

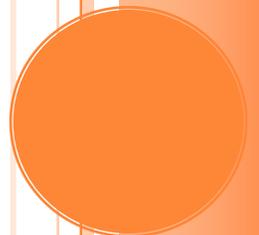
CONSULTANCY MISSION REPORT FOR CAMBODIA

By

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3 October 2014

As part of the project on Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System, three expert consultants, one on meteorology, one on hydrology, and one on disaster risk reduction, conducted a highly successful two-day mission to Cambodia on 1-2 September 2014. The main purpose of the mission was to collect and compile data, information, examples, and diagrams on standard operating procedures (SOPs), good practices, gaps and needs, and recommendations for inclusion in the Manual on Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazard Early Warning System which will meet the needs of the 13 beneficiary countries involved in the Project.





Participants in the Meetings at the Ministry of Water Resources and Meteorology (MOWRAM)

Acknowledgments

This consultancy mission was conducted as part of Activity 1.3 of the Project - Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System. The lead organizations for the project are: the ESCAP/WMO Typhoon Committee; and the WMO/ESCAP Panel on Tropical Cyclones in association with a wide cross section of partner agencies. Very kind appreciation is expressed to the ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries which funded this project; to the Department of Meteorology (DOM) of the Ministry of Water Resources and Meteorology (MOWRAM) and other governmental and non-governmental organizations for their vital assistance, support, and active participation in the successful working-level meetings; and to the Typhoon Committee Secretariat who provided excellent and very time-consuming support, coordination, detailed arrangements, and insights for the mission.

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1. Introduction

1.1 The Economic and Social Commission for Asia and the Pacific (ESCAP) approved a submitted project *Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System* and funded it through the ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries. The ESCAP/World Meteorological Organization (WMO) Typhoon Committee (TC) and the WMO/ESCAP Panel on Tropical Cyclones (PTC) in cooperation with other agencies had recognized a strong need to create synergies in early warning systems among different types of coastal hazards, including tsunami, storm surge, high tide, high wave, strong wind, flood and sediment disasters, by reviewing relevant existing Standard Operating Procedures (SOPs).

2. SSOP Project Overview

2.1 The goal of the SSOP project is to promote community resilience to coastal multi-hazards through effective SOPs for multi-hazards Early Warning System (EWS). The project is collaboration with multiple agencies and organizations. It involves 13 beneficiary countries in TC and PTC regions: Bangladesh; Cambodia; China; India; Lao People's Democratic Republic; Malaysia; Maldives; Myanmar; Pakistan; Philippines; Sri Lanka; Thailand; and Viet Nam. The designated target groups/organizations include National Meteorological and Hydrological Services (NMHSs); National Tsunami Warning Centres; and National Disaster Management Offices (NDMOs) in TC and PTC Member countries.

2.2 Among the planned activities under the project, Activity 1 is to collect, review, analyze, and synergize existing SOPs for coastal multi-hazards EWS in TC and PTC Members and develop a Manual of Synergized SOPs. The third item in Activity 1 is to synergize existing SOPs and develop additional SOPs as needed to meet identified gaps and needs and compile the SSOP Manual for coastal multi-hazards EWS, mainly focusing on the hydro-meteorological aspect, to meet the needs of diverse users, including decision makers, early warning issuers, media, researchers and the public at community level.

2.3 To complete Activity 1.3 and to meet the success indicator, further to the three in-country pilot workshops already carried out in October 2013, two teams of consultants visited 3 targeted countries each in the Panel on Tropical Cyclones region: Maldives, Myanmar and Sri Lanka, and in the Typhoon Committee region: Cambodia, Malaysia and Viet Nam. The missions to the PTC region countries were conducted from 4 to 11 August 2014 and to the TC region countries from 28 August to 5 September 2014.

3. Purposes of the Mission Visits

3.1 The main purposes of the mission visits were:

- (a) To review existing coastal multi-hazards EWS SOPs of hydro-meteorological services, disaster management agencies, media, elected officials, and others from national to district to local levels;

- (b) To identify good practices, gaps and needs, and recommendations for internal and cross-cutting SOPs; and
- (c) To compile data, information, examples, and diagrams collected on SOPs good practices, gaps and needs, and recommendations for inclusion in the Manual on Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazard Early Warning System which will meet the needs of the 13 beneficiary countries involved in the Project.

4. Mission Date and Team Members

4.1 The consultancy mission to Cambodia was carried out on 1 and 2 September 2014 by three consultants: on Meteorology - Dr Tokiyoshi Toya (Japan), Former Regional Director for Asia and the South-West Pacific, WMO; on Hydrology - Mr Abdul Majid (Pakistan), Former Director of the National Flood Forecasting Bureau, Pakistan; and on Disaster Risk Reduction (DRR) - Dr Amir Ali Khan (India).

5. Meeting Programme Overview

5.1 The programme for the two-day working-level meetings for Cambodia was developed, as given below, in collaboration with members/participants from Cambodia, the Project Manager, and the Typhoon Committee Secretariat (TCS), in order to identify: specific existing coastal hazards-related MOUs/SOPs which could be synergized; those which need improvement; and specific areas both technical and non-technical where additional coastal hazards-related SOPs are needed, and to collect recommendations for the SSOP Manual.

Day 1

- Session 1:* Plenary Meeting with all the participants
(for introduction to the SSOP project and mission purposes)
- Session 2:* Meeting on the Questionnaire with participants representing warning services, DRR and media sectors

Day 2

- Session 1:* Meetings on the Early Warning System with participants representing warning services and DRR sectors
- Session 2:* Discussion on the recommendations for the SSOP Manual
- Session 3:* Summary of the Meetings and Results

5.2 The Plenary Meeting was opened by Mr Oum Ryna, Director, Department of Meteorology (DOM) at 09.00 a.m. on 1 September 2014 with a brief introduction of the consultants and participants and of the SSOP project. The list of participants is given in **Appendix I**.

5.3 On behalf of the mission team as well as the Project Manager and TCS, Dr Toya provided presentations on: the Overview of the SSOP project; the Meteorological insights into

SOPs; and Tentative work programme and expectations from participants, with special emphasis on the importance of SOPs.

5.4 Discussions were made, based on the questionnaire response on the existing EWS and SOPs in Cambodia, on the role of SOPs in the integration, collaboration, and coordination needed by the various agencies/organizations, and on what does the SSOP Manual need to contain to help integration, collaboration and coordination.

5.5 The questionnaire was completed through the discussions for clarification and with detailed specific information. The completed Questionnaire Response is given in **Appendix II**.

6. Key Findings

6.1 Early Warning System

6.1.1 Existing Early Warning System

Legal Framework for Disaster Management in Cambodia

6.1.1 In 1995, as a result of the country's experience with regularly occurring disasters, the Royal Government of Cambodia (RGC) established a National Committee for Disaster Management (NCDM), a Ministerial-level Agency, through a Sub-Decree (No. 35 ANKR-BK) signed by the First Prime Minister and Second Prime Minister. The organization and functioning of NCDM was established and amended in 2004 by the King Majesty of the Kingdom of Cambodia, who signed the Royal Decree No SN/RKT/0804/234 (dated 31 September 2004). Accordingly, the mission of NCDM is to lead disaster management activities in the Kingdom of Cambodia.

6.1.2 The Decree outlines an organizational structure and states about the membership of NCDM among the Royal Government of Cambodia Ministries/Institutions. There are 19 Ministries/Institutions of the Royal Government that are members of the Committee, which is chaired by the Prime Minister and seconded by two senior Ministers as First and Second Vice Presidents. According to the Royal Decree, the composition of NCDM is as follows:

- | | |
|-----------------------|---------------------------------------------------------------------------|
| 1. President | Prime Minister |
| 2. 1st Vice-President | High Ranking Official (Senior Minister) |
| 3. 2nd Vice-President | High Ranking Official (Senior Minister) |
| 4. Vice-President | Minister of the Ministry of Interior |
| 5. Vice-President | Minister of the Ministry of National Defense |
| 6. Member | Minister in charge of the Office of the Council of Ministers |
| 7. Member | Minister of the Ministry of Economy and Finance |
| 8. Member | Minister of the Ministry of Foreign Affairs and International Cooperation |
| 9. Member | Minister of the Ministry of Environment |
| 10. Member | Minister of the Ministry of Water Resources and Meteorology |
| 11. Member | Minister of the Ministry of Agriculture, Forestry and Fisheries |
| 12. Member | Minister of the Ministry of Commerce |
| 13. Member | Minister of the Ministry of Health |

