sunset or during working hours for the purpose of inspection as to whether the licensee has complied with this Act or whether the antiques or objects of art or duplicate antiques or duplicate objects of art or duplicate antiques or duplicate objects of art not being complied with notification prescribed by the Director-General under section 18 bis in such places. In the case where there is a reasonable cause to suspect that the licensee has not complied with this Act or there are the antiques or objects of art not complied with notification prescribed by the Director-General under section 18 bis, the competent official shall have the power to seize or attach any antiques or objects of art or duplicate antiques or duplicate antiques or objects of art or duplicate objects of art not complied with notification prescribed by the Director-General under section 18 bis, the competent official shall have the power to seize or attach any antiques or objects of art or duplicate antiques or duplicate objects of art or duplicate objects of art for the benefit of legal prosecution.

Section 21 bis.²⁶ In the performance of duties, the Director-General or a person entrusted by him or her or the competent official, as the case may be, shall produce his or her identity card to the owner, the possessor, the licensee or the person concerned at the places being inspected under section 14 bis or section 21 and such person concerned shall provide him with reasonable facilities.

Section 21 ter.²⁷ In the performance of duties, the Director-General or a person entrusted by him or her or the competent official shall be official under the Penal Code.

Section 22.²⁸ No person shall export or take out of the Kingdom any antique or object of art irrespective of whether it is registered or not, unless a licence has been obtained from the Director-General.

The application for a licence and the grant thereof shall be in accordance with the rules, procedure and conditions prescribed in the Ministerial Regulation.

The provisions of paragraph one shall be not apply to objects of art which are not more than five years old and have not been registered and the bringing of antiques or objects of art in transit.

Section 23. Any person being desirous of temporarily dispatching antiques or objects of art out of the Kingdom shall apply to the Director-General for a licence. In case the Director-General gives the order refusing to grant the application, the applicant is entitled to lodge an appeal against the Director-General's refusal to the Minister within thirty days from the date of his or her being aware of such order. The decision of the Minister shall be final.

In case the Director-General deems appropriate or the Minister decides that a licence be issued to the applicant for temporarily dispatching antiques or objects of art out of the Kingdom and the applicant has agreed to comply with the conditions, methods and requirements on deposit of security money and/or payment of penalties as prescribed in the Ministerial Regulation relating thereto, the Director-General shall accordingly issue a licence to the applicant.

Section 23 bis.²⁹ In the case where it is necessary to export or take out of the Kingdom any antiques or objects of art or parts of them which are in the possession of the Department of Fine Arts for the purposes of education, analysis, research, repair or assembly, the Director-General shall have the power to export or take out temporarily of the Kingdom such antiques or objects of art or parts of antiques or objects of art. In case the parts of such antiques or objects of art have to be processed or destroyed in regard to the process of analysis or research, the Director-General may export or take such parts out of the Kingdom without having to bring them back.

²⁵ As amended by section 20 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

²⁶ As added by section 21, ibid.

²⁷ Ibid.

²⁸ As amended by section 22, ibid.

²⁹ As added by section 23 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

Section 24.³⁰ Antiques or objects of art buried in, concealed or abandoned within the Kingdom or the Exclusive Economic Zone under such circumstances that no one could claim to be their owners shall, whether the place of burial, concealment, or abandonment be owned or possessed by any person, become the State property. The finder of such antiques or objects of art shall deliver the same to the competent official or the administrative or police official under the Criminal Procedure Code and is entitled to not more than a reward of one-third of the value of such property.

The Director-General shall appoint a committee of not less than three members to determine the value of property according to paragraph one. The Finder is entitled to appeal against the decision of the said committee to the Director-General within fifteen days from the date of his or her being aware of the decision. The decision of the Director-General shall be final.

Section 24 bis.³¹ In the case where the licence issued under this Act is lost or materially destroyed, the licensee shall file an application for a substitute for the licence to the Director-General within fifteen days from the date of his or her being aware of the loss or destruction.

The application for a substitute of the licence and the issuance thereof shall be in accordance with the rules, procedure and conditions prescribed in the Ministerial Regulation.

CHAPTER III

National Museums

Section 25. There shall be national museums for keeping antiques or objects of art which are the State property.

Any site on which a national museum is to be established or any place required to be a national museum as well as the cancellation of the status of national museum shall be published by the Minister in the Government Gazette.

National Museums existing on the day of the coming into force of this Act shall be national museums under this Act.

Section 26.³² Antiques and objects of art which are the State property under the custody of the Department of Fine Arts shall not be kept in other place than in the national museums. But in case it is unable or unsuitable to keep them in the national museums, they may be, subject to the permission of the Director-General, kept in other museums, temples, or places belonging to the government.

The provisions of paragraph one shall not apply to the case of temporarily displaying antiques or objects of art at any place by permission of the Director-General, or to the case of taking antiques or objects of art out of the national museums for repair by order of the Director-General.

In case of plurality of similar pieces of antiques and objects of art, the Director-General may allow any Ministry, Sub-Ministry or Department to keep some pieces of them.

Section 27.³³ When it is deemed appropriate for preserving the safety, cleanliness an tidiness of national museums, the Minister shall have the power to issue a Ministerial Regulation on conducts of visitors during their visit and may fix admission fee or any other fees.

CHAPTER IV

Archaeological Fund

Section 28. There shall be set up a fund called the "Archaeological Fund" for the expenses of operation profitable to ancient monuments or museum activity.

Section 29. The archaeological fund consists of :

- (1) money acquired under this Act;
- (2) monetary benefits accuring from ancient monuments ;
- (3) donation in cash or property;

³⁰ As amended by section 24, ibid.

³¹ As added by section 25, ibid.

³² As amended by section 26 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

³³ Ibid.

(4) central fund or capital money which, under the law on ancient monuments, objects of art, antiques and national museums, is at the disposal of the Department of Fine Arts on the day of the coming into force of this Act.

Section 30. The keeping and the payment of archaeological fund shall be in compliance with the rules prescribed by the Minister.

CHAPTER IV BIS34

Suspension and Revocation of Licences

Section 30 bis. When any licensee violates or does not comply with this Act, Ministerial Regulation, Notification or rules issued under this Act or conditions imposed by the Director-General, the Director-General shall have the power to suspend the licence for a period of not more than sixty days each time; but in the case where a licensee is prosecuted in the Court for an offence under this Act, the Director-General may suspend the licence pending the final judgement of the Court.

