

Report

Workshop on the Development of a National Strategy for Integrated Flood Management for Thailand



Nakhon Pathom
Thailand

19-23 March 2012



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Table of Content

Acronyms	iii
Introduction:.....	1
Background	1
Objectives.....	2
Organization of the Workshop.....	2
Workshop Proceedings	4
Day One: 19 March 2012	4
Day Two: 20 March 2012	8
Day 3, 21 March 2012	19
Day 4, 22 March 2012	24
Main Conclusions of the Workshop.....	24
Day 5: 23 March 2012	27
Annex I: Programme Schedule	28
Annex II: List of Participants	31

NOTE: On request, electronic version of the presentations made during the workshop will be provided as PDF versions on a CD. Requests for CDs should be sent to: neichrodt@wmo.int

Acronyms

AIT	Asian Institute of Technology
APFM	Associated Programme on Flood Management
BMA	Bangkok Metropolitan Administration
DDPM	Department of Disaster Prevention and Mitigation
DMCR	Department of Marine and Coastal Resources
DMR	Department of Mineral Resources
DNP	Department of National Parks, Wildlife and Plant Conservation
DPT	Department of Public works and Town & Country Planning
DSS	Decision support System
DWR	Department of Water Resources
EGAT	Electricity Generation Authority Thailand
EMIT	Emergency Medical Institute of Thailand
EMSC	European - Mediterranean and Seismological Center
EOC	Emergency Operation Center
EU	European Union
FROC	Flood Relief Operations Command
GDACS	Global Disaster Alert and Coordination System
GFZ	German Research Centre for Geosciences
GIS	Geographic Information Systems
GISTDA	Geo-Informatics and Space Technology Development Agency
HAI	Hydro and Agro Informatics Institution
HDRTN	Hydrographic Department
ICT	Information and communication Technology
IFM	Integrated Flood Management
IT	Information Technology
IWRM	Integrated Water Resources Management
JCOMM	Joint Commission for Ocean and Marine Meteorology
JICA	Japan International Cooperation Agency
JMA	Japan Meteorological Agency
KJC	Malaysian Meteorological Service
LAO	Local Administration Office/Organization
LDD	Land Development Department

LIDAR	Light Detection and Ranging
MOAC	Ministry of Agriculture and Cooperatives
MOE	Ministry of Education
MOI	Ministry of Interior
MONRE	Ministry of Natural Resources and Environment
MOST	Ministry of Sciences and Technology
MOT	Ministry of Transport
NDWC	National Disaster Warning Center
NESDB	Office of National Economics and Social Development Board
NOAA	National Oceanic and Atmospheric Administration
NWFPC	National Water and Flood Policy Committee
PTWC	Pacific Tsunami Warning Center
RID	Royal Irrigation Department
RTSD	Royal Thai Survey Department
SCRF	Strategic Formulation Committee for Reconstruction and Future Development
SCWRM	Strategic Formulation Committee for Water Resources Management
TMD	Thai Meteorological Department
USGS	United States Geological Survey
WMO	World Meteorological Organization

Introduction:

Background

Following the 2011 monsoon season, heavy rains triggered both flash floods and riverine floods in several parts of Thailand, spreading through the provinces of Northern, Northeastern and Central Thailand along the Mekong and Chao Phraya river basins. Moreover, in October floods reached the mouth of the Chao Phraya and inundated parts of the capital city of Bangkok, resulting in loss of life, widespread displacement and damage. Almost 14 million people are now reported as having been directly affected. As of November 6, the death toll has risen to 506 deaths and 2 missing persons, as reported by the 24/7 Emergency Operation Center for Flood, Storm and Landslide (EOC). Sixty-five of Thailand's 77 provinces were declared flood disaster zones, and over 20,000 square kilometers (7,700 sq mi) of farmland was damaged.

http://en.wikipedia.org/wiki/2011_Thailand_floods_-_cite_note-EOC_Nov_6-65#cite_note-EOC_Nov_6-65

Based on Integrated Water Resources Management's principles, the Government of Thailand has already developed a National Water Resources Strategic Plan that aims at maximizing the sustainable economic, social and environmental returns on the water resource development, and has recently outlined water management plans including flood prevention measures along the Chao Phraya River. Government of Thailand has established the National Committee for Water and Flood Policy chaired by the prime minister to supervise policy planning of water management. It will be advised by the Strategic Committee for Water Resources Management (SCWRM).

Another committee on water and flood management, chaired by a deputy prime minister or a minister has been set up to execute the action plan in accordance with the policy formulated by the national committee for water and flood policy.

The office of water resources and flood policy and management has been set up in order to integrate and implement all policies. The office is run by its secretary-general appointed by the premier and is supervised by the Office of the Prime Minister.

Following this devastating flood disaster, the Government is evaluating to promote the Integrated Flood Management (IFM) approach.

The IFM approach is relatively new to Thailand and the Thai Meteorological Department (TMD) provided the platform to strengthen national capacity to implement this concept. The TMD also believes that it is strategic to involve all relevant stakeholders in this workshop so as to ensure nationwide support for the implementation of the concept of Integrated Flood Management within existing policies and Plans, such as the Strategic Plan for Water Resources Management. The expected outcome of this workshop had been to help government officials and stakeholders

to understand IFM concept and jointly develop flood management programs in line with this concept. The major approach has been a participatory approach along the lines of mandates and responsibilities of major actors and institutions in flood management in Thailand.

The central theme of the workshop has been the concept of Integrated Flood Management and its implementation in Thailand:

“Integrated Flood Management (IFM) is a process promoting an integrated – rather than fragmented – approach to flood management. It integrates land and water resources development in a river basin, within the context of IWRM, and aims at maximizing the net benefits from the use of floodplains and minimizing loss of life from flooding”. (from: APFM Concept Paper, p. 14)

Objectives

To introduce Integrated Flood Management (IFM) concepts and tools in the framework of Integrated Water Resources Management (IWRM)

To analyze the current flood management situation in Thailand (institutions involved, existing management plans, stakeholders, lessons learned from the 2011 flood disaster.