14. Member	<i>Minister of the Ministry of Rural Development</i>
15. Member	<i>Minister of the Ministry of Industry, Mine and Energy</i>
16. Member	<i>Minister of the Ministry of Social Affairs, Veterans and Youth Rehabilitation</i>
17. Member	<i>Minister of the Ministry of Public Works and Transport</i>
18. Member	<i>Minister of the Ministry of Education, Youth and Sports</i>
19. Member	<i>Minister of the Ministry of Women Affairs</i>
20. Member	<i>Representative of the Commander in Chief of the Royal Cambodian Armed Forces</i>
21. Member	<i>Representative of the Chairman of the National Society of Cambodian Red Cross</i>
22. Member	<i>Secretary of State of the State Secretariat of Civil Aviation</i>

6.1.3 According to the Royal Decree, the main functions and responsibilities of NCDM are:

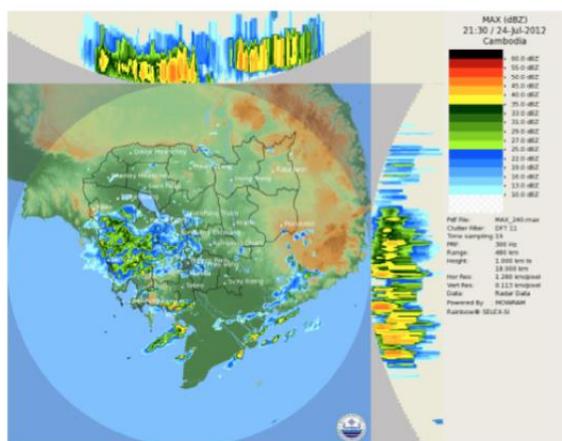
- To study, monitor, assess, collect, analyze and manage the disaster risk data and develop the disaster situation reports to be submitted to the Royal Government with recommendations in order to issue principles, policy, circulars, declaration and measures undertaken for disaster management;
- To put forward a proposal to the Royal Government on reserves, funds, fuel, means of working, equipment and human resources for disaster prevention, emergency response and post disaster management;
- To coordinate with the Ministries/Institutions of the Royal Government, UN agencies, International Organizations/other International Communities, NGOs, National Associations, and Local Donors in order to appeal for aid for emergency response and post-disaster management/rehabilitation;
- To disseminate disaster management-related activities to communities and strengthen the hierarchy from national level (i.e., concerned Ministries/Institutions) to the Provincial/Municipal/District/Commune level for effective disaster management;
- To develop human resources through skill training activities for the capacity building of the officials in-charge of disaster management at national level in related ministries/institutions, at provincial/municipal, district, commune and village level; and
- To organize public awareness and education programmes/activities for vulnerable communities about the natural and man-made disaster risks.

6.1.4 NCDM works in all stages of disaster management. There is a Contingency Plan at national/provincial level, which defines the roles and responsibilities of all stakeholders at all levels and during all stages of disaster management. The Contingency Plan also highlights the steps to be taken for disaster management. There is a General Secretariat of NCDM, which acts as headquarters for NCDM. *[See DRR Aspects below for the structure and main activities of key Departments of the General Secretariat of NCDM.]*

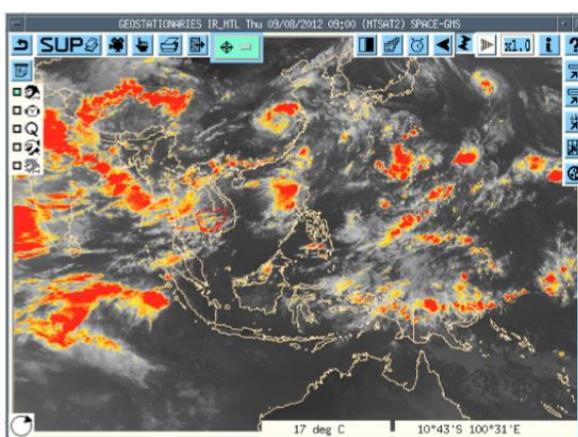
6.1.5 The year 2008 is a milestone year for disaster risk management in Cambodia, when the “Strategic National Action Plan for Disaster Risk Reduction” (2008-2013) was launched by the Government. The Strategic Plan sets out clear priorities for disaster management in Cambodia for the plan period. The Plan is revised every five years and the next Plan is expected to be

Message Switching System (MSS). At a local level, 24 Hydro-Meteorological Offices are established at provinces and municipalities under the Provincial Departments of Water Resource and Meteorology.

6.1.9 A S-band Doppler weather radar (SELEX - Gematronik) was installed in February 2012, with the government funding, at the premises of MOWRAM/DOM in Techo Sen, Phnom Penh, which became operational in April 2012. The visualization and manipulation of MTSAT satellite imagery are made with the SATAID (Satellite Animation and Interactive Diagnosis) software provided by the Japan Meteorological Agency (JMA). The GTS MSS was furnished with the assistance of Japan (JMA and the Japan International Cooperation Agency (JICA)) and WMO in 2006.

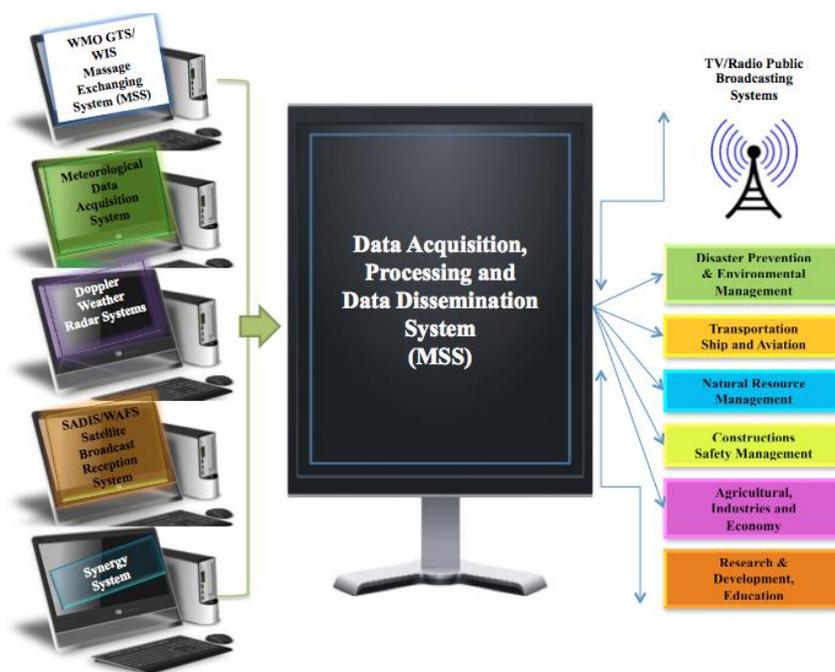


Doppler Radar Image (Range: 480 km)

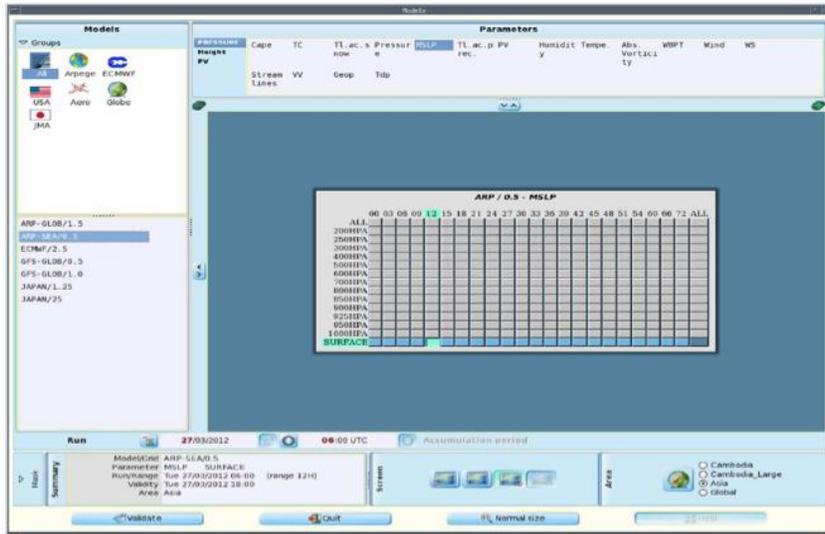


MTSAT Satellite Image

6.1.10 The observed data are collected by phone, e-mail, SNS and SSB. The observed domestic data and global data and information collected via the GTS from various sources (including JMA, BOM, Hong Kong Observatory, NOAA/ National Weather Service (NWS) and TMD) are managed with the message switching system (MSS) at the DOM headquarters for analysis and forecasting, and also for data sharing with key users. The figure on the right shows the flow of the collected data and information.