The person whose licence has been suspended shall not be apply for any licence under this Act during the period of such suspension.

Section 30 ter. When it appears that any licensee has received the final judgement of the Court for a violation of this Act or violates the order of suspension, the Director-General shall have the power to revoke his licence.

The person whose licence has been revoked shall not apply for any licence under this Act until the period of two years from the date of the revocation has elapsed.

Section 30 quarter. The licensee shall be notified of the order of suspension and the order of revocation in writing. In the case where the person whose licence has been suspended or revoked is not found or refuses to receive the order, such order shall be posted at the conspicuous place specified in the licence or the domicile of such licensee, and such licensee shall be deemed to have known thereof from the date of posting the order.

The order of suspension and the order of revocation under paragraph one shall be published in the Government Gazette and may propagate in newspaper or by other method.

Section 30 quinque. The person whose licence has been suspended shall have the right to appeal in writing to the Minister within thirty days from the date of his or her being aware of the order.

The decision of the Minister shall be final. The appeal under paragraph one shall not stay the execution of the order of suspension or revocation.

CHAPTER V

Penalties

Section 31.³⁵ Any person who finds any antique or object of art which is buried in, concealed or abandoned at any place under such circumstances that no person could claim to be its owner and converts the same to himself or herself or to other person, shall be liable to imprisonment for a term not exceeding seven years or to a fine not exceeding seven hundred thousand Baht or to both.

Section 31 bis.³⁶ Any person who conceals, disposes, makes away with, or purchases, receives in pledge or otherwise any antique or object of art obtained through the commission of an offence under section 31 shall be liable to imprisonment for a term not exceeding five years or to a fine not exceeding five hundred thousand Baht or to both.

If the offence under paragraph one is committed for commercial purposes, the offender shall be liable to imprisonment for a term not exceeding seven years or to a fine not exceeding seven hundred thousand Baht or to both.

Section 32.³⁷ Any person who trepasses ancient monument or damages, destroys, causes depreciation in value to or makes useless of any ancient monument, shall be liable to imprisonment for a term not exceeding seven years or to a fine not

³⁴ As added by section 27 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

³⁵ As amended by section 28, ibid.

³⁶ As added by section 29 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

³⁷ As amended by section 30, ibid.

exceeding seven hundred thousand Baht or to both.

If the offence under paragraph one is committed against the registered ancient monuments, the offender shall be liable to imprisonment for a term not exceeding ten years or to a fine not exceeding one million Baht or to both.

Section 33.³⁸ Any person who damages, destroys, causes depreciation in value to, makes useless of or loss any registered antique or object of art, shall be liable to imprisonment for a term not exceeding ten years or to a fine not exceeding one million Baht or to both.

Section 34.³⁹ Any person who does not comply with section 9, 12, 13 paragraph two, 14 bis, 16, 17 or 20 or does not comply with the Ministerial Regulations issued under section 13 or 27 shall be liable to imprisonment for a term not exceeding one month or to a fine not exceeding ten thousand Baht or to both.

Section 35.⁴⁰ Any person who violates section 10 or does not comply with the conditions imposed by the Director-General in the licence under section 10, shall be liable to imprisonment for a term not exceeding three years or to a fine not exceeding three hundred thousand Baht or to both.

Section 36.⁴¹ Any person who trades in antiques or objects of art not to be traded by the notification issued under section 14 paragraph two or violates section 15 or does not comply with the conditions imposed by the Director-General in the licence under section 15, shall be liable to imprisonment for a term not exceeding five years or to a fine not exceeding five hundred thousand Baht or to both.

Section 36 bis.⁴² Any person who does not comply with the notification issued under section 18 bis paragraph two or does not inform a list of his produced items to the Director-General or does not show a sign of duplication on his or her produced item under section 18 bis paragraph two, shall be liable to imprisonment for a term not exceeding one year or to a fine not exceeding one hundred thousand Baht or to both.

Section 37.⁴³ Any person who does not comply with section 19 paragraph one shall be liable to imprisonment for a term not exceeding three years or to a fine not exceeding three hundred thousand Baht or to both.

Section 37 bis.⁴⁴ Any person who does not comply with section 19 bis or the notification issued under section 19 bis shall be liable to imprisonment for a term not exceeding six months or to a fine not exceeding fifty thousand Baht or to both.

Section 37 ter.⁴⁵ Any person who obstructs or does not provide reasonable facilities to the Director-General or person entrusted by him or her or the competent official who is performing the duties under this Act shall be liable to imprisonment for a term not exceeding one month or to a fine not exceeding ten thousand or Baht to both.

Section 38.⁴⁶ Any person who, in violation of section 22, exports or takes out of the Kingdom any non-registered antique or object of art shall be liable to imprisonment for a term not exceeding seven years or to a fine not exceeding seven hundred thousand Baht or to both.

Section 39.⁴⁷ Any person who, in violation of section 22, exports or takes out of the Kingdom any registered antique or object of art shall be liable to imprisonment for a term of one year to ten years and to a fine not exceeding one million Baht.

Transitory Provisions

Section 40. Any person who, on the day of the coming into force of this Act, trades in antiques or objects of art or as his or her regular business, displays the same to the public for collecting admission fee shall apply to the Director-General for a licence to that effect within thirty days from the day of the coming into force of this Act.

³⁸ Ibid.

³⁹ As amended by section 31, ibid.

⁴⁰ Ibid.

⁴¹ As amended by section 32, ibid.

⁴² As added by section 33, ibid.

⁴³ As amended by section 34 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

⁴⁴ As added by section 35, ibid.

⁴⁵ Ibid.

⁴⁶ As amended by section 36, ibid.

⁴⁷ Ibid.

The provisions of sections 19 and 20 shall not apply to the person who trades in antiques or objects of art or as his or her regular business, displays the same to the public for collecting admission fee, and has applied for a licence in comformity with the foregoing paragraph, thus as from the day of the coming into force of this Act up to the day of receiving the licence.