To develop an IFM concept in support of the Master Plan for Water Resources Management

Organization of the Workshop

On request of the Thai Meteorological Department, the workshop on “Development of National Strategy for Integrated Flood Management (IFM) for Thailand” was co-organized by World Meteorological Organization (WMO) through Associated Programme on Flood Management (APFM), from 19 to 23 March 2012 in Nakhon Pathom and Bangkok, Thailand. The four-day workshop was targeted to policy makers, top- and mid-level managers and professionals in water resources management, disaster management, and land use management of Thailand. The fifth and final day i.e. on 23 March 2012 was observation of World Meteorological Day, where the summary outcomes of the workshop were presented to the Minister for Information and Communication Technology, Government of Thailand.

The program comprised of two parts:

A. Seminar/Workshop for TMD officials and major stakeholders in flood-related issues in Thailand. (19-22 March 2012)

Day 1: Presentations by experts on the present picture of flood management in Thailand, and by WMO on the concepts of IFM.

Day 2: Open discussion on IFM, Assessment of roles and responsibilities in Thailand’s flood management.

Day 3&4: Development of key elements of a flood management strategy, implementation issues and definition of a practical implementation approach, based on ongoing programmes and activities in Thailand.

The detailed programme schedule is attached in the annex I.

B. World Meteorological Day: (23 March 2012)

Day 5: Presentation of the outcomes of the workshop of days 2 to 4. Consultation with experts on the workshop outputs on TMD's IFM strategic framework plan, which shall also discuss on approaches to incorporate IFM in existing flood management plans and action plans. This event generated feedback on the proposed draft IFM Strategic Framework Plan to address floods and its management in Thailand.

Mr. Thanonnat Jaroenwimonnaragul from National Disaster Warning Center presented the summary of the workshop outputs on the behalf of all participants during the World Meteorological Day ceremony in presence of the Minister for Information and Communication Technology. Ministry of Information and Communication Technology is the parent Ministry of the Thai Meteorological Department.

Twenty-two participants representing 15 different government organizations, working in flood management in Thailand and 3 representatives of WMO attended the workshop. The list of participants is presented in annex II.

Workshop Proceedings

Day One: 19 March 2012

Opening Session

Deputy Director General of Thai Meteorological Department (TMD), Mr. Chamnong Kaeochada welcomed the participants of Workshop for development of “National Strategy for Flood Management for Thailand” held at Rose Garden Hotel, in Nakhon Pathom province from 19 to 22 March 2012 by the Thai Meteorological Department (TMD) as the host agency in cooperation with the World Meteorological Organization (WMO).

He recalled that the massive flood threaten Thailand in 2011 caused a tremendous impact to the country. It gave a big lesson to the country to be better prepared and formulated measures before such natural hazards and disaster in future. TMD believed that outputs of the workshop could strongly support to the Master Plan for Water Resources Management undertaken by the Strategic Committee for Water Resources Management (SCWRM) and could be used for planning and making decision by the authorities concerned for country’s flood disasters management in the future.

He reiterated that flood management is not single institution’s responsibility and TMD take part on this management with other relevant agencies. As a Member of, TMD joined an effort with WMO to organize this workshop and availed its role as a facilitator for relevant agencies to brainstorm ideas to achieve the consensus in development of such the national strategy. He thanked all invited agencies sending representatives to participate in the workshop and openly invited all participants to attend the technical seminar on 23 March 2012 to mark the World Meteorological Day during which the workshop outcome would be presented. At last but not least, he expressed his sincere thanks and gratitude to WMO for supporting Thailand in its development of a National Strategy for IFM technically and financially and wished the workshop conducted successfully and meeting its objectives.

The Chief, Hydrological Forecasting for Water Resources Management, WMO, Dr. Wolfgang Grabs expressed his pleasure to see all concerned stakeholders in this workshop and congratulated all for their participation. He recalled the Thailand Flood 2011 and cited the His Majesty’s call for proactive action to flood management in Thailand.

He expressed the World Meteorological Organization (WMO) is a specialized agency of the United Nations. While WMO is not a funding agency; it is the UN system's authoritative voice on Climate, Weather and Water. WMO has been working in the Integrated Flood Management activities for last 11 years by providing technical support to the member countries in developing National Strategy and capacity building in Integrated Flood Management. Governments of Pakistan, Malaysia, and Kenya along with other countries were recently

beneficiaries of WMO support in development of National Strategy for IFM. He further stressed that WMO is not creating parallel document or system but support to the government endeavor of integrated Flood management. He stressed that workshop was meant to support the Steering Committee on Water Resources Management (SCWRM) for the preparation of Master Plan of Water Resources Management in Thailand. He extended his warm welcome to participants and anticipated the active and meaningful participation in this four days workshop.

Workshop began with introduction of the participants, which was followed by two presentations from Thai Meteorological Department and National Economic and Social Development Board respectively.

The first TMD's presentation was on "lesson learned from 2011 Flood". The presentation commenced with the meteorological features of Thailand. Thailand is greatly under the influence of two seasonal monsoons; the Southwest monsoon and the Northeast monsoon. The Southwest monsoon usually blows in from the Indian Ocean between May and October, while the Northeast monsoon comes from the mainland China sweeping across Thailand typically from October to February. In 2011, Thailand received 28% more rain than its average normal precipitation of last 30 years. This excessive rainfall induced massive flood in the history of Thailand. The estimated damage from flood was 1.43 trillion Baht (USD 46.5 Billion) affecting 68 provinces out of 77 provinces in Thailand. Flood killed 813 people, about 14 million people were directly affected and damaged 11.2 million Rai (1.79 million ha) farmland and 7 industries.

Although structural measures are one of the most powerful tools for water resources management, this has not prevented floods that cause widespread damages. Meanwhile non-structural measures such as public understanding of information especially warnings/forecasts and effective data communication are also essential to be achieved. These measures play an important role in water resources management. More than dozen government institutions were involved in the flood response activities. These institutions acted either in isolation or with minimal coordination with each other during 2011 flood response. After this devastating flood, Government of Thailand has initiated various measures to avoid such damages in the future. Initiations are mainly focus on management of reservoir, flood retention areas, low laying areas, improvement of water ways and drainage, tidal fluctuation management and effective participation of people.