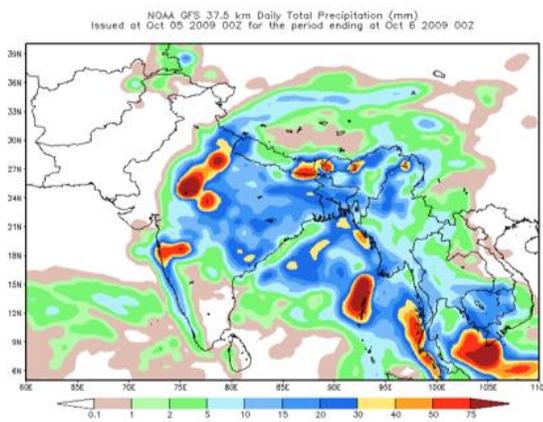


6.1.11 The data analysis, data processing and forecast production are made with the “Synergie” system - a weather analysis and forecasting system, installed by the Météo-France International (MFI) in 2012 as part of the modernization project of MOWRAM. The “Synergie” system allows the forecasters to: easily access to the necessary data and information; to automate their daily tasks; and (with the “MeteoFactory” system) to prepare customized products and warning messages for dissemination on the Website.



SYNERGIE: Graphical User Interface

6.1.12 The advisories and warnings are issued for heavy rain, gusty wind, severe thunderstorm and lightning, as well as for tropical cyclone and storm surge, using the Synergie system and with reference to global data and information through the GTS (see also paragraph 6.1.1o) and the Numerical Weather Prediction (NWP) products of the Global Forecast System (GFS) of US NWS; of JMA as well as Typhoon Forecasts by the RSMC Tokyo - Typhoon Center, the Joint Typhoon Warning Center (JTWC, Hawaii), the Hong Kong Observatory, the European Centre for Medium-Range Weather Forecasts (ECMWF), the Korea Meteorological Administration (KMA) and NOAA/NWS (see below).



Forecast Rainfall by GFS Model



Typhoon Track Forecasts by JTWC, JMA and Hong Kong Observatory

Some examples of forecasts and warnings issued by DOM are presented in [Appendix III.1](#) and [Appendix III.2](#), respectively. [Appendix III.3](#) shows an example of “Announcement” (i.e., advisory/warning) in Khmer and English on weather situation in the case of heavy rain, which was signed by the Minister of MOWRAM.

6.1.13 The advisory/warning messages contain the following:

- Issuance time;
- Warning statements on potential disasters including warning areas and period of warning in effect;
- Potential disasters (flood/Inundation in cooperation with the Department of Hydrology and River Works (DHRW)); and
- Quantitative forecasts (period of warning in effect).

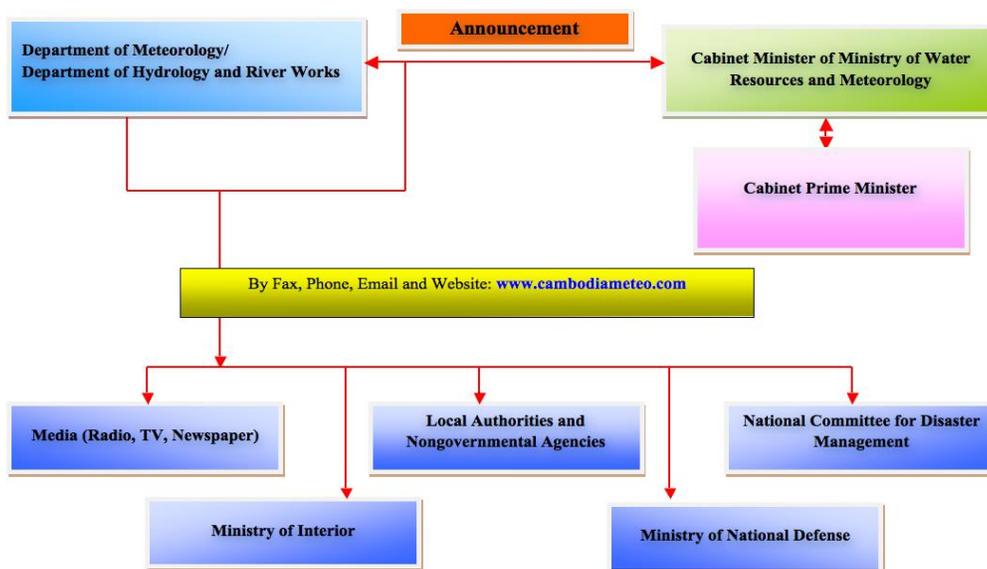
The Flood/Inundation Warning (by DHRW) contains:

- Issuance time;
- Explanatory note on potential risks;
- Targeted municipalities or provincial area; and
- Actions required.

Examples of strong wind warning, heavy rain warning and high-water level warning are given in [Appendix III.4](#).

6.1.14 Bulletins for meteorological disasters are issued to call the public’s attention to weather conditions prior to the issuance of Warnings/Advisories and/or to supplement the Warnings. In addition, bulletins for inundation/flood on exceptionally heavy rain are issued when it happens only once in several years, observed or analyzed once a day.

6.1.15 The weather and flood forecasts and tropical cyclone and flood warnings are disseminated, by Website, fax, e-mail and phone, to the (national and local) government authorities, media and private sector (Cambodian Red Cross: CRC). DOM directly reports the messages to the Minister of MOWRAM and issues the messages to the general public through media (TV, radio and newspapers). In case of urgent warning, DOM provides an “Announcement” to the Minister of MOWRAM, and then the Minister reports to the Prime Minister. The Minister of MOWRAM and/or the Director of DOM make live announcement of warnings on television and over radio. At the same time DOM (and the Department of Hydrology and River Works (DHRW)) disseminate(s) the warnings to NCDM, the Ministry of Interior, the Ministry of Defense, local authorities and non-governmental organizations (NGOs), and the mass media. The diagram below shows the dissemination process of the warnings from DOM/DHRW. *[See also [Appendix V](#) for Dissemination of Forecasting and Early Warning Information.]*



Warning Dissemination Chart

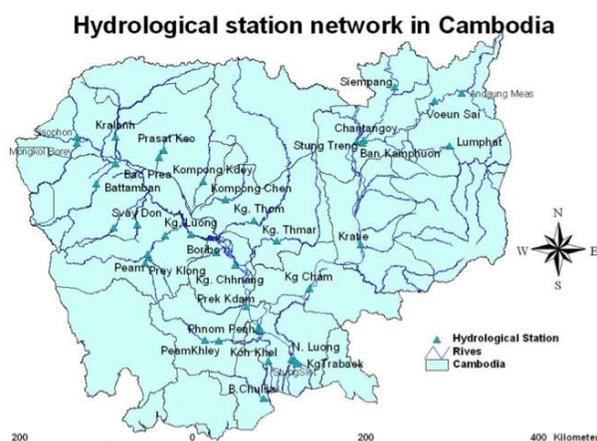
6.1.16 Part of dissemination/communication measures (phones and SMS) is two-way and interactive for confirmation that warnings have been received at the community level. DOM receives acknowledgement confirming the receipt of warning through e-mail, mobile phone and SMS.

Hydrological Aspects

6.1.17 Flood is the most frequent and severe natural hazard in Cambodia. Cambodia is naturally susceptible to river flooding during the main monsoon season. Localized flooding caused by monsoon thunderstorms is also a serious threat as this phenomenon periodically sweeps through the country. Flood forecasts/warnings are issued by the Department of Hydrology and River Works (DHRW).

6.1.18 DHRW was established in 1999 under the Ministry of Water Resources and Meteorology (MOWRAM). The responsibilities of DHRW include: monitoring of water level, water discharge and sediment in the river basins system; exchange of the hydrological information; issuing forecasts and early warnings of possible flood and drought situations; and having appropriate measures of mitigation of such situations in time.