Countersigned by :

Field-Marshal S.Dhanarajata Prime Minister

Rates of Fees⁴⁸

(1) Licence under section 19

20,000 Baht each

- (2) Licence under section 22
 - (a) Antiques or objects of art which the Department of Fine Arts deems as dated from Ayudhya and earlier periods, not exceeding 2,000 Baht each
 - (b) Antiques or objects of art which the Department of Fine Arts deems as dated in the period later than
 - Ayudhya period, not exceeding 1,000 Baht each
- (3) Licence substitute 100 Baht each
- (4) Renewal of a licence each time equal to the fee for the licence

⁴⁸ As amended by section 37 of the Act on Ancient Monuments, Antiques, Objects of Art and National Museums (No.2), B.E.2535 (1992)

Appendix 5: Indonesia 1

Tokyo University Foreign Studies Aceh Project for the Preservation of Cultural Heritage - Condition of Damage to Documents in Aceh

(1) Survey of Damage: Dispatch of Researchers from the National Islamic University to Aceh

January 16-20, 2005 "Historical Document Hub Regional Culture Research Center" Project Condition of Damage to Documents in Aceh 2005/03/25 Translated from Edited by Yumi Sugawara Including Video of Conditions

1. Documentation and Information Center of Aceh (PDIA (Pusat Dokumentasi dan Informasi Aceh))

Location: Jl. Prof. Majid Ibrahim I/5, Banda Aceh

- A library mainly used by university students to collect information for writing papers. It was established with the cooperation of Aceh Province and Syiah Kuala University. The main collections are documents donated from the Netherlands and Jakarta. The materials here were better than those in universities.
- 70 manuscripts in Malay, Arabic and Acehnese were collected and stored here.
- The building was destroyed and all documents were washed away, but they would be useless even if they remained in the building. These have all been cleaned up and no traces remain.
- PDIA strongly wishes to receive donations of copied materials and books in order to rebuild (However, books are scheduled to be stored in a museum for some time because the building needs to be repaired first).

2. Research facility on traditional values and history

Balai Kajian Sejarah dan Nilai Tradisional

Location: Jl. Tuanku Hasyim Banta Muda 17, Banda Aceh

- Approx. 15 manuscripts are stored here.
- The building was destroyed and the collection was washed away in a flood or soaked in water.

3. Foundation for Education and Museum of Ali Hasjmi

Yayasan Pendidikan Ali Hasjmi

Location: Jl. Jend. Sudirman 20, Banda Aceh

- This is a library established by the late Ali Hasjmi, who was chairman of the Indonesian Council of Islamic Propagation in Aceh. It collects books related to Islam.
- It contains approximately 50 manuscripts and many historical documents including the personal records of Ali Hasjmi.
- As it was located in a slightly elevated location, the building was not destroyed by the tsunami. However, the floor was covered in around 5cm of water. Furthermore, bookcases fell over in the initial earthquake, leaving all books and other materials on the floor. Not only were they waterlogged, they were also left in that state for approximately one week after the earthquake and tsunami. They were immediately picked up and dried in the sun. (http://www.pikiran-rakyat.com/cetak/2005/0105/14/0804.htm)

 $(\Rightarrow$ This is an incorrect method of saving the materials)

As the bookshelves containing manuscripts did not fall over, the manuscripts were not soaked in water.

- The condition of the manuscripts stored here is quite poor and cloves are used for preservation. They have not been organized. We saw as far as the case where the manuscripts are standing.
- This is a library with poor organization and storage conditions because no expert instruction has been provided, and it was very difficult for researchers to use.

4. Provincial State Museum

Museum Negeri Propinsi

Location: Jl. Sultan Alaidin Mahmudsyah

- It has around 360 manuscripts. The storage conditions are very good.
- The building was largely unaffected by the earthquake or tsunami.
- The curator has philology expertise. When planning manuscript projects in Aceh, the first step should be to obtain the cooperation of this curator.
- 5. Tanoh Abee Library

Dayah Tanoh Abee (Dayah means Islam boarding school)

Location: Seulimeum, Aceh Besar (Approx. 50km from Banda Aceh)

- A boarding school established by Abdul Wahab al-Fairusy in the 19th century. It owns approximately 3500 manuscripts (estimated) (A catalog has been created in the past, but they do not cover the entire collection). The boarding school has the largest collection of manuscripts in Indonesia. The manuscripts were inherited from Ulema and collected from the private sector.
- The building is a traditional Achean design. No effects of the earthquake are evident.
- No steps have been taken to preserve the manuscripts. Not even traditional methods such as the use of cloves have been adopted.
- It is famed for being exclusive, and there are particularly stringent restrictions on use by non-Muslims. (Difficult for non-Acehnese Indonesians to use, but actually tolerant of foreigners.) A UIN representative was given permission to conduct a survey.

6. Regional Public Archives

Badan Arsip

- In the past, this was the West Indonesian branch of the National Archive in Jakarta. It became an independent organization with the decentralization of the government.
- It contains public documents from the 1950s onwards. However, there are also some documents from as far back as the 1920s.
- The are basically closed to the public because some of the public documents are directly related to current political issues. It is difficult for researchers to se the facility.
- All of the items that were on the first floor were washed away by the tsunami. However, documents are usually stored on the second floor. It is believed that only documents recently distributed by the government were located on the first floor.
- 7. Regional Library (Perpustakaan Daerah)
 - · Books for the general public are placed on the first floor. Publications on Aceh are stored on the second floor.
 - Like the public documents, all of the books that were on the first floor were washed away by the tsunami. There was already no sign of books. The second floor was not damaged by the tsunami, but many valuable items were taken by looters.
 - Two vehicles used as mobile libraries were destroyed by the tsunami.
- 8. Private Sector

We obtained information that some manuscripts in the region are still being held by the private sector such as Teupin Raya, Kabupaten Pidie, Awe Geutah Aceh Utara, Samalanga Aceh Utara and Langsa Aceh Timur. Small Dayahs probably still house manuscripts. Overview:

- 1. Manuscripts being held by institutions can e divided into those that cannot be saved (1 and 2) and this that received little damage from the tsunami (3-5).
- 2. However, as the storage conditions were already bad before the earthquake in 3 and 5, instruction on the repair and restoration of manuscripts is required \Rightarrow Necessary to request assistance from libraries and public archives.
- 3. It is necessary to create an inventory and a catalog for 3 and 5. However, as the number of items is so large for 5, there is a high probability that this will take a substantial amount of time. ⇒ It may be necessary to request the dispatch of literature experts from the Indonesian Association for Nusantara Manuscripts.
- 4. In order to gain the trust of the owners for 3 and 5, work was jointly conducted by the Jakarta Islamic State University and the Islamic University in Aceh because personnel with expertise in Islamic manuscripts are required.
- 5. Looking at the videos, 3 needs to be addressed quickly. As 5 suffered very little damage from the earthquake, no urgency is required. (More restoration support than disaster support)
- 6. The National Archive and Mr. Sakamoto have provided instruction on emergency measures in 6 and the National Land Authority (Badan Pertanahan Nasional), but private sector staff could not be invited as was the case for 3 and 5.
- 7. The National Library in Jakarta is providing support for 7.
- 8. It is necessary to survey manuscripts held in the private sector.
- 9. Surveys on the need for support to regional archives are still insufficient.

Information source:

Oman Fathurahman, (PPIM UNI Jakarta)

National Library, National Archive

Teuku Ibrahim Alfian (Acehnese Historian who was formerly a professor from Gadjah Mada University)

Imran T. Abdullah (Formerly a professor of Gadjah Mada University and former visiting professor at the Tokyo University of Foreign Studies).

Yoshimi Nishi

Site No	Name	Location	Manuscript and its Condition	Stored Condition
1	Mesujid Raya Mudiak Padang / Surau Tandikek	Padang Pariaman	Photo01: Smudging of some letters	Photo04: All manuscripts are stored in the cabinet at office
			Photo02:	
2	Mesujid Raya Ampalu VII	Padang	Photo03:	
	Koto Ampalu	Pariaman	Photo08:	Photo10: Manuscripts were stored in a cardboard box
			Photo09:	

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Photo06: Damage on the inner wall of the mosque



Photo07: Interier of the Mosque



Photo11: Landsliding of the road to the village



Photo12: Mosque



Photo13: Damage of the Mosque

Remarks A mosque located in Patamuan district (kec.Patamuan) in Pariaman, that was damaged by the earthquake. Many cracks were noted on the walls and columns of the mosque, but it is still being used for worship services.

A building attached to the mosque is used as an office, and manuscripts are stored on a shelf in the office.

Seven manuscripts are stored, and in several of these, we noted smudging of some letters.

Information of the manuscripts has been indicated in the catalog which was made by Andalas University and TUFS, but desiccant agents and insect repellent are not being used. Also, the digitalization of the manuscripts was not done yet.

A mosque located in Sungai Sarik (Kec. Sungai Sarik) district in Pariaman.

A landslide occurred on the entry road to the village, and for some time after the earthquake the road was impassable. At the time of our survey, the villagers were carrying out works, and bikes and pedestrians were able to pass.

The mosque itself has been damaged and we noted cracks not only on the walls and columns, but also on the floor. However, the damaged part is still being used for worship services. According to Andalas University, at the time of the previous ceremony <u>23 manuscripts</u> were confirmed, but all of them had been moved to the state library for restoration. But it appears that manuscripts from this mosque were buried under a collapsed library building and <u>17 manuscripts</u> were moved to the national library in Jakarta for restoration. Beside those manuscripts, there are few manuscripts are in a box, stored in a wooden dwelling located to the east of the mosque.

Desiccant agents and insect repellent are not being used, and even though the manuscripts are being stored inside, they are not in a case with glass doors, but instead in one box on top of a cabinet against the wall.

3	Surau Ampalu Tinggi	Padang Pariaman	Photo14: Manuscripts were stored in indivisual envelop	Photo15: Stored in the glass cabinet	PI
4	Surau Baru Bintungan Tinggi	Padang Pariaman	Photo18 : Damp documents were air dry in the mosque	Photo19 :Some documents were kept in the envelop	Ph
5	Surau Paseban	Padang	Photo22: Manuscripts in the glass cabinet	Photo23 : The glass cabinet with manuscripts	P

	A place of worship located in Panaman district. Construction of a new mosque has been in progress since before the earthquake, and only the first floor is complete. This new mosque is currently used for worship services. The old mosque was badly damaged by the earthquake and people are not allowed in. There is a dwelling located next to the old mosque, and <u>26 manuscripts are stored there</u> . According to Andalas University, cataloging and digitalization of the manuscripts was completed before the earthquake. In contrast with the previous two sites, manuscripts were stored in individual envelopes and stored in a glass cabinet in a file-box. However, desiccant agents and insect repellent are not being used.				
Photo16 : Mosque					
Photo17 : Inner wall of the mosque was seriously damaged	A place of worship located in Nan Sabaris district in Pariaman state				
Photo20 : Gave was totally collapsed. (front) Final Action of the second secon	The mosque is registered as cultural heritage by BP3. The building registered with BP3 is a wooden mosque, and the grave in front of the mosque has been destroyed apart from its roof. There was little damage to the wooden structure, but the brick extension at the back of the mosque was been damaged. More than <u>16 manuscripts are stored</u> , in the mosque and in a dwelling located next door. This dwelling was destroyed in the earthquake, and the old kitabs, text for Islam studies, stored there got wet in the rain as they sat under the collapsed house. Currently the occupants of the collapsed house are living in the wooden mosque which was not affected by the earthquake. The kitabs and books that were gotten wet are still being dried in the shade in the mosque. The owned kitabs were mainly published in the Middle East and in the West Sumatra, and the collection is a valuable because the kitabs which was published in the West Sumatra were extremely rare. Currently, all the manuscripts are stored in a small room in the mosque, and some of them are stuffed into envelopes and placed vertically. Further, desiccant agents and insect repellent are not being used.				
Photo21 : Mosque is registered as cultural heritage by BP3	A place of working Quray, in the Kets Teacock district (Kee, Kets Teacock) in Dedeca				
	Said to have previously been home to over <u>100 manuscripts, it now has 33 manuscripts. 31</u> <u>manuscripts were listed on the catalog</u> which was made by TUFS and Andalas University. The place of worship is of wooden construction and was not damaged in the earthquake. Manuscripts were stored both in glass cabinets and in cabinets in a small room in the place of worship follow to suggestions by Andalas University. It seems that the former is for important manuscripts, and they are laid down horizontally and stored correctly. It seems that the remaining manuscripts on the shelf have not been sorted out. For both shelves, desiccant agents and insect repellent are not being used.				
Photo 25 · Supran					
				Photo24 : Documents which is kept in the woodern cabinet in a room.	
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6	Surau Darussalam	Agam	Photo 26: Manuscripts	Photo27: Manuscripts were kept in the office	Pł
7	Surau Syattariah	Tanah Datar	Photo29: Manuscrints	Photo30: Manuscripts were stored in the envelop	Pł
8	Provincial Museum	Padang City			P