The master plan development for water resources management is under way to address the water induced disaster in all three phases before, during and after flood scenarios. The government has also come up with strong voice to have effective coordinated actions from all relevant stakeholders and advocated for single authority mechanism. For this, government has formed different sub committees to oversee policy, strategy, conflict, relief, reconstruction, hydrological cycle observation and master plan of water resources management.

The second presentation of the Office of National Economics and Social Development Board (NESDB) was on “Thailand’s Management Policy after flood 2011”. This presentation provided an overview of Thailand’s planning process and current efforts in flood management. This consists of long term plan and mechanism, strategies for reconstruction and future development, financing sources, action plan for urgent period, and single command authority in dealing with water and flood management. This multi-billion reconstruction and rehabilitation planning is being carried out under direct guidance from the Prime Minister.

The paper emphasized on the need of community participation and coordination among different stakeholders to ensure effective delivery of the services to the victim communities. It also mentioned about the synchronization of master plan with finding of JICA study on Sustainable Flood Mitigation in Chao Phraya River basin. This flood management plan is expected to be prepared with areas segregated into upper, middle and lower river basin reaches.

The role of local community in the SCWRM plan implementation:

The plan is still under discussion and internal consultations within government agencies are going on. Once it is finalized, community will be informed, educated on how to implement plan. At this moment communities are not consulted.

Compatibility of Water Resources Management Plan with existing water related plans and programme

The Ministry of Science and Technology is compiling sectoral and departmental plans and programmes from concerned agencies but mostly they are urgency and short term plans.

“Single Command Mechanism” in flood Management is the baseline for further planning and implementation

By law, the prime minister will have authority to act in a crisis situation through designated committees and mandated institutions.

Session: The Concept of Integrated Flood Management (IFM)

WMO provided an overview of the concept of Integrated Flood Management (IFM) and highlighted the need to view at both sides of floods: Beneficial aspects that have great economic value as well as disastrous aspects. It was emphasized that IFM requires a best mix of all available approaches to flood management that includes both conventional structural as well as non-structural methods.

Session: Legal and Institutional aspects of IFM

WMO presented the “Legal and Institutional aspects of IFM.

Discussion and Issues raised:

◀ Community participation in IFM:

Case studies from South Asian countries are good examples for community participation in IFM. It is suggested to use community participation in flood management tool as guideline document for community participating. The tool is helpful in educating, mobilizing community during flood response, preparedness and recovery actions of the flood management.

◀ Use of Media in IFM:

Media plays an important role in flood management. Media could be used to encourage coordination and cooperation between government and communities including NGOs

Session: Flood Risk Assessment

WMO made a presentation on “Flood Risk Assessment”, highlighting on methods and approaches in risk management.

Discussion and Issues raised:

◀ Responsible agencies/organization

There is no designated agency or organization for flood risk assessment. Different agencies produce various flood mapping products on their own. Flood maps are different from agency to agency. No standard flood risk maps exist in Thailand. In Italy and Switzerland, maps are generally produced at provincial level. However, it depends on resources available. In case of low resources provinces, central government supported. EU has prepared framework for member country to prepared flood hazard map by 2012. This is very important to insurance companies and industries dealing with potentially hazardous materials (such as refineries, chemical industries).

◀ Flood Information

Thailand has no unified and seamless flood information system/mechanism. Flood information are mainly model-based information in scientific terms and generally not in a language easily understood by (rural) communities providing information such as from where flood is coming in, how deep the flood water is and how long it will remain. Thailand is not yet ready to engage in country-wide flood hazard mapping and does not have a flood regulatory system. As an additional commented it was noted that reliable seasonal forecasting is preferred for rule curve adjustment in dam operation to avoid any misuse of water in downstream in irrigation.

◀ Coordination

Ten institutions have a consultation meeting every week for dam operation during the flood season. Forecasted flood information is available to that committee.

Session: Urban Flood Management

WMO made a presentation on “Urban Flood Management”.

Discussion and Issues raised:

◀ Emergency Preparedness and Response

Urban areas like Bangkok need emergency contingency plan. Regulations to be made for retention of flood water through various means as demonstrated for Tokyo, Singapore and Malaysia, provision of emergency stockpiling in the middle floor of the high rise building made as regulatory measure. Emergency contingency plan should be prepared.

◀ Tradeoff between Flood Control and Management

In the context of Integrated Flood Management, it is advisable to have affordable tradeoff between flood control and management based on economic analysis. Highest tide and highest flood level is rare event, it is economic issue to protect from this rare event or allow “controlled damage” on the basis of risk analysis. Trade off between flood protection and management is an economic decision as well as the political and stakeholders perception of permissible risk.

Day Two: 20 March 2012

Day two sessions began with open floor discussion on issues raised by the participants. Raised issues were categorized under six broad headings which were further discussed by six working groups, reporting to the Plenary and consensus-based discussions:

- Institutions & Single Source Forecasting
- Operation & Harmonization of Network and Data Management
- IFM integration in Master Plan of WR
- Flood Mapping
- Community Participation
- Forecasting/Warnings, dissemination of information

Specific Outcomes of the Working Groups

◀ Single stop shopping for Early Warning:

Multiple flood forecasting and warnings from different agencies in a not optimally coordinated manner during the 2011 flood events were amongst major problems that made people confused and concerned with governmental activities. Urgency of having cooperation and single forecast is realized and unity among all institutions is inevitable to send single and reliable warning message to public through appropriate media. Agencies need talk and exchange flood forecasting information internally first, verify the results and then disseminate. There is also need of standard suitable model for the country to forecasting the flood and other hydro-meteorological disaster. One voice policy should be adopted in case of public announcement and warning.

◀ Harmonization of Warning information:

Different agencies have produced flood warnings in their web page, media, using their own models. This information is not uniform and validated and created confusion to general public as well as operational agencies. Hence, an authoritative model for flood forecasting system should be identified/developed and used for notification. For the efficient flood management, institutions require 3-day advance information for deriving reliable forecasting information.