6.1.19 River monitoring for the whole of the Mekong River basin is carried out under a project established under the Mekong River Commission (MRC). The telemetric system of river water-level recordings is established and the data is transmitted on line, not only for the river stations in Cambodia, but also for

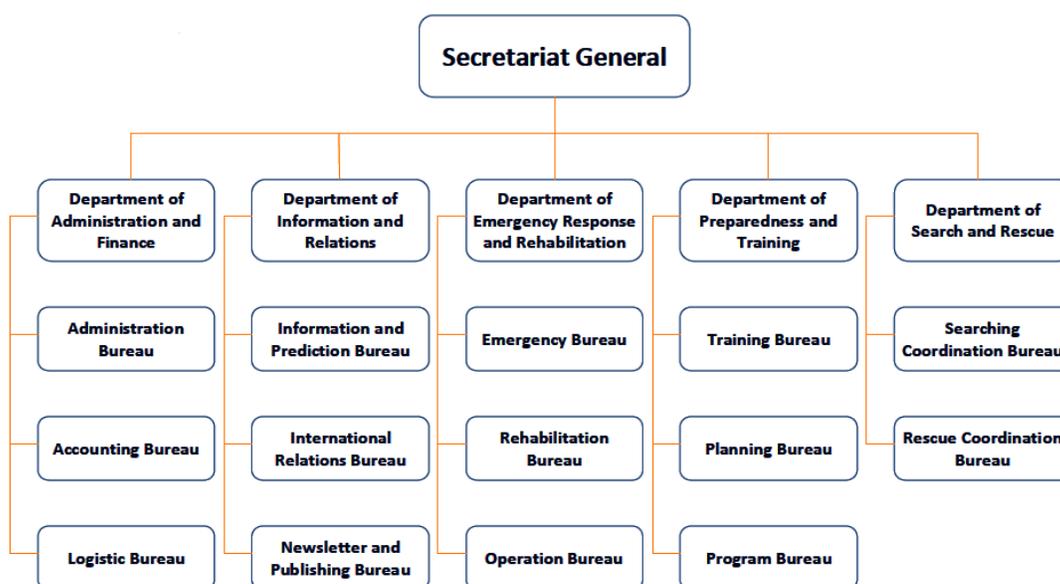


those from surrounding countries of Lao People’s Democratic Republic, Thailand and Viet Nam. The MRC maintains a series of meteorological and hydrological stations in Cambodia as part of its regional hydro-meteorological network. Six-hourly data is recorded and received in real time. DHRW passes on this data to MOWRAM and the National Committee for Disaster Management (NCDM) once a day at around 07.30 a.m. This routine continues even when the rivers are in high flood situation. No flood forecast or warning is issued by DHRW apart from the flood forecast contained in the meteorological forecast issued by DOM.

DRR Aspects

Institutional Set Up

6.1.20 The General Secretariat of NCDM has five departments as shown below.



Structure of the NCDM Secretariat

The main activities of the Department of Information and Relations are:

- To follow weather information, and meteorology and hydrology situation;
- To write and compile disaster news;
- To issue information regarding various disasters occurring in and out of the country through bulletin and broadcasting systems;
- To produce disaster posters and leaflets;
- To prepare report on hydrology and meteorology situation in collaboration with skilled Ministries/Institutions, and broadcast the warning of the emergency, needs and measures; and
- To communicate with foreign countries and International Organizations regarding disaster work.

The main activities of the Department of Emergency Response and Rehabilitation are:

- To establish a command structure for emergency operations according to the National Policy for Disaster Management, upon receiving information on disaster predictions;
- To prepare a prevention/mitigation/emergency relief plan;
- To coordinate research on topics related to hazards, services, emergency relief, safety, security, evacuation, and shelters, etc.; and
- To conduct damage and needs assessment and lead the operation when an emergency occurs.

The main activities of the Department of Preparedness and Training are:

- To prepare equipment, resources material, and supplies for emergency response;
- To formulate plans and programmes for training human resources who serve disaster management functions at the national/local level;
- To choose the candidates who participate in the training courses, in and out of the country;
- To educate and disseminate disaster preparedness to the local communities and the affected people; and
- To publish pictorial documents related to disaster preparedness and mitigation.

The main activities of the Department of Search and Rescue are:

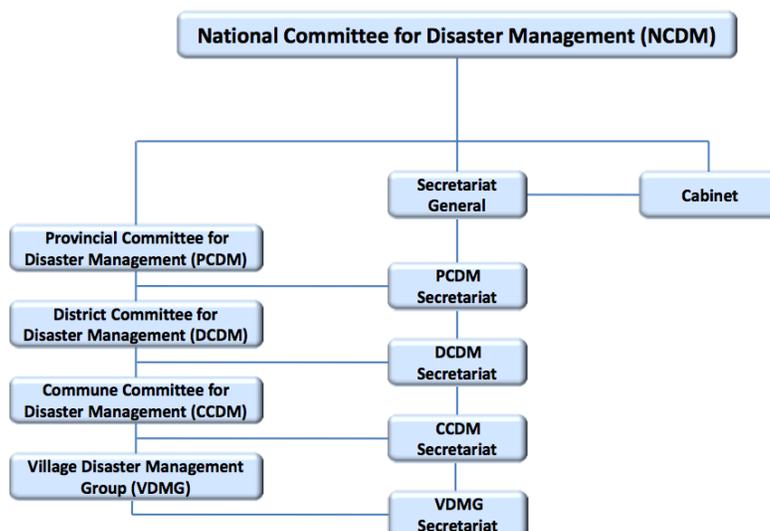
- To coordinate work with the Secretariat of State for Civil Aviation and Ministries/ Institutions concerned in order to conduct the activities in conformity with the organized legislative procedure;
- To prepare a plan and submit to the High-Command of the Royal Cambodian Armed Forces regarding the use of means for Search and Rescue (SAR) intervention of the Armed Forces;
- To receive and dispatch information on aircraft/ship accident and request principles, implementing regulations and instructions from the National Committee for Disaster Management related to the coordination of search and rescue;
- To issue official announcements on the crash site, after the information is double checked;
- To prepare modality and conduct the SAR operation in collaboration with the neighboring country, according to agreements on SAR; and
- To collaborate with the Emergency Coordination Center of the State Secretariat of Civil Aviation and identify SAR mission.

6.1.21 There are four levels of disaster management in Cambodia. At every level, there is Committee for Disaster Management as follows: (1) National Committee for Disaster Management (NCDM); (2) Provincial Committee for Disaster Management (PCDM); (3) District Committee for Disaster Management (DCDM); and (4) Commune Committee for Disaster Management (CCDM). NCDM stipulates the designation of the Provincial Governors and the provincial-level departments as members of PCDM. At the district level, District Chiefs and relevant district-level officers are designated as members of DCDM, while membership is

entirely composed of government organizations at commune- and village-level committees at that respective level.

6.1.22 The Sub-Decree (No. 35 ANKR-BK) also provides instructions on the important role and membership of the Cambodian Red Cross (CRC) in NCDM and their provincial and district branches in PCDM and DCDM, respectively.

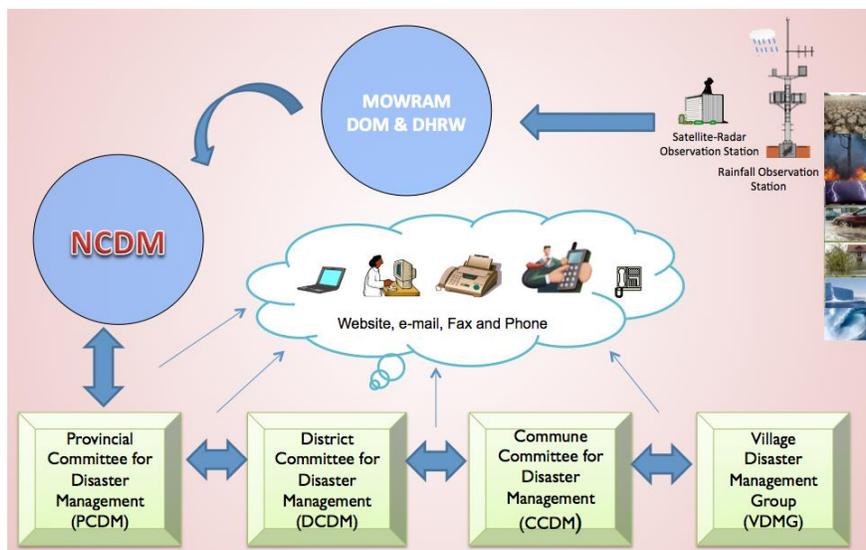
6.1.23 The figure on the right shows the prevalent disaster management coordination structure in Cambodia.



6.1.24 At provincial level, there are four sub-groups, which take care of post disaster management at that level. These groups cover the following specific areas: (a) Search and Rescue; (b) Health (including water and sanitation) and Hygiene; (c) Information and Communication Management; and (d) Response and Emergency.

Warning Dissemination Process

6.1.25 The diagram on the right shows the early warning dissemination process for NCDM. The Disaster Management Committees at different local levels disseminate the warnings to the general public through: media (TV, radio, news paper); Website and e-mail; and disaster radio.



6.1.26 The Cambodia Red Cross (CRC) plays an important role in delivery of warnings at the local level. NCDM has MOUs with NGOs (including CRC) to assist in building capacity for disaster risk reduction, including early warning preparedness.

6.1.27 MOWRAM has a plan for establishing an Early Warning Center based on the current early warning system of DOM to handle flood and drought, and severe weather.

6.1.28 NCDM conducts post disaster impact assessment for floods and other disasters, based on assessment forms at various levels.

6.1.29 There is a National Disaster Risk Reduction Forum in Cambodia mainly run by NGO partners (local and international) in partnership/patronage with NCDM. The Forum is comprised of all stakeholders in disaster risk reduction in Cambodia. The Forum organizes meetings/workshops on theme relevant to disaster risk reduction in Cambodia with the main purposes of: exchanging lessons learned between national and sub-national implementers; and identifying good practice and challenges on mainstreaming of DRR and Climate Change Adaptation into the National Programmes. There have been 23 consultations/meetings of the Forum so far.