A place of worship, Surau, in the Agam state and owned four manuscripts. Currently local Muslim often bring their manuscripts and request the Surau to conserve, therefore, Andalas University just started contacting with the place and try to support them in response to the request of this Surau. Manuscripts were stored in office of the place of worship and not well organized. Although there is no damage on the buildings and the manuscripts by earthquake in last Septembre, i <u>t is necessary to take countermeasures against the earthquakes that frequently occur</u> .
A place of worship in Batusangkar district in Tanah Datar State and <u>owned 27 manuscripts.</u> Digitalization of the manuscripts were already completed under the support of British Library. The manuscripts are stuffed into envelopes and stored in the office of the place of worship. The maintanance staff of the Surau graduated from National Islamic high school in Batusangkar and have cooperated with Andalas University to collect and to survey on manuscripts since 2006. Also, the Surau give advice on the manuscripts which were owned by local residents. Also, there is no damage on the buildings and the manuscripts by earthquake in last Septembre, <u>it</u> <u>is necessary to take countermeasures against the earthquakes that frequently occur</u> <u>as same as Site06</u> .
Located in Padang city. Unfortunately, as we visited on Sunday and Director was on the mission to the Netherlands and the curator was not on site, we were unable to go inside and only inspected the interior. It is said that the museum has <u>58 manuscripts</u> . All of them are on the catalog which was made by TUFS and Andalas University and it seems to have no damage on the manuscripts in the earthquake.





Appendix 7: Greece 1

On 20 June 2009, Mr. Koichiro Matsuura, the Director-General of UNESCO, took part in the inauguration of the New Acropolis Museum in Athens, Greece.

Speaking in the presence of the President and Prime Minister of the Hellenic Republic, their Excellencies Karolos Papoulias and Kostas Karamanlis, the Minister for Culture, Antonis Samaris, numerous Heads of State and Government, the President of the European Commission, Mr. Jose Manuel Barroso and Mr. George Anastassopoulos, President of UNESCO's General Conference and Ambassador of the Hellenic Republic to UNESCO, Mr. Matsuura congratulated his hosts on the completion of the museum. Recalling his first visit to the Acropolis and the strong emotion he had felt on seeing the craftsmanship of the work undertaken 2,500 years ago, he observed that "this stunning new home for its artefacts is an important complement to the World Heritage site that will allow visitors to fully appreciate this outstanding heritage of humanity."

"At UNESCO, we believe that museums are places where cultural legacies are safeguarded and transmitted to successive generations. By generating pride and mutual understanding through cultural representations, [they] foster appreciation for cultural diversity," Mr. Matsuura continued.

Congratulating the Hellenic Republic on its commitment to safeguarding heritage for future generations, the Director-General acknowledged its special contribution in the area of the return of cultural property, highlighting an international conference held in Athens in March 2008 and its support for the activities of the International Committee for Promoting the Return of Cultural Property to its Countries of Origin or its Restitution in Case of Illicit Appropriation. In this regard, Mr. Matsuura noted that "at its fifteenth session last month, this Committee adopted a recommendation jointly proposed by the Governments of Greece and the United Kingdom, inviting UNESCO to assist in convening necessary meetings between the two countries with the aim of reaching a mutually satisfactory solution to the issue of the Parthenon Marbles. We stand ready to do so," he concluded.

In a meeting prior to the inauguration, the Director-General and President Papoulias discussed the outcomes of the Regional Summit of Heads of State of South East Europe held in Cetinje, Montenegro, on 4 June last. Mr. Matsuura also paid warm tribute to Ambassador Anastassopoulos's tireless work both in strengthening the bilateral cooperation between UNESCO and the Hellenic Republic and as President of UNESCO's General Conference.

A lunch hosted by Ambassador Anastassopoulos provided the opportunity for wide ranging discussions with Mr. Theodore Dravillas, Secretary of State for Culture, Mrs. Maria Ekaterini Papachristopoulou-Tzitzikosta, the President of the Hellenic National Commission for UNESCO and Mrs. Elena Korka, Director of Antiquities at the Ministry of Culture.

During his brief stay in Athens, the Director-General also had the opportunity to admire the collections of the National Archaeological Museum.

*Author(s):Office of the Spokesperson - La Porte-parole *Source:Flash Info N° 123-2009 *24-06-2009 Appendix 8 : Greece 2

STRENGTHENING DISASTER RISK REDUCTION AT WORLD HERITAGE PROPERTIES: THE OLYMPIA PROTOCOL FOR INTERNATIONAL COOPERATION (UNESCO WORLD HERITAGE CENTRE, 2009)

1. INTRODUCTION: WHAT IS THIS DOCUMENT AND HOW TO USE IT

This document is part of the outcome of a Workshop on Disaster Risk Management at World Heritage Properties, jointly organised in November 2008 at Olympia (Greece) by the Hellenic Ministry of Culture and the UNESCO World Heritage Centre, with a financial contribution from the UNESCO Goodwill Ambassador Mrs. Marianna Vardinoyannis.

During this workshop, which gathered experts and heritage site managers from various regions, participants discussed the scope and contents of a possible "Programme" for reducing disaster risks at World Heritage properties, which would assist States Parties to the 1972 Convention in translating into action the "Strategy for Reducing Risks from Disasters at World Heritage Properties" adopted by the World Heritage Committee in 2007¹. The present document provides a summary of the discussions held at Olympia with regard to this possible Programme.