Thailand needs consolidated and coordinated approach in flood forecasting and management. Coordination of concerned institutions should be initiated as follow up activities of this workshop. Such endeavor is helpful to solve present problem in coming up with best forecasting system, harmonizing different data sets and models of forecasting. TMD requested all not to make confusion by giving public warning notification generated based on their own forecasting model. Presently, Media is faster than government agencies in dissemination of flood and other disasters information based on non-verified information.

◀ Integrated Flood Management:

IFM is one component of the IWRM, and outputs of this workshop will be the contribution to the Master Plan of Water Resources Management

Quantitative precipitation forecast and effective flood forecasting systems are important elements in integrated flood management.

TMD has been developing and testing the radar compositing data for short-range rainfall estimation (1-3 hours) in mm. It is expected to be in full operation by the end of 2012.

DWR is working in 10 basins by installation of Telemetry Systems which have 116 automatic rain gauge stations along the river. There are about 864 automatic rain gauge stations for Early Warning System covering 2,374 villages located near mountainous areas.

Experiences of other countries would be helpful for making reliable and efficient rainfall estimation and flood forecasting.

Various kinds of individual experiments and models for flood forecast available on the internet may cause unnecessary confusion to the public. Thailand needs to have a standard approach for delivering the countries' authoritative voice for public warning by dedicated mandated institutions.

Issues of flood management in Thailand

- Institutional and Policy Issues
- Governance System and Political issue
- Communication of flood incidence
- Community education
- Media training
- Educating political personnel
- Adequacy of observation systems
- Forecasting system
- Central data base system (Meta Data Archival)
- Standard Operating Procedures
- Standardization of Data Acquisition
- Emergency/Crisis Situation Handling

DDPM under Ministry of Interior is responsible for Disaster Response and Management. All information related to disaster send to the DDPM for further action. As per prevailing law, all specialized agencies have to mobilize equipment and human resources under their disposal within 48 hours under the directive of DDPM.

Governor is responsible for overall decision. Under leadership of the governor, there are committee representatives from concerned relevant government agencies for disaster response and management. Normally, emergency situations are handled by DDPM at Central- Provincial government at Province to local authorities at community levels.

Community Participation:

Local administration is responsible for community participation and education through provincial government.

Case Studies

Case of France was cited for single stop warning system after established by the order of the then Prime Minister after a series of avoidable flood disasters that had happened as a result of fragmented approach to flood forecasting and management several years ago.

Departmental Presentations

The table below provides a summary of each participating agency in the workshop in flood management.

S. N.	Institution	Highlight of Flood Management Related Activities
	Thai Meteorological Department (TMD)	<ul style="list-style-type: none">- Measure and gather rain data every 15 minutes by telemetering system from over 1000 stations at sub district level- using satellite data information from China, Japan and NOAA, also get radar data but these are recently installed and is in experimental stage with 3 hrs data from radar weather data- are disseminated to government agencies, public communication, media including mobile services
	Royal Irrigation Department (RID)	<ul style="list-style-type: none">- has Strategy and Plan of operation to assess flood hazard and prevent and mitigate water related disasters- Hydrology and management of 17 regional offices- Both structural and non structural measures including flood forecasting, hazard map preparation, model running, coordinating joint flood management committee, Participatory management practice- RID is authorize to command flood manage
	Electricity Generation Authority Thailand (EGAT)	<ul style="list-style-type: none">- Weekly water management and dam operation plan used- Water supply is mainly for irrigation and domestic use and power generation is byproduct- Spillway operation always done with informing to

S. N.	Institution	Highlight of Flood Management Related Activities
		<p>management committee including provincial governor, Weekly meeting convened at RID for dam operation</p> <ul style="list-style-type: none"> - work on volume & depth of PPT not percentage forecasting and prefers to have basin wide with 7 or 3 days forecast and even 30 days forecasting for proper dam operation. - Uncertainty in forecasting cost both social image as well as economic loss to their organization. - usually provides forecasting information to the downstream people on releasing of dam water along with side flow from other streams
	Department of Water Resources (DWR)	<ul style="list-style-type: none"> - just started forecasting system (but not (yet) 24 hour, 7 day operations) - coordinating all agencies for forecasting (monthly meeting) and try to improve the accessibility of flood warning information of the specialized institution like EGAT, RID and others
	National Disaster Warning Center (NDWC)	<ul style="list-style-type: none"> - Multi (4) hazards warning system installed - Strong organizational set up with equipment back up for generation of each hazards warning - Provide information to needy person as well as agencies including DDTM for emergency situation - Four phase of warning systems (see presentation Slide) have been adopted - Using both Domestic as well as international agencies' data sources - SOP develop for different hazards of disaster - Work as advisory group for DPMS - It is watching and warning institution not implementation institution

S. N.	Institution	Highlight of Flood Management Related Activities
	Department of Drainage and Sewerage, Bangkok Metropolitan Administration (BMA)	<ul style="list-style-type: none"> - Control, maintain, improve and construct the drainage system, canal including any construction related to water drainage. - Operate the yearly flood prevention for BMA - Control and operate water treatment plants in Bangkok - Create short-term, medium-term and long-term for drainage in order to prevent flood and waste water disposal - Standardize the construction related to drainage - Collect data relating to flood prevention system for Bangkok and suburban through communication network to proper creation of flood prevention system
	Department of disaster Prevention and Mitigation (DDPM)	<ul style="list-style-type: none"> - Create national plan for disaster prevention and mitigation - Study related issues in order to find measures for public disaster prevention and mitigation - Support government agencies, local administrations, private sectors - Follow up and evaluate the results
	Hydro and Agro Informatics Institution (HAI)	<ul style="list-style-type: none"> - Product of Royal Initiation long ago, and in 2009, officially made public institution under Ministry of Sciences and Technology - Works as knowledge, data warehouse for nation, maintaining Mega Data in collaboration with different data holders' agencies - Make a water report on important water incidences (Flood, Drought, water cycle) - Work closely with communities in managing and supporting community based WR management and Capacity building activities. - Provide DSS support for flood manager that include rainfall estimation and forecasting