6.1.2 Good Practices/Strengths

6.1.30 The Department of Meteorology (DOM) and the Department of Hydrology and River Works (DHRW) have been placed under the same Ministry, i.e., the Ministry of Water Resources and Meteorology (MOWRAM), which consequently provides potential for well-coordinated and close-knit operation.

6.1.31 DOM has recently (in 2012) installed powerful tools for weather analysis and forecasting – a Doppler radar and a “Synergie” system. With reference to global/regional data and information from various sources, DOM performs its duties in accordance with the international/regional standards, including provision of advisories and warnings for key hazards in Cambodia.

6.1.32 To a large extent in a tropical country like Cambodia, weather forecasting is based on the stream flow analysis, besides NWP models. DOM has a GTS link with JMA and Météo-France from which the computed stream flow data for all levels is readily obtained. This also provides a strong basis for weather forecasts and warnings.

6.1.33 Weather forecasts are updated three times a day (every 8 hours) within the period of the preceding forecast [but still being issued only once a day (at 10.30 a.m.)]. This would ensure/improve the level of forecast accuracy.

6.1.34 There exists a telemetric system of water level measurements, linked with the "HYCOS" communication system, through which water level data at around 15 river gauge stations is received every six hours at DHRW. The data is received from the Mekong River Commission countries as well. This keeps DHRW continuously updated in respect of flood situation in the rivers.

6.1.35 Weather forecast and warning bulletins (announcements) are issued from a single source (DOM/DHRW of MOWRAM) using a standard format. This ensures no conflicting information for the disaster management agencies and the general public.

6.1.36 A high-level government support for the early warnings is indicated by the fact that all the severe weather forecasts and warnings are signed by the Minister of MOWRAM and, in the case of a very severe weather resulting into a big hazard, the forecast/warning is signed by the

Prime Minister. This practice raises the importance of the warnings and draws the necessary attention of the public, and ensures the full government support to all the disaster management processes. [However, on the other hand, this makes the warning an extra ordinary document and makes the process more complex and time consuming.]

6.1.37 A Disaster Management Information System (DMIS) in Cambodia has been developed, called “CamDi” - Cambodia Disaster Loss and Damage Database, in collaboration with UNDP, and has been launched in July 2014 (see <http://camdi.ncdm.gov.kh>). The “CamDi” provides disaster loss and damage data for previous years (from 1996 to 2013). The data is being collected throughout the country. The CamDi (DMIS) online disaster loss and damage database will soon be linked to the NCDM Website (<http://www.ncdm.gov.kh>) and will be accessible/available to all stakeholders in DRR. Some examples of screen shots of “CamDi” are presented in **Appendix V**.

6.1.38 The “Web-EOC”, a real-time crisis information management at the Emergency Operations Center (EOC), is under development in collaboration with the ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre). The Web-EOC will be installed, under the bureau of Emergency Coordination Center (ECC). The Japan International Cooperation System (JICS) is providing technical support for the same. JICS has so far trained five staff members and provided basic facilities (e.g., five computers and five screens) for the Web-EOC.

6.1.39 The existence of the Disaster Management Forum involving all stakeholder at all levels is also considered as a good practice in Cambodia.

6.1.3 Gaps and Needs/Challenges

6.1.40 Although DOM has recently introduced a Doppler weather radar, further instrumentation, in particular the rehabilitation/enhancement of the AWS network and installation of an upper-air observing station, will contribute to the improvement of forecasting and warning services using “Synergie” system with NWP GSM. DOM still has the need for human resources development (both quality and quantity) for operation and maintenance of the early warning system.

6.1.41 The DOM staff is always present in the operation center 7 days a week, but not always on a 24-hours-a-day basis except for during the event of severe weather such as Typhoon where the forecasters are present and follow up the duties 24 hours a day. At present, no specific fail-safe systems are in place in the operation center. DOM does not have a specific plan to routinely monitor and evaluate operational processes, including warning performance. DOM and DHRW have no experience in verifications and assessments of warning services after events.

6.1.42 No quantitative flood forecasts are computed nor issued. Presently, the flood forecast is made as part of weather forecast/warning in which, as a result of heavy rain, the possibility of occurrence of flood is mentioned. Thus most flood forecasts in Cambodia are given qualitatively, not quantitatively. Since flood is a major natural hazard in Cambodia, the quantitative flood forecast constitutes the vital information for the early warning system. This is a big gap in the flood forecasting system where a total of 12 major rivers can cause floods. An attempt is being

made for rudimentary flood computation for the downstream stations using upstream data and employing statistical correlation methods, but no such forecasts are issued to the public at present.

6.1.43 Not only that the flood forecast (in quantitative form) is not issued at present, even the six-hourly flood data is not passed to the EWS-related agencies/organizations during the flood situation. Even during the flood, the flood output is given out only once a day (at 07.00 a.m.) in the morning. However, the flood warnings, when issued in conjunction with the weather warnings, are disseminated to the flood-related agencies immediately through fax, phone and the Internet (e-mail and Website). No flood data is communicated in these warnings.

6.1.44 Flood risk (inundation) maps in respect of any river are not available. There is a need to develop the flood risk maps so as to enable the establishment of the flood plane-zoning scheme in respect of the major flood prone rivers. Similarly, the storm surge inundation risk maps should be developed. The hazard risk mapping will increase the public awareness on the potential hazards and their impacts, and shall constitute a major step forward in reducing the loss of life and property in case of serious hazards.

6.1.45 No pre-flood preparations are carried out to ensure that river dykes/bunds and other hydraulic structures are in good shape, or provided under SOP. Only when some river breaches and the information is received at the river authority, the repair work is started.

6.1.46 The field of Disaster Risk Management in Cambodia, at present, remains at an early stage of evolution. In the existing system, support from different stakeholders including international organizations plays a critical role. One of the characteristic features of the current system is that it has a number of good ideas which are waiting to be implemented in absence of availability of adequate financial and human resources.

6.1.47 Few other observations include:

- Limited availability of highly skilled human resources;
- Limited allocation of financial resources for disaster management activities by the Royal Government, which is a stumbling block in the effective development of DRR efforts at different levels;
- Limited compatibility in systematic procedures and cooperation among NCDM, all line agencies and NGOs in the implementation of DRR activities (including cooperation between DOM, DHRW and other agencies including NCDM);
- Limited facilities for capacity building at national and sub-national level of the relevant stakeholders;
- Limited availability of sophisticated equipment for making weather forecasts on a real-time basis, which is hampering development of accurate and timely severe weather forecasts and early warning system;
- Limited availability of sufficient number of automatic on-line stations for monitoring of water levels at critical locations along the major rivers, which is hampering hydrological data collection and making significant location-specific flood forecasts;

- Limited capacity for forecasting and early warning information dissemination. The information from national level reaches the provincial level in appropriate time limits, however, there is very slow progression to pass on the information up to commune and village level;
- Limited disaster preparedness plans available at different levels; and
- Limited availability/lack of fully developed multi-hazards maps in the country.

6.2 Standard Operating Procedures

6.2.1 At present, no well-documented SOPs or MOUs are available for any components of the early warning system in Cambodia. Up to now, roles and responsibilities of the disaster management agencies have not clearly been established by law/legislation. In principle, without SOPs but through the experience and training, the disaster management agencies' staff members perform their duties in all the processes of the early warning system, including warning dissemination. For example, DOM does not have documented SOPs containing technical information, e.g., thresholds, but DOM uses its own thresholds for severe weather according to the real experiences in the past disasters in Cambodia.

6.2.2 DOM does not have the Meteorological Service Act specifying its roles and responsibilities in general (including those for the disaster management). The "Disaster Management Law" has been developed and is expected to be adopted within a couple of years. This law will take a multi-hazard approach and form a basis for cross-cutting integration and coordination among disaster management agencies.

6.2.3 DOM has some manuals for operation of EWS hardware and software, e.g., on "weather radar" and "Synergie" system. For the weather forecast and warning operation using "Synergie" system, there exists a kind of checklist for responsible actions to be taken by the staff (see [Appendix IV.1](#)). Another example of checklist for reporting is given in [Appendix IV.2](#).

6.2.4 There are no agreements developed to use private-sector resources. The private sector contributes to and participates in the DRR activities at the request of the government.

Media and Public Awareness Aspects

6.2.5 The Ministry of Information is responsible for media-related activities, including broadcasting severe weather advisories/warnings and flood situation, and disseminating warning messages to the general public. For warning messages, DOM/DHRW uses plain language indicating the time, place and potential hazards, especially for lightning, gusty wind and flash flood.