The participants in the Olympia Workshop recognised that a Programme for reducing disaster risks at World Heritage properties would have a considerable scope and require the joint effort of all the actors engaged in the implementation of the World Heritage Convention. Considering the difficulty of identifying resources for the entire Programme in one time, it was suggested that its implementation could proceed in steps, depending on the availability of funds and the interest of potential donors. It was not to be expected, thus, that this Programme be implemented within a given time frame as a standard project under a single, comprehensive funding, but rather that it may provide a framework under which separate, but related activities could be developed, funded and carried out. For this reason, the present Document makes reference to the "Olympia Protocol for International Cooperation", named after the venue of the above-mentioned Workshop, rather than to a Programme in the more traditional sense.

It is hoped, indeed, that States Parties would use this document as a general framework, or protocol, for developing cooperation among them – possibly through partnerships and twinning arrangements among World Heritage properties sharing similar disaster risks - in the area of disaster risk reduction at World Heritage properties. At the same time, States Parties and other potential donors are encouraged to provide support to enable the UNESCO World Heritage Centre and other partners to ensure the overall coordination of the initiative as well as the implementation of the proposed activities at global level, within the framework of the Strategy approved by the World Heritage Committee. Some activities foreseen under this Document have already been carried out and others may be implemented with funding through the International Assistance scheme under the World Heritage Fund, or with support from States Parties and other donors. The majority of them, however, are currently not funded. The more resources can be mobilised, the larger the scope of the initiative that will be implemented and the more World Heritage sites that will benefit from it.

The present document includes an initial chapter explaining the rationale for its establishment (i.e. why such a protocol is needed), an outline of its main objectives and a description of proposed activities. The latter include both initiatives that would need to be implemented by UNESCO, owing to their global scope, and actions (the majority) that could be carried out directly by States Parties, individually or, more appropriately, in the framework of twinning arrangements among World Heritage sites, as mentioned above. Both the global and individual activities would be framed within a single, coherent

¹ See Document WHC-07/31.COM/7.2, available online from: http://whc.unesco.org/archive/2007/whc07-31com-72e.doc

strategy, where each step contributes to the achievement of the broader aims of the Protocol.

2. RATIONALE: WHY REDUCING DISASTER RISKS

World Heritage properties, as with all heritage properties, are exposed to natural and man-made disasters, which threaten their integrity and may compromise their values.

By disaster we mean here a sudden event whose impact exceeds the normal capacity of property managers, or of a community, to control its consequences. The loss or deterioration of these outstanding properties would negatively impact the national and local communities, both for their cultural importance as a source of identity and of information on the past, and for their socioeconomic value. Experience, moreover, has demonstrated that the conservation of cultural heritage and the transmission of traditional technology, skills, and local knowledge systems, are not just important *per se*, i.e. for their intrinsic historic, artistic or scientific significance, but because they may contribute fundamentally to sustainable development, including the mitigation of disasters. Heritage-sensitive practices, in fact, can assist in significantly reducing the impact of disasters, before, during and after they have taken place. For instance, research in areas affected by seismic activities has shown that buildings constructed with traditional techniques have often proven to be very resilient to quakes, when well maintained, as compared with modern construction. Sustainable land-use practices for agricultural and forestlands act to prevent landslides and floods, which each year cause more casualties than earthquakes in many parts of the world.

Risks related to disasters within heritage sites are a function of their vulnerability to different potential hazards. The recent natural disasters in Bam, Iran, or in the Old Fort of Galle in Sri Lanka are high profile examples of the vulnerability of cultural heritage worldwide. Natural heritage can also be threatened, in exceptional circumstances, by natural disasters. Hazards, however, may be also man-made, such as fire, explosions etc. Accidental forest fires, conflicts, massive refugee movements, bursting of tailing pond dams as in Doñana, Spain, are certainly a concern to natural World Heritage sites. If natural disasters are difficult to prevent or control, hazards resulting from human activities can be avoided, and the vulnerability of heritage sites to both natural and manmade disasters can be reduced, thus lowering the overall risk threatening a property. Despite this, most World Heritage properties, particularly in developing areas of the world, do not have any established policy or plan for managing the risk associated with potential disasters. Existing national and local disaster preparedness mechanisms, moreover, usually do not take into account the significance of these sites and do not include heritage expertise in their operations. At the same time, traditional knowledge and sustainable practices that ensured a certain level of protection from the worst effects of natural hazards are being progressively abandoned. As a result, hundreds of sites are virtually defenceless with respect to potential hazards and consequent disasters. Strengthening disaster risk management for properties inscribed in the World Heritage List, therefore, is necessary to prevent and reduce damage from disasters and preserve their cultural and natural values, thus protecting an essential support for the social and economic wellbeing of their communities.

UNESCO and other partner institutions such as ICCROM, ICOMOS, IUCN and ICOM, have in the past years developed a number of initiatives aimed at strengthening the capacity of site managers to address disaster risk management for World Heritage cultural and natural properties. These drew from concerns originating after the Second World War and renewed in 1992 because of the high and visible incidence of disasters and armed conflict on television in the early 90s. They were part of a general movement from curative approaches to conservation to a concern for preventive approaches, and from managing interventions to managing sites. While the need to strengthen disaster risk management for World Heritage has been stressed in the past, governmental commitments have not yet followed. In particular, the *Kobe-Tokyo Declaration* of 1997 and the *Recommendations from the Kobe Thematic Session on Cultural Heritage Risk Management* in 2005 pinpointed the necessity for better integration of concern for risk in cultural heritage management, and recognition of the value of local and indigenous knowledge in disaster risk reduction. *The Davos Declaration*, adopted in 2006 by the International Disaster Reduction Conference (IDRC), reiterated these principles².

3. OVERALL OBJECTIVES AND STRATEGY FOR IMPLEMENTATION

The overall objective of this Protocol is to provide a general framework for developing cooperation among States Parties in order to translate the *Strategy for Reducing Risks from Disasters at the World Heritage Properties* into concrete actions at the site level.