S. N.	Institution	Highlight of Flood Management Related Activities
	Hydrographic Department, Royal Thai Navy	<ul style="list-style-type: none"> - Generate and disseminate nautical chart for mariners - Monitor, forecast and report daily peak and low of Chao Phraya River including sea level. - Forecast and report time of sunrise and sunset on daily basis
	Department of Mineral Resources	<ul style="list-style-type: none"> - Planning for preservation, conservation and rehabilitation of geological resources, and the management of geological resources and geology-related activities - Submit opinions for the formulation or amendment of laws, regulations and measures of preservation, conservation and rehabilitation of geological resources - Perform surveying, inspecting, studying, researching, knowledge developing, data providing, knowledge disseminating, technical servicing and international cooperating in geology and geological resources.
	Geo-Informatics and Space Technology Development Agency (GISTDA)	<ul style="list-style-type: none"> - 3 site stations for data collection and Satellite imageries are used in processing of flood damage assessment - Measurement of water level before and after comparison in the field - International Cooperation and received a data (satellite images) for disaster management - Multi satellite, multi platform to in situ data and geospatial information have been used for generating disaster related map - Platform for knowledge sharing both at national and international levels

S. N.	Institution	Highlight of Flood Management Related Activities
	Department of Public works and Town & Country Planning (DPT)	<ul style="list-style-type: none"> - Promote both Structural and non structural measures - Community participation solicited - “Considering the flood risk management in Thailand, It is crucial to give an importance to the integration of structure and non structure measure with the collaboration of involved organization ”
	Department of National Park and Wildlife Conservation	<ul style="list-style-type: none"> - Upstream protection and conservation of the watershed by restoration and rehabilitation of check dams, plantation of Vetivar grass for soil and water conservation in upstream reach of the river basin
	Thai Disaster and Medical Emergency	<ul style="list-style-type: none"> - Providing management, secretary support, inter-agency cooperation according to Emergency Medical Committee - Prevention for emergency condition - Providing pre-hospital care, inter-hospital care and disaster emergency care
	National Economic and Social Development Board	<ul style="list-style-type: none"> - provide opinions and recommendations on national economic and social development to the cabinet - scrutinize the National Economic and Social Development Plan and other proposals before submitting to the cabinet for consideration - set up the coordination mechanism between the NESDB, concerned agencies and state enterprises regarding the planning and implementation of development programs and projects - Currently Master Plan on WRM is ongoing and making sustainable plan is major issue.

Group Discussion

Group discussions were carried out in the six identified board issues. Participants were divided into 3 groups on voluntary basis. Each group consisted of 6 to 8 persons. Groups selected

following three issues for day two discussion sessions. The discussion findings are presented below:

Group Discussion and Findings

Group I: Flood Mapping

(Purpose)

1. Provide the hazard map for watching and warning
 - Flash flood hazard map
 - Riverine flood hazard map
 - Landslide hazard map
2. The agencies to be responsible
 - DDPM, RID, (Royal Thai Survey Department), (GISTDA), (TMD), Local government
3. Data to be required to put in hazard map
 - Boundary of flood)
 - Inundation depth)
 - Velocity
 - Evacuation Center
 - Important location that must be protected
 - Evacuation Route
4. Target Groups to bring hazard map for using
 - The authorities concerned with early warning
 - The agencies involved with policy plan and town & country planning, (Department of Public Works and Town & Country Planning, (the regional and Provincial agencies)
 - The people in the risk area
 - National Disaster Warning Center

Group II: Community Participation

Problems:

- ◀ Community could not receive warnings from government agency
- ◀ There is only one-way communication from government agency to community
- ◀ Villagers have no knowledge what to do to prevent the flood
- ◀ There is no flood map, no escaping routes for community

- ◀ Community has no participation in planning to construct flood prevention such as dams, dikes

Related responsible agencies:

Two main agencies who have people and tools to reach community directly are DDPM and MOI (Ministry of Interior)

Proposed Solutions:

- ◀ Providing training for trainers, representatives from community, to transfer knowledge to community by the government
- ◀ Setting up back-up communication channel for crisis
- ◀ Setting up operation manual for dealing with crisis
- ◀ Providing warning formation that easy to understand
- ◀ Encouraging community to be ready for crisis; having basic needs such as survival bag, drinking water, first-aid kit
- ◀ Encouraging participation of volunteers to dealing with crisis
- ◀ Having delegates from community to be aware of any construction plan and providing compensation to affected people from that construction

Group III: Forecasting/Warnings, dissemination of information

Problems:

- ◀ Forecasts could not provide the needs of agencies perfectly such as amount of rainfall in mm. and basin-based forecasts.
- ◀ Public could not well understand the technical terms from forecasts
- ◀ Unable to specify the depth and duration of flood in flood-affected area
- ◀ Unable to provide warnings for flash flood in time

Related responsible agencies:

TMD, GISDA, DDPM

Proposed solutions:

- ◀ Late of 2012, TMD will apply 1- 3 hour precipitation radars to come up with amount of rainfall forecast in mm.
- ◀ For 24, 36 and 72-hour forecasts, the amount of rainfall will be reported in percents. The advanced system to report these forecasts in mm. is ongoing process of requesting budget for the years of 2012-2014.

- ◀ Assigning agency spoke person to make an announcement with easy to understand statements; and providing training to public relating to forecast information
- ◀ Setting up amendment or law to support warning announcement
- ◀ JICA is working on a project to provide the topology information with pixel size about 2 m and 20 cm accuracy using LIDAR. The project will be finished in August 2012. This information could lead to depth flood forecasts or warnings in local area
- ◀ Creating communication network for upstream in case of heavy rain for flash flood warnings
- ◀ Warning system for upstream area should be set up
- ◀ Doing more research for criteria of possible flash flood event

Day 3, 21 March 2012

Day three sessions commenced with the institutional mapping for integrated flood management in Thailand. The mapping information is derived from contributions from participants during the session and is documented in the table below. The mapping exercise was seen as highly important to then propose single lead-agencies with distinct responsibilities to avoid overlaps in mandates and activities.