6.2.6 The government TV (in Khmer language) uses sign language to ensure people with disabilities understand the warning messages. The government is now pushing the TV media to incorporate the warning messages into the TV programme under broadcasting (e.g., during an entertainment programme, etc.). Radio is still the most important and major means of dissemination of warnings to the general public.

6.2.7 DOM builds and maintains credibility and trust in warnings through periodical Monsoon Forums with users including local authorities, and through awareness campaign. NCDM conducts community-level education and preparedness programme on a regular basis in hazard-prone areas. No SOPs have so far been developed for the above activities to build credibility.

Regional and International Frameworks for Disaster Management

6.2.8 The “ASEAN Agreement on Disaster Management and Emergency Response” was concluded in July 2005, ratified by 10 Member Countries (including Cambodia) of ASEAN, and entered into force on 24 December 2009. This agreement forms a legal framework for all ASEAN States and serves as a common platform in responding to disasters within ASEAN for cooperation, coordination, technical assistance, and resource mobilization in all aspects of disaster management. It also affirms ASEAN’s commitment to the Hyogo Framework for Action (HFA). The ASEAN Coordinating Centre for Humanitarian Assistance (AHA Centre) serves as the operational coordination body. *[The “ASEAN Agreement on Disaster Management and Emergency Response” is separately attached to this Report.]*

6.2.9 Cambodia also has coordination/cooperation mechanisms with international and regional organizations, e.g., WMO, MRC, the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) and the ESCAP/WMO Typhoon Committee. Without official agreements/MOUs and SOPs, but under “mutual/common understanding” through the international/regional meetings (e.g., TC sessions and WMO meetings) and within these frameworks, DOM and DHRW perform their duties and responsibilities for disaster mitigation and risk management based on the international/regional standards.

6.2.10 A regional agreement within MRC called “Mekong Agreement and Procedures” was concluded on 5 April 1995 for sustainable development and utilization of the water and related resources and environment of the Mekong River Basin. The regional agreement contains: Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin; Procedures for Data and Information Exchange and Sharing; Procedures for Water Use Monitoring; Procedures for Notification, Prior Consultation and Agreement; Procedures for the Maintenance of Flows on the Mainstream; and Procedures for Water Quality. *[The “Mekong Agreement and Procedures” is also attached to this Report separately.]*

6.3 Recommendations for the SSOP Manual

6.3.1 Since Cambodia does not have well-documented SOPs, the SSOP Manual is very important to them. The meeting with different stakeholders endorsed the suggestions/recommendations already made at the pilot workshops on the contents of the SSOP Manual, including: minimum baseline standard requirements and guidelines on format and content; checklist for SOPs for different types/levels of threat; guidelines for multi-hazards SOPs; need for regular updating; need to conduct regular exercises/drills to validate SOPs; SOP examples from other countries; list of relevant available websites, case studies, documents, etc.; examples of usage of social media and its application; and ideas on advance communication techniques.

Among others, SOP examples of the countries having similar meteorological, hydrological and climate conditions, are most useful and beneficial to Cambodia. SOP examples of developed countries could also be customized to meet Cambodia's requirements.

6.3.2 The meeting with different stakeholders further suggested that various SOPs should be coordinated and synergized and that the SSOP Manual should be translated into local languages of the participating countries; and should also include lists of definitions and acronyms.

7. Conclusions and Recommendations

7.1 The present day disaster management system in Cambodia is not one of the most efficient systems working at regional and/or international levels. There is a need to further strengthening the existing disaster management system in the country. It appears that besides other obstacles, there is a lack of political commitment for establishment of effective DRR system in the country. To overcome such obstacles, the international agencies including the Typhoon Committee may like to take initiative for sensitization of the senior-level government functionaries including political leadership.

7.2 Activities related to disaster management in Cambodia are managed by the National Committee for Disaster Management (NCDM). The organization and functioning of NCDM were established and amended in 2004 through a Royal Decree. The existing disaster management system in Cambodia is struggling with issues related to financial and human resources, which is hampering the smooth and efficient functioning of the system. Coordination mechanism between different stakeholders is also not very well-organized and creating obstacles for effective disaster management.

7.3 There are high expectations from the upcoming new DRR Law - "Disaster Management Law", which is expected to be ready for implementation in next few years. It is expected that the new Law will provide a holistic and comprehensive approach with well laid down mechanisms/procedures for coordination among different Ministries of the Government and other role players in the area of DRR at national/provincial level in Cambodia. At the same time the new Law will have strong provisions for appropriate funding and human resources to carry forward the agenda of effective DRR at all levels in Cambodia.

7.4 Cambodia has a DRR system, which is at very nascent stage of development. However, the existing system has several strengths like the well laid out structure up to the commune and village levels. Cambodia, at present, has a very high percentage of rural population, the existing DRR system provides a basis for establishing a very strong DRR system in Cambodia by involving local people in decision making. In the existing system, it will be much easier to mainstream disaster risk reduction into social-economic development and poverty elevation programmes of the country.

7.5 Cambodia has a combined severe weather and flood early warning system to the extent that the flood forecasts are part of the weather forecasts. On one hand this has the advantage that a comprehensive message including all types of hazards is passed on, on the other hand it has the

big disadvantage that the incomplete information is given out. This disadvantage is much too obvious in case of a severe flood situation wherein there is a need to inform the recipients at least regarding the intensity and time of occurrence of the impending flood at the significant downstream water level measurement points along the channel. Presently even during flood emergency, no flood information or the flood data is passed on to the public and the flood-related agencies in real time.

7.6 Floods being one of the major hazard in Cambodia, there is an urgent need to improve the quality of flood early warning system at least to the extent that, in flood warning, approximate flood level and the time of occurrence along the downstream points on the channel are indicated. Furthermore it is recommended that during flood situation, the actual flood data of the river(s) in flood should be passed on to NCDM to keep it informed of the prevailing flood situation.

Recommendations

7.7 There is a need for establishing the standard procedures to carry out operational activities related to DRR in a systematic manner. To this effect, it is proposed to develop SOPs for all activities related to DRR including a multi-hazard forecasting and early warning system at national level in Cambodia. The upcoming SSOP Manual is expected to provide useful insights and will be a very handy tool to establish a credible system within the limitations of the existing disaster management mechanisms. However, it may also be noted that with limited resources on disposal of MOWRAM and NCDM, it will not be an easy task to develop and implement SOPs using the Manual. The Typhoon Committee should consider technical and financial assistance in providing additional resources to MOWRAM to develop well-documented SOPs.

Concluding Remarks

The main purposes of the mission visits were: to review existing coastal multi-hazards EWS SOPs of hydro-meteorological services, disaster management agencies, media, elected officials, and others from national to district to local levels; to identify good practices, gaps and needs, and recommendations for internal and cross-cutting SOPs; and then to compile data, information, examples, and diagrams collected on SOPs good practices, gaps and needs, and recommendations for inclusion in the Manual on Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System which will meet the needs of the 13 beneficiary countries involved in the Project. These purposes have been met and were described above.

Now the challenge is to take the information from these six missions and develop a Manual of Synergized Standard Operating Procedures for Coastal Multi-hazards Early Warning Systems focusing on the hydro-meteorological aspects to meet the needs of diverse users and to create a Manual that can and will be used. This development will be done in collaboration and coordination with the consultants, the beneficiary countries, the Task Force, the TC Advisory Working Group, and partner organizations. This Manual will then form the foundation for the training and working meeting scheduled under Activity 2 of the project.

Appendix I

List of Participants in the Working-level Meetings 1-2 September 2014

No.	Name	Position	Organization
1	Mr Oum Ryna	Director	Department of Meteorology (DOM)
2	Ms Peou Phalla	Deputy Director	DOM
3	Mr Korng Yutray	Deputy Director	DOM
4	Ms Tep Phollarath	Vice-Chief	Climate Office/DOM
5	Mr Touch Lay Srun	Chief	Weather Forecast Office/DOM
6	Mr Chou Sokun	Vice-Chief	Weather Forecast Office/DOM
7	Mr Phan Sambath	Vice-Chief	Weather Forecast Office/DOM
8	Mr Sum Pich	Forecaster	Weather Forecast Office/DOM
9	Mr Khun Sam Ol	Forecaster	Weather Forecast Office/DOM
10	Ms Kong Mara	Forecaster	Weather Forecast Office/DOM
11	Mr Iv Rachna	Forecaster	Weather Forecast Office/DOM
12	Mr Lim Hak	Information Technology Engineer	Weather Forecast Office/DOM
13	Mr Ho Lyhon	Information Technology Engineer	Weather Forecast Office/DOM
14	Mr Sam Oeun Soknara	Chief	Administration Office/DOM
15	Mr Ton Seng	Chief	Department of Hydrology and River Works (DHRW)
16	Mr Chhoun Veasna	Vice-Chief	DHRW
17	Mr Ku Bunnavuth	Deputy Director, Search and Rescue Department	National Committee for Disaster Management (NCDM)
18	Ms Nou Maneth Athana	TV- Programmer	Cambodia National Channel (CNC)