The Protocol is based on a combination of global and site-based activities complementing each other and contributing to its overall goal. Its main components are:

- 1. The establishment of a Clearing House on Disaster Risk reduction;
- The organization of International Workshops to introduce the 2007 Strategy for Disaster Risk reduction art World Heritage Properties and the scope and contents of the present Protocol for Cooperation. These workshops should also facilitate the identification of pilot sites – and the establishment of twinning arrangements among them – for the implementation of the Protocol;
- 3. The development, mostly through partnerships or twinning arrangements, of disaster risk reduction strategies on pilot properties inscribed on the World Heritage List, selected among those more vulnerable to possible hazards in different regions of the world, and also using, as a methodological reference, the recently developed "World Heritage Resource Manual for Disaster Risk Reduction";
- 4. The organisation of International Workshops to review the progress made at different pilot sites, harmonise the approaches and share the lessons learnt. The experience resulting from these activities will be widely disseminated through publications regional meetings, on line communications, etc.;
- 5. The development of complementary capacity-building, educational and communication initiatives.

4. ACTIVITIES AND EXPECTED RESULTS

A detailed description of the proposed activities is provided here below, arranged according to the three most relevant strategic objectives of the World Heritage Convention, i.e. Conservation, Capacity-Building and Communication, taking into account that the strategic objective of "Community" – adopted by the Committee in 2007 - is integrated within each of these. Activities that could be implemented directly by the States Parties, for example in the framework of twinning arrangements, are marked with an asterisk.

Conservation

4.1. Establishment of a Clearing House on Disaster Risk Reduction

It is proposed to develop a Clearing House of resource materials on Disaster Risk Reduction – possibly at the World Heritage Centre or at ICCROM - including policy texts, guidance, case studies and illustrations, drawing also from submission by States Parties in the context of Nominations and the Periodic Reporting exercise. This would include information on existing initiatives and twinning arrangements between World Heritage properties. ICOM will continue to collect and put at disposal resource material concerning principally the disaster risk reduction of movable heritage.

Expected result: Information and reference materials on disaster risk reduction for World Heritage are accessible to those

² The *Davos Declaration* is accessible online from:

http://www.idrc.info/userfiles/image/PDF_2006/IDRC_Davos_Declaration_2006.pdf

concerned.

4.2. International Workshops³ to introduce the Protocol, to identify pilot sites and facilitate the establishment of twinning arrangements

These international workshops (as many as appropriate and feasible) would involve bringing key management personnel from selected sites together with disaster risk reduction experts for cultural and/or natural heritage, depending on the selected sites. The Protocol for International Cooperation and its strategy for implementation will be presented, and case studies reviewed. In selecting potential sites, attention will be paid to ensure diversity of typologies (including presence of movable heritage), of disaster risks – with consideration given to post-disaster areas and linkages with Climate Change - and of geographical regions, with priority given to properties exposed to multiple hazards.

Expected results: The objective and scope of the protocol for cooperation as well as a methodology for developing disaster risk reduction strategies for each site are introduced. Experiences on disaster risk reduction are shared among management personnel, while concrete twinning arrangements among partner World Heritage sites are developed; understanding of the "Strategy for Reducing Risks from Disasters at World Heritage Properties" (adopted by the World Heritage Committee in 2007) is increased.

4.3*. Workshops to build capacities of concerned stakeholders and launch the development of appropriate disaster risk reduction strategies at selected sites.

These workshops - to be organized once two or more World Heritage properties have decided to cooperate in the framework of a twinning arrangement - will involve key management personnel from each site, local and national-level authorities responsible for reducing disaster risks in each country concerned (i.e. civil defense officials) and international resource persons. A general introduction on Disaster Risk Reduction will be provided, based on the selected sites' case studies, and modalities for long-term cooperation will also be identified through the establishment of time-framed action plans. This would be the first step towards the development of appropriate disaster risk reduction strategies at the concerned World Heritage properties.

Expected results: Capacities among the key stakeholders are built, and a concrete time-framed plan of action is defined for the implementation of activities in the context of established cooperation agreements (e.g. twinning) among States Parties and other partners.

4.4*. Risk Assessment at selected pilot properties

An analysis and assessment of the risks threatening the selected pilot sites and the people living in them will be led by responsible site managers, in collaboration with local civil defence officials and in consultation with disaster risk experts, taking into account existing records of disasters, potential hazards and the vulnerability of the property. This assessment will also provide a complete understanding of existing policies and measures for reducing the impact of disasters (if any) on the World Heritage property, and opportunities for cooperation with other concerned institutions.

Expected results: Risks to the World Heritage property are defined, which will have to be reduced through appropriate identification of potential hazards and vulnerabilities of the site. Priorities for intervention are set up.

4.5*. Socio-economic analysis and research on traditional skills and local knowledge systems relevant to disaster risk reduction

This activity will enable the understanding of the opportunities and threats, resulting in particular from the interaction

³ The Olympia Workshop of November 2008 intended to achieve these objectives, as well as serving as an opportunity for the launching of the Programme and this Protocol for International Cooperation.

between the local communities and the selected World Heritage properties, with regard to the risks associated to disasters. Research will be carried out on traditional land uses, skills, knowledge systems etc. whose continuation or revitalisation might be beneficial to strengthen the preparedness to disaster for the protection of the World Heritage property. Research on traditional knowledge related to movable heritage disaster risk management will also be carried out. At the same time, the study will take into consideration the social and economic feasibility of the integration of this traditional knowledge in the management of risks within the property, making suggestions for its adaptation to modern constraints and requirements.

Expected result: Essential information is provided for the establishment of consultations with the local community and valuable insights on its possible participation in the reduction of disaster risks in the context of the management of their World Heritage property.

4.6*. Inter-institutional Workshops on Disaster Risk Reduction at site level

At this stage of the Protocol for Cooperation, it is proposed to organise an Inter-institutional Workshop at each of the pilot-sites, including representatives from the heritage agency responsible for the protection of the property, and of all other institutions and agencies, both at national and local levels, concerned with disaster risk reduction. The workshop, moderated by an international resource person, will facilitate the exchange of information on perceived risks at the World Heritage property and existing policies and procedures to mitigate the impact of disasters. This will provide essential input for the integration of concern for disaster risks within Management Plans for the World Heritage property.

Expected results: An understanding of the respective needs, roles and capacities with respect to disaster risk reduction for the World Heritage property is shared among participating institutes, and possible weaknesses and the scope for better coordination and integration are identified.