Mapping of institutions involved in Flood Management issues in Thailand

Major Components in IFM	Involved Institutions	
	Responsible	Supporting
Policy Development	NESDB, NWFPC	DWR, RID, SCWRM
Protocols/Procedures in flood management	MOI/DDPM, BMA	FROC, EGAT, RID, DWR/
Institutional coordination	NWFPC	Ad hoc
Legal	DDPM	Provincial & local governments
Economic	NESDB	MOI
Environmental	DWR, MONRE	
Social	MOI, Ministry of Social Development and Human Security	
Community outreach	Department of local Administration	Local Government
Disaster prevention and management	DDPM, MOI	Local Governments
Meteorological Forecasting	TMD,	
Hydrological Forecasting (Flood Forecasting)	RID, EGAT, DWR, TMD	HAI, Hydrographic Department (HDRTN)
Flash Floods (Forecasting)	TMD,	DDPM, NDWC
Landslides and mudflows	DMR, TMD, Land Development Department, DWR, RID, National Park Wildlife and Flora,	DDPM, NDWC
Climate change	TMD , MONRE (convention)	MOAC, MOST, NESDB
Dams and Reservoirs	EGAT, RID	LDD
Land use & Land use	DPT, LDD, BMA,	

Major Components in IFM	Involved Institutions	
	Responsible	Supporting
planning		
Urban Planning	BMA, DPT	Local Government
Public warnings	NDWC, TMD,, DDPM	Public Relations Department, LAO
Community outreach	DDPM and LAO	
Flood mapping	RTSD, DDPM, GISTDA, BMA, DWR	DPT, LDD, DMR
Coastal floods	DMCR	HDRTN, TMD
Engineering works	RID, EGAT, DPT, LAO, MOT	
Transboundary rivers	DWR, RID,	
Scientific support	MOST Universities,	GISTDA
Capacity building in flood management	DDPM, LAO, MOE, DMR, TMD, NDWC	
Health	Ministry of Public Health,	DDPM, EMIT

Group discussion:

Again participants were divided into 3 groups to discuss the remaining three issues. The summary of the groups findings are presented below:

Group IV: Institutions & Single Source Forecasting

Based on the tables above, the group provided recommendations for institutional arrangements to show responsible or lead agencies in different forecasting domains together with proposed supporting agencies. The recommendations below were supported by all participants after discussion in the plenary.

Responsible	Supporting
Weather Forecasting	
TMD	Regional National Meteorological Services, Global Centres (such as ECMWF, WMO)
Flash Flood	
TMD	DNP, DMR, DWR, HAI, Universities

Responsible	Supporting
Riverine Forecasting	
RID	EGAT, TMD, DWR, HAIL, HDRTN, Universities, AIT, DPT, GISTDA Etc.
Landslide/ Mud Flow	
DMR	TMD, HAIL, DNP, DWR
Coastal Flood Forecasting	
DMCR	TMD, HDRTN
Tsunami	
NDWC	TMD, HDRTN International sources such as Pacific Tsunami Warning Center (PTWC) Japan Meteorological Agency (JMA) United States Geological Survey (USGS) National Oceanic and Atmospheric Administration (NOAA) European - Mediterranean and Seismological Center (EMSC) Malaysian Meteorological Service (KJC) Joint Commission for Ocean and Marine Meteorology (JCOMM) German Research Centre for Geosciences (GFZ) Global Disaster Alert and Coordination System (GDACS), PTWC, JMA, USGS, NOAA, EMSC, KJC, IOC, GFZ, GDACS

Group V: Operation & Harmonization of Network and Data Management

Problems:

- ↖ Unable to exchange or share data effectively
- ↖ Limitations of data accessibility

Proposed solutions:

- ↖ Assigning an agency, Ministry of Science and Technology (MOST) to be a center for data access and data integration.
- ↖ Inviting all agencies relevant to disaster management to have a data sharing agreement for accessibility
- ↖ Creating web portal with the same standard Metadata for all relevant agencies by MOST

Related data such as

- ◀ Climate and forecast by TMD
- ◀ Capacity of dams by EGAT, RID and Land Development Department (LDD)
- ◀ Basin situation, cultivation, water level and amount of water by RID
- ◀ Daily high/low waters (Tides) and sea level forecast by Marine Department (MD) and Hydrographic Department (HD)
- ◀ Geological structure, risk area by DMR
- ◀ Coastal resources by DMR and Department of Marine and Coastal Resources (DMCR)
- ◀ IT data

Relevant data for particular floods

Flash flood

- ◀ Rainfall and weather forecast, risk area, soil structure, forest zone, types of ground cover plant, soil moisture, topology and GIS

Coastal flood

- ◀ Sea level from buoys, tidal, wind and wave high forecast

Riverine flood

- ◀ Weather forecast, rainfall, tides, dams & water management, irrigation management, flood map, river basin capacity etc.
- ◀ Setting up priority for data accessibility
- ◀ Having representatives from related agencies to participate as a committee in central database management and administration

Group VI: IFM integration in Master Plan of WR

In action plan of Integrated and sustainable flood mitigation in Chao Phraya River basin (Master Plan), there are eight work plans to be implemented. There are supplementary issues to be incorporated into the master plan

1. Work Plan for Restoration and Conservation of Forest and Ecosystem

Additional proposal:

- Formulation of restoration and conservation of forest at upstream area

2. Work Plan for Management of Major Water Reservoirs and Formulation of Water Management

Additional proposal:

- Strongly enforcing the law of conservation of forest at upstream
- Having amendment of environmental Act 1992

3. Work Plan for Restoration and Efficiency Improvement of Current and Planned Physical Structures

Additional proposal:

- Using mathematical (numerical) models for IFM in all possible cases
- Giving more alternative plans for single command authority

4. Work Plan for Information Warehouse and Forecasting and Disaster Warning System

Additional proposal:

- Setting up data communication network among related agencies
- Having standard data accessibility
- Assigning NDWC to be the data center

5. Work Plan for Response to Specific Area

Additional proposal:

- Strongly enforcing the law of city planning with more severe penalty

6. Work Plan for Selecting Water Retention Areas and Recovery Measures

Additional proposal:

- Setting up criteria of construction in floodplain area

7. Work Plan for Improving Water Management Institutions

Additional proposal:

- Using the mechanism of Public Prevention and Relief Act, Public Prevention and Relief Plan and existing related agencies to collaborate and coordinate more effectively

8. Work Plan for Creating Understanding, Acceptance, and Participation in Large Scale Flood Management from all Stakeholders

Additional proposal:

- Encouraging setting up community volunteer, emergency plan for local community
- Raising awareness of community nationwide to issues of public interest

Day 4, 22 March 2012

The day four began with the brief reflection of the previous days' group discussions in plenary. The main conclusions of the workshop are documented below.