Appendix II

QUESTIONNAIRE (SSOP Project) Completed by Cambodia

I. Background Information

SECTION 1: Contact Information (Name, Address, Phone, Fax, E-Mail)

1- Ministry of Water Resources and Meteorology

- *Name: Mr Oum Ryna, Director, Department of Meteorology*
- *Address: #364, Preah Monivong Blvd, Chamkarmon, Phnom Penh*
- *Phone: +855-16-756-389*
- *E-Mail: rynaoum@yahoo.com*

- *Name: Ms Peou Phalla, Deputy Director, Department of Meteorology*
- *Address: #364, Preah Monivong Blvd, Chamkarmon, Phnom Penh*
- *Phone: +855-16-616-927*
- *E-Mail: phallapeou1@gmail.com*

2- National Committee for Disaster Management

- *Name: Dr Soth Kimkolmony, Deputy Director of Preparedness and Training Department*
- *Address: No. 154Eo, St.110 Sangkat Phsachas, Khan Donpenh, Phnom Penh, Cambodia*
- *Phone: (855)12272107*
- *E-Mail: soth_mony@yahoo.com*

- *Name: Mr Ku Bunnavuth Deputy Director of Search and Rescue Department*
- *Address: No. 283C, Sankat Ruseykeo, Phnom Penh, Cambodia*
- *Phone: (855)12916661*
- *E-Mail: bunnavuthku@ncdm.gov.kh*

Question 1: In addition to the SSOP focal point, please identify others who helped to complete this questionnaire.

The questionnaire was complemented by the Department of Hydrology and River Works (DHRW) and other disaster management-related participants, attended at the working-level meetings with the consultants on 1-2 September 2014.

II. Early Warning System

Section 2: Authority and Coordination

2a: Legal Framework

Question 2: What laws, administrative rules or similar legislation does your country have which designate specific government agencies to provide science-based coastal warnings to specific government agencies, to disseminate public warnings instructing the public to take or prepare to take actions, and to provide appropriate emergency response for coastal hazards?

- Do these laws, administrative rules or similar legislation designate standardize processes and specific roles and responsibilities for warning issuers, disaster management agencies, media, decision makers, and other agencies? What is designated and to what level?
- Do these laws, administrative rules or similar legislation cover all national, district, and local level responsibilities or are there separate laws or rules for different levels of government?
- Please briefly describe these, listing the laws or the agencies designated, and their roles and responsibilities.

At present, Cambodia does not have any laws, administrative rules or legislation for early warning for specific warning areas, even for coastal area. Cambodia has only Sub-Decree related to disaster management. A disaster management law has been developed and is expected to be adopted within a couple of years.

Question 3: What coordinated, integrated Memorandums of Understanding (MOUs) or Standard Operating Procedures (SOPs) are there among the various early warning system agencies on specifics of how to implement the assigned roles and responsibilities at the national level, district level, and/or local level? Please specify the MOUs or SOPs.

There are no coordinated, integrated MoUs and SOPs among the various EWS agencies.

2b: National Platform for Disaster Reduction

Question 4: Does your country have a national committee or other mechanism for guiding disaster risk reduction in general?

National Committee for Disaster Management (NCDM) is the leading agency in coordinating Disaster Risk Reduction in general.

Question 5: Who (types of persons and agencies) are members of this committee?

NCDM is composed of 19 Ministries and 3 Institutions as listed below, and chaired by Prime Minister and Seconded by two senior Ministers: HE Nhim Vanda as first vice President and HE Ly Thuch as second vice President.

<i>1. Prime Minister</i>	<i>President</i>
<i>2. Senior Official</i>	<i>1st Vice President</i>
<i>3. Senior Official</i>	<i>2nd Vice President</i>
<i>4. MOINT (Ministry of Interior)</i>	<i>Member</i>
<i>5. MOND (Ministry of National Defense)</i>	<i>Member</i>
<i>6. COM (Council of Ministers)</i>	<i>Member</i>
<i>7. MOEF (Ministry of Economics and Finance)</i>	<i>Member</i>
<i>8. MOFAIC (Ministry of Foreign Affairs and International Cooperation)</i>	<i>Member</i>
<i>9. MOE (Ministry of Environment)</i>	<i>Member</i>
<i>10. MOWRAM (Ministry of Water Resources and Meteorology)</i>	<i>Member</i>
<i>11. MOAFF (Ministry of Agriculture, Forestry and Fisheries)</i>	<i>Member</i>
<i>12. MOC (Ministry of Commerce)</i>	<i>Member</i>
<i>13. MOH (Ministry of Health)</i>	<i>Member</i>
<i>14. MORD (Ministry of Rural Development)</i>	<i>Member</i>
<i>15. MOIME (Ministry of Industry, Mines and Energy)</i>	<i>Member</i>
<i>16. MOSAVY (Ministry of Social Affairs, Veterans and Youth Rehabilitation)</i>	<i>Member</i>
<i>17. MOPWT (Ministry of Public Works and Transport)</i>	<i>Member</i>
<i>18. MOEYS (Ministry of Education, Youth and Sports)</i>	<i>Member</i>
<i>19. MOWA (Ministry of Women Affairs)</i>	<i>Member</i>
<i>20. RCAF HQs (Royal Commander of the Cambodian Armed Forces)</i>	<i>Member</i>
<i>21. CRC (Cambodia Red Cross)</i>	<i>Member</i>
<i>22. SSOCA (Secretary of State of the Secretariat Office of Civil Aviation)</i>	<i>Member</i>

Question 6: Does your country have similar coordination mechanisms at the district and community level? Who compose these committees?

In 1995, as a result of the country's experience with regularly occurring disasters, the Royal Government of Cambodia (RGC) established a National Committee for Disaster Management (NCDM) through a Sub Decree (No. 35 ANKR-BK) signed by the First Prime Minister and Second Prime Minister and later amended in 1999. Under this Sub-decree, an organizational structure is outlined stating the membership of NCDM among Royal Government of Cambodia Ministries. It also includes the designation of the Provincial Governors and the provincial level departments as members of the Provincial Committee for Disaster Management (PCDM). At the district level, District Chiefs and relevant district level officers are designated members of District Committee for Disaster Management (DCDM). While membership is almost entirely composed of government organizations, the Sub-decree also provides instructions on the important role and membership of the Cambodian Red Cross (CRC) in NCDM and their provincial and district branches in PCDM/DCDM.

Question 7: What authority does this committee have (decision-making, policy-making, advisory (if yes, to whom), independent reporting to one agency, etc.) and for what levels (all, national, district, local)?

NCDM does not have decision-making, policy-making or advisory authority but plays a coordination role.

The Roles and Responsibilities of NCDM are the following:

- *To study, monitor, assess, collect, analyze and manage the disaster risk data and develop the disaster situation report to be submitted to the Royal Government with recommendations in order to issue principles, policy, circulars, declaration and measures undertaken for disaster management;*
- *To make request to the Royal Government on the needs and the use of resources, namely funds, fuel, means of mission and human resources for disaster management operation and assisting victims affected by natural and man-made hazards;*
- *To develop human resources through skill training activities equipped with knowledge for the capacity building of officials in charge of disaster management at the national level in related ministries/institutions, at provincial/municipal, district, commune and village level, and make public awareness and education to the people in vulnerable communities about the natural and man-made disaster risk;*
- *To collaborate with government ministries/institutions, UN agencies, IOs, NGOs and donors to implement the national policy of disaster management, including disaster prevention, preparedness & mitigation to strive against natural and man-made hazards;*
- *To coordinate with the national agencies, regional and international communities for cooperation in sharing information on disaster situation in order to reduce the negative impact of disasters;*
- *To coordinate with government ministries/institutions, UN agencies, IOs, NGOs, international communities and local donors in order to seek assistance for the purpose of emergency response and post-disaster rehabilitation.*

NCDM has a national Strategic Action Plan for disaster management (updated every 5 years).

Question 8: Does this national committee have SOPs for handling different coastal hazards? Do district and/or local committees have SOPs? Can you provide examples?

NCDM, PCDM, DCDM and CCDM do not have SOPs. NCDM and PCDM have their contingency plans for emergency (before, during and after emergency).

2c: National Organizations

Question 9: What are the important organizations, both government and non-government, for the implementation of an early warning system?