4.7*. Seminars with local community

A Seminar with representatives from the local communities will be held at each selected property in order to sensitise them to the risks from disasters affecting the World Heritage site in or around which they live, and the possible impact of a hazard on their persons and well-being. The Seminar will present and discuss the results of the research (see points 4.4 and 4.5 above) and solicit a reaction from the local communities on its possible direct involvement in disaster risk reduction activities for the protection of the World Heritage property, and the appropriate ways of achieving this.

Expected result: A full understanding of the opportunities and constraints for the integration of local community concerns and capacities related to disaster risk reduction into the Management Plan for the World Heritage property are shared among local communities.

4.8. Mid-term International Workshop to review progress of the activities and validate methodologies for developing an appropriate disaster risk management strategy at site level.

This international workshop, gathering representatives from the pilot sites where activities are being implemented, will enable the review of experiences and learning among the participating sites, and will compare proposals for finalising their respective risk-sensitive management plans.

Expected results: The approach and methodologies being developed within each site are confirmed or reoriented, best practices are shared, and the network among all participants in the initiative is strengthened.

4.9*. Development of disaster risk reduction strategies at selected World Heritage properties

When activities 4.1 to 4.7 are completed, Heritage Conservation Agencies, assisted by international resource persons, will develop the appropriate Disaster Risk Reduction Strategies for their properties, taking into account all the elements gathered throughout the Programme. These will be integrated on one hand into Management Plans for the properties, if existing,

and into existing Disaster Preparedness, Response and Recovery Plans at national and local levels. They will include the identification of indicators for monitoring the effective management of disaster risks at the sites.

Expected result: conservation at selected World Heritage properties is strengthened through improved disaster risk reduction strategies.

4.10*. Follow up at Pilot Properties

A follow-up evaluation is suggested, at each pilot World Heritage property, to assess the impact of the activities carried out on the conservation and management of the sites. This evaluation could take place two years after the completion of activity 4.9 above.

Expected results: lessons from past activities are learnt and corrective measures identified.

Capacity building and Communication

4.11. Publications and dissemination of materials on the web

After the completion of the work at the selected pilot sites, a publication will be prepared, and translated into the official languages of UNESCO. Complementing the "Resource Manual" developed by ICCROM, IUCN and the World Heritage Centre, this publication will provide concrete references and best practices showing how the methodology outlined in the Resource Manual can be applied in practice. The Resource Manual will be also made available on the web, possibly in a more user-friendly format.

Expected result: Publications and materials (including on the web-site of the World Heritage Centre) on disaster risk reduction are disseminated to site managers around the world.

4.12. Distribution of information for each Region

Distribution of the results from the above activities will also take place in conjunction with scheduled regional meetings for each of the five geographic regions of the world, i.e. Africa; Arab States; Asia and the Pacific; Europe and North America; and Latin America and the Caribbean. The staff members of the Heritage Conservation Agencies for each pilot site will be asked to contribute to information sessions and presenting the above-mentioned publication, and to share their experience in helping completing the risk-sensitive Management Plan for their site in the context of their particular region. This component will complement the above publication in building capacities among the various regions of the world.

Expected result: Firsthand knowledge about the development of disaster risk reduction strategies from the pilot sites exchanged.

4.13. Development of a curriculum for a Training Course on Disaster Risk Reduction

Building on the experience of the activities carried out, and on the methodology outlined in the "Resource Manual", it is suggested to develop a curriculum for a short (one or two weeks) course on World Heritage Disaster Risk Reduction, which could possibly become a regular feature of ICCROM's Training programmes. This Course could be offered in different regions of the world, in partnership with the various Category 2 Centres on World Heritage that are being established, using one of the pilot World Heritage properties taking part in the initiative as a case study.

Expected result: Progress is made towards the development of a much-needed training programme which would build capacity on reducing disaster risks among those responsible for the conservation of World Heritage properties.

4.14. Development of a component on Disaster Risk Reduction within the World Heritage in Young Hands School Kit and activities

It is proposed to expand the current School Kit "World Heritage in Young Hands" by introducing a component on Disaster Risk Reduction. The related activities could envisage visits to sites exposed to disaster risks and activities to reduce underlying risk factors.

Expected result: Educational material is developed which would contribute to sensitising the young people to the threats posed by disasters to World Heritage properties and the urgent need to reduce the related risks.

4.15. International Day of Disaster Risk Reduction at World Heritage Properties

It is proposed to celebrate the International Day of Disaster Risk Reduction at World Heritage Properties, in coordination with the existing International Day of Disaster Risk Reduction (early October, every year), to give visibility and raise awareness about this important issue. This annual event will also provide opportunities for conducting drills and educational activities, including exhibitions, at World Heritage properties.

Expected results: Awareness is raised at the local and global level on disaster risks that affect World Heritage properties and ways to reduce them. At the same time, preparedness for effective response is strengthened at site level.

5. IMPLEMENTATION MODALITIES

If resources were made available, the activities under this Protocol for International Cooperation could be coordinated by the World Heritage Centre of UNESCO, possibly through the establishment of a Focal Point, and implemented by various partners according to different modalities, including – as mentioned above – bilateral twinning arrangements.

Global activities such as International Workshops, publications and training courses will be implemented directly by the World Heritage Centre in collaboration with Advisory Bodies and other appropriate partners, including ICOM, the Blue Shield and the UN International Strategy for Disaster Reduction.

As already explained, considering the difficulty of identifying resources for all activities proposed under this protocol for Cooperation, it is envisaged that its implementation could proceed by steps, depending on the availability of funds and the interest of potential donors. The activities described in Section 4 above, on the other hand, lend themselves to a certain degree of flexibility. Site-based activities, for example, could be implemented independently from global ones in the framework of specific "packages", and the number of sites concerned would also depend on the availability of resources and the number of twinning arrangements established. When the Programme reaches a critical mass of ongoing activities, it is proposed to establish an Advisory/Steering Group involving, of course, the Advisory Bodies to the World Heritage Convention, but also UN-ISDR, ICOM and other Members of the Blue Shield, the Council of Europe and other relevant Institutions. The role of this Steering Group would be to review the progress of the Programme and provide orientation for its improvement.