Moreover, participants also agreed on the way in which the results of the workshop should be communicated to a larger audience on the occasion of the World Meteorological Day 2012. Participants welcomed that Mr. Thanonnat Jaroenwimonnaragul from National Disaster Warning Center volunteered for the presentation of the summary of the outcomes to the Minister (ICT) and other high officials of Thai Government during the World Met Day programme. The summary of the workshop outcomes are:

Main Conclusions of the Workshop

IFM integration in Master Plan of Water Resources

Recommendations and proposed actions from this workshop should be integrated into national policies and master plans. Further details are mentioned in the group discussion papers, which are part of the final workshop report.

Community Participation

- ◀ Providing training for trainers, representatives from community, to transfer knowledge from the government to community and setting up an operation manual for dealing with crisis
- ◀ Encouraging participation of volunteers to dealing with crisis
- ◀ Having delegates from community to be aware of any flood control measures affecting their property and providing compensation to affected people from that construction

Flood Mapping

- ◀ Flood risk maps should be developed in support of decision making for land-use planning
- ◀ Flood risk maps should be distributed within flood affected communities to enable them to be prepared before and during flooding situations

Flood forecasting and early warnings

Meteorology:

- ◀ Late of 2012, TMD will apply 1- 3 hour precipitation radars to come up with amount of rainfall forecast in mm.
- ◀ Provide for basin-wide precipitation forecasting
- ◀ Improve on Flash Flood Forecasting

Hydrology:

- ◀ Improve and optimize the existing hydrological observation networks, applying real-time observation and telemetry systems
- ◀ Improve data acquisition on cross sections and rating curves
- ◀ Early Warning Systems
- ◀ Create and improve nation-wide communication networks for flood early warnings
- ◀ Provide easy to understand early warning information and develop public awareness programs for crisis situations

Operation and Harmonization of networks

- ◀ Invite all agencies relevant to disaster management to have a data sharing agreement for accessibility of data and information
- ◀ Creating web portal with the same standard Metadata for all relevant agencies by the concerned Ministry
- ◀ Set up an inter-agency technical committee on database management and administration

Institution & Single Source Forecasting and Warning

- ◀ Identified agencies for forecasting and warnings:
 - Weather forecasting and provision of climate information: TMD
 - Flash flood forecasting: TMD
 - Riverine flood forecasting: RID
 - Landslide and mudflow forecasting: DMR
 - Coastal flood forecasting: DMCR
 - Tsunami early warning: NDWC
 - Acting on warnings: DDPM

Explanatory note: forecasting and warning needs to be quantified in terms of amounts (mm rainfall, water level, discharge, wind-speed), intensities, durations, and warning levels. It needs to identify the expected affected areas and the timing of the expected occurrence of the event. Actions arising from the forecasting and warnings issued by each responsible agency are the mandate of DDPM.

Actions required

- Integration of IFM into the Water Resources Management Master Plan.
- The concept of IFM should be taken up as a policy issue by the National Committee for Water and Flood Policy.

- Clearly identify responsibilities of all relevant agencies in regard to their role and mandate on flood management.
- Clearly identify communication channels (Who informs whom, when, on what occasion) in a formalized manner following a communications protocol)
- Strive for better cooperation between different relevant agencies on issues related to flood management.
- Enhance community participation in flood management issues especially with regard to flood preparedness.
- Enhance cooperation at all levels with well established NGOs and institutes of higher learning.

“Where do we go from here?”

Firstly, the first draft outcome of the workshop will be presented at the World Meteorological Day and will receive feedback and suggestions from the audience.

TMD will submit the revised outcomes of the workshop to the agencies concerned in flood management, especially the agencies that sent representatives to participate in this workshop.

TMD will formally send the outcome of the workshop to the ICT ministry which is in charge of Thai Meteorological Department (TMD) for their information and acknowledgement and further submit to the ICT Minister or higher levels or to the committee or subcommittees concerned where it can be utilized and integrated for flood management, especially, in support to the existing Master Plan on Water Resources Management.

The workshop’ participants themselves can further and widely distribute or expand the outcome of the workshop in their network or stakeholders wherever it is possible. -

Main “Messages” for the presentation on World Meteorological Day

A Single Command Centre should be established for flood management operations within the existing structure

Additional Comments

- Necessity to develop criteria for warning levels
- Capacity building at the technical, professional and communication level is a necessity in order to improve the service delivery of agencies

Day 5: 23 March 2012

World Meteorological Day:

Thai Meteorological Department (TMD) organized a special programme to mark the World Met Day observation on 23 March 2012 at TMD premises. Minister of Information and Communication Technology was chief guest of the World Met Day Celebration. The opening ceremony was addressed by Chief Guest, minister for Information and Communication Technology, Chief Hydrological Forecasting and Water Resources Division, WMO Dr. Wolfgang Eric Grabs along with welcome speech from TMD acting Director General Dr. (Ms) Somsri Huntrakul .

Mr. Thanonnat Jaroenwimonnaragul from National Disaster Warning Center presented the summary of the outcomes of the 4 days workshop on the behalf of all participants in the World Met Day ceremony in presence of the Thai Minister for Information and Communication Technology.

Annex I

Programme Schedule

Workshop on National Strategy on Integrated Flood Management (IFM) for Thailand
Thailand, Rose Garden Hotel in Nakhon Pathom province, 19 – 22 March 2012

Time	Day1 – Monday 19 March	Day2 – Tuesday 20 March	Day3 – Wednesday 21 March	Day4 – Thursday 22 March
8:30 - 9:00	Registration			
9:00 - 9:30	Opening (TMD/WMO)	Open discussion: the concept of IFM (All) <i>sharing of experiences with other organizations</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 3: Outcomes and activities – institutional elements and community involvement (All) <i>Plenary or smaller groups</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 5: Actions to be undertaken – the Long term (action plan) (All) <i>Plenary or smaller groups</i>
9:30 - 10:15	Introduction of workshop contents, objectives, scope and purpose, structure of sessions and expected outcomes (TMD/WMO) <i>TMD Introduction first with additional comments from WG</i>			
10:15 - 10:30	Coffee Break			
10:30 - 11:30	Challenges in Flood Management in Thailand and The Way Forward Presentations on lessons learnt from the 2011 flood: room for improvement (TMD)	Review of past and present efforts/activities in flood management in Thailand (All with <i>short presentations by invited organizations</i>) Open discussion: assessment of institutional roles and responsibilities in Thailand’s flood management; <i>short statements on roles and responsibilities of participating representatives from invited organizations</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 3: Institutional elements and community involvement (continued) (All) <i>Plenary or smaller groups</i> <i>Here, we could perhaps save some time and start earlier with Part 4 below</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 6: Actions to be undertaken – the Near term (workplan) (All)
11:30 - 12:00	Basics of Integrated Flood Management - the concept - the principles - the components (WMO) <i>WG-presentation</i>	Identification of challenges and opportunities (such as institutional cooperation, communication, knowledge gaps, forecasting, etc.) (All) <i>Plenary or smaller groups</i>		

Time	Day1 – Monday 19 March	Day2 – Tuesday 20 March	Day3 – Wednesday 21 March	Day4 – Thursday 22 March
12:00-13:30	Lunch Break			
13:30 - 14:30	Legal and Institutional Aspects of IFM Laws and Institutions for flood management: the case of Kenya, Zambia and Pakistan <i>(WMO) GT-presentation</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 1: Key components of a Strategy <i>(All)</i> <i>Plenary or smaller groups</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 4: Structural and non-structural measures (Flood Forecasting and Early Warning) <i>(All)</i> <i>Plenary or smaller groups</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 6: Conclusions and wrap-up <i>(All)</i>
14:30 – 15:00	Flood risk assessment/Mapping <i>(WMO) GT-presentation</i>			
15:00 – 15:15	Coffee Break			
15:15 – 17:00	Economics of floods and flood plain management Urban Flood Management <i>(WMO) WG-presentation</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 2: Objectives and Expected Results <i>(All)</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 4: Structural and non-structural measures (Flood Forecasting and Early Warning) (continued) <i>(All)</i> <i>Plenary or smaller groups</i>	Workshop on “Development of Thailand’s IFM Strategic Framework Plan” - Part 6: Conclusions and wrap-up (continued) <i>(All)</i> <i>Here, we could perhaps save some time</i>

Friday, 23 March 2012

Conference Hall, Thai Meteorological Department's Headquarters

TIME	ACTIVITIES
08.00 - 09.00	Registration
09.00 - 09.30	Opening Ceremony : <ul style="list-style-type: none"> • Introduction to World Meteorological Day 2012 and Technical Seminar by Acting Director-General, TMD • Opening address by Group Captain ANUDITH NAKORNTHAP Minister of Information and Communication Technology (ICT)
09.30 - 10.15	<ul style="list-style-type: none"> • Address and introduction on WMO's activities and roles in support of world community By Dr. Wolfgang Eric Grabs, Chief of Hydrological Forecasting and Water Resource Division (WMO) (15 minutes) • Presentation Workshop Output on Development of Thailand's IFM By Mr. Thanonnat Jaroenwimonnaragul, NDWC (30 minutes)
10.15 - 12.00	<ul style="list-style-type: none"> • Panel Discuss on "Powering our future with weather, climate and water" By : Mr. Prawit Jampunya Director, Central Weather Forecast Division Ms. Kornrawee Sitthichivapak Director, Climatological Division Mr. Boonlert Archevarahuprok Senior Meteorologist, Meteorological Development Bureau Moderator : Dr. Phuwieng Prakhammintara, Senior Meteorologist, Acting Director, Meteorological Instrument Bureau
12.00 - 13.30	<ul style="list-style-type: none"> • Lunch at Ket Udomsak Room, 13th Floor, 50 Years Building
13.30 - 16.30	<ul style="list-style-type: none"> • Presentations of case studies on Meteorology and related matters By : TMD Meteorologists Moderator : Mr. Prasarn Sangwaldech, Senior Meteorologist, Meteorological Development Bureau
16.30 - 17.00	<ul style="list-style-type: none"> • Presentation award to the winner of naming WMD 2012's theme in Thai • Presentation awards to the first three outstanding case studies • Closing address by Acting Director-General, TMD

Annex II
List of Participants

ORGANIZATIONS	PARTICIPANTS
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WMO Presentations:

- III-1. Introduction to Workshop
- III-2. Lessons Learned from 2011 Thailand Flood (TMD)
- III-3. Thailand's Management Policy After 2011 Flood (NESDB)
- III-4. IFM Concept aims and elements
- III-5. Legal and Institutional Aspects of IFM
- III-6. Flood Risk Assessment and Mapping
- III-7. Economic Aspects of IFM
- III-8. Urban Flood Management

Departmental Presentations

- IV-1. Thai Meteorological Department (TMD)
 - IV-2. Royal Irrigation Department (RID)
 - IV-3. Electricity Generation Authority Thailand (EGAT)
 - IV-4. Department of Water Resources (DWR)
 - IV-5. National Disaster Warning Center (NDWC)
 - IV-6. Department of Drainage and Sewerage, Bangkok Metropolitan Administration (BMA)
 - IV-7. Department of disaster Prevention and Mitigation (DDPM)
 - IV-8. Hydro and Agro Informatics Institution (HAI)
 - IV-9. Department of Mineral Resources
 - IV-10. Geo-Informatics and Space Technology Development Agency (GISTDA)
 - IV-11. Department of Public Works and Town & Country Planning (DPT)
 - IV-12. Thai Disaster and Medical Emergency
- Conclusions: Summary Outputs of Workshop (presentation)