- *Ministry of Water Resources and Meteorology (MOWRAM): Department of Meteorology (DOM)/ Department of Hydrology and River Works (DHRW)*
- *Ministry of Information (for Media)*

- *National Committee for Disaster Management (NCDM)*
- *Local Authorities (Provincial Government, etc.)*
- *Cambodian Red Cross (CRC)*

Question 10: *What roles will they play and have these roles been coordinated? Please specifically include the roles, responsibilities and authorities of the National Meteorological Service and the National Disaster Management Organization, or their equivalent monitoring, warning evaluation, and warning dissemination agencies.*

Department of Meteorology: *Monitor and operate weather forecast, hazard analysis; and provide weather forecast and early weather warnings.*

Department of Hydrology and River Works: *Monitor and operate river forecast, provide flood forecasting, flash flood watch and warning.*

Ministry of Information: *Broadcast severe weather or weather warning and flash flood situation and disseminate warning message to audience*

National Committee for Disaster Management (NCDM): *Make disaster preparedness and rescue*

Local Authorities: *Convey warning information to village and community*

Question 11: *Which of these agencies have SOPs for their assigned tasks? Please provide examples as possible.*

The above agencies do not have SOPs for their assigned tasks. Based on training and from experience, the agencies perform their tasks. For example, the Department of Meteorology: Provides announcement before the event reach into the area for 5 days, Update information on Website every 15-30 minutes of the weather phenomena using the satellite and radar data/analysis.

Section 3: Coastal Hazards Warning Centers and Monitoring

3a: Reception of Warnings from International Agencies

Question 12: *How does your country currently receive international warnings for coastal hazards? From whom, by what method and who receives it?*

Cambodia receives international warnings automatically for coastal hazard by:

- *GTS from Japan Meteorology Agency (JMA) and*
- *Synergy System from Météo-France.*

Question 13: *What is the back-up or alternative method for receiving the warning messages?*

The above methods back up each other.

Question 14: *Do the agencies sending and receiving these international warnings provide 24-hours-a-day, 7-days-a-week services?*

DOM receives the international warnings 24-hours-a-day and sending it 24-hours-a-day.

Question 15: *What communication arrangements, regional agreements, and coordination mechanisms with international and regional organizations were established and used?*

Mekong River Agreement on cooperation for the sustainable development of the Mekong River basin for sustainable development, concluded on 5 April 1995.

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Question 16: *Does the agency (agencies) who receive the international warnings have SOPs on what to do with them when received and where to send them to? What are they? Please provide examples.*

The agencies have not yet SOPs.

Question 17: *Are there SOPs available for the implementation of the backup or alternative method to receive these warnings? Is this backup method tested regularly?*

No. (N/A)

3b: National Warning Centers

Question 18: *Does your country operate separate national or regional centers for coastal hazards or does one warning center handle all warnings for coastal hazards? Which center handles which hazard?*

DOM is the only warning center that handles all warnings for coastal hazards such as tropical storm, thunderstorm, and heavy rain and other issues related to the coastal area.

Question 19: *Do the warning centers have staff that are always present in the operation center 24-hours-a-day, 7-days-a-week, or are staff on an on-call basis through automated processes?*

Staff of the Department of Meteorology are always present in the operation center for 7-days-a-week (not always 24 hours).

Question 20: *Do the different warning centers have MOUs or SOPs describing how the different centers will coordinate actions in a multi-hazard situation? What are they? Please provide examples.*

No.

3c: Utilization of Data for Monitoring, Data Collection and Data Dissemination

Question 21: *Does your country have sufficient equipment and sensors to monitor potential coastal hazards in real time? If not, how does the country conduct sufficient monitoring without this equipment?*

Cambodia does not have sufficient equipment and sensors to monitor potential coastal hazards in real time. Cambodia conducts the monitoring by Weather Doppler Radar and the information that received from GTS and Synergy System and from the international Websites.

Question 22: *Describe the current capacity (equipment to receive, technical ability to access and interpret, etc.) of your country in utilizing sensors for hazard monitoring, data collection and exchange?*

Radar and satellite images. GTS received all warning information and the forecaster can interpret to common language.

Question 23: *What are the major obstacles faced by your country with respect to the use of sensors data for hazard monitoring, data collection and exchange – insufficient technical expertise, data not timely, data format, lack of funds, lack of equipment, or other reasons?*

Lack of funds, insufficient technical expertise and lack of equipment.

Question 24: *How is collected data shared with among agencies? Is this done in real time?*

Flood forecasting – with MRC through GTS. Through the DOM Website with DHRW and NCDM. Website is updated once a day. Rainfall data is updated every 15 minutes.

Question 25: *How do you obtain applicable data/analyses from regional networks, adjacent territories and international entities in real time?*

DOM obtains data/analyses from global and regional network via SYNEGIE and SATAID in real time, as well as via GTS and Websites.

Question 26: *Are there SOPs or instructions on how to interpret these data, how to analyze these data, critical thresholds, strengths and weaknesses of the sensors, how to handle outages or malfunctioning sensors? Which SOPs are implemented and documented?*

DOM does not have SOP on the critical thresholds, but have its own experience in the hazard based on the environment of the country, especially in rural area.

Question 27: *Are there SOPs in place for the process of real time sharing and availability of data collected? Please provide examples.*

Not standardized. With MRC, under MOU.

Question 28: *Are there SOPs or instructions on how to handle data/analyses from regional, international, or adjacent sources?*

No.

Section 4: Warning and Forecast Services

4a: Warning Coordination and Agreements

Question 29: *Are standardized processes, and roles and responsibilities of all organizations generating and issuing warnings established and mandated by law? What are these?*

No. Up to now, roles and responsibilities have not been established and mandated by law, but any warnings related to weather-related disaster are coordinated by the Ministry of Water Resources and Meteorology.

Question 30: *What agreements and interagency protocols were established to ensure consistency of warning language for different coastal hazards when handled by different agencies?*

DOM does not have any agreement and interagency formal protocols.

Question 31: *Was a multi-hazard plan established to obtain mutual efficiencies/effectiveness among warning systems and agencies? What is the plan?*

No. The draft Disaster Management Law does include M-H approach.

4b: Warning Generation/Preparation

Question 32: *How do you ensure data analyses, prediction and warning generation are based on latest scientific and technical methodologies? If they are not why – training, equipment (both hardware and software), other?*

We are not sure that the data analyses and prediction are based on the latest scientific and technical methodology, but we are sure they were up to date.

Question 33: *Does each warning center have detailed SOPs on each hazard on how to conduct the analysis and prediction and prepare the warnings? Are there separate SOPs for each hazard or is there a multi-hazard approach used? Do these SOPs contain technical information (thresholds, what to look for, critical requirements) as well as how and when to coordinate with other agencies during the preparation of warnings?*

DOM has its own thresholds for weather situation according to real experience of any kind of disasters in Cambodia.

Question 34: Are data and warning products issued in accordance with international and national standards and protocols? Where these standards jointly developed and coordinated? What standards are used?

Meteorological data and warning products are issued in accordance with international (WMO) standards and protocols.

Question 35: Are the required standards and protocols easily available for people to reference when preparing warnings? Are there separate SOPs for this or are they combined with others? Please provide examples.

Yes. DOM prepares one warning for three different warning areas (coastal, low lying and plateau).

Question 36: How are warnings generated and disseminated in a variety of formats to meet users' needs? Media, decision makers, disaster managers, government officials and public (e.g., for diverse cultural, social, gender, linguistic and educational backgrounds)? What are these formats?

DOM has only one format for warnings generated and dissemination to all agencies and users.

Question 37: How are warning alerts/messages geographically-specific and threat-specific to ensure warnings are targeted to those at risk only and they understand potential impacts? Please provide samples.

DOM provides warning alert/messages link with geographically-specific and threat-specific to ensure warning are targeted to be understood by the vulnerable and the potential impact to that specific areas. For example: warning related to heavy rain/thunderstorm that caused to flash flood and gusty wind are issued for low land and waterway areas and for the coastal area (fishery and marine).

Question 38: Are there SOPs available which clearly state the format, process, and procedures to use for each warning? Are there SOPs describing procedures to ensure the warnings are geographical and threat specific with examples?

No.

Question 39: Are warnings consistent over time and include follow-up actions when required? What procedures and SOPs are used to ensure consistency and to ensure follow up actions needed? Please provide samples.

Yes. Warnings are consistent over time and include quick follow-up actions to be taken.

DOM prepares the warning before the event occurs and follows up the action during and after the event.

Question 40: How do warnings communicate target risk information to help guide/motivate user response? Please provide samples.

Using simple/understandable language indicating the time, place and potential hazards, especially for lightning protection, for gusty wind and for flash flood.

Question 41: What is done to ensure people with disabilities receives and understands warnings (sign language, text and audio formats)? Please provide what ways are used.

The Provincial Department of Water Resources and Meteorology with Local Authority and all relevant institutions who concerned will help the disabled people on this matter, but the actions are limited with the lack of skill and facilities.

Also with sign language on national TV (in Khmer language).

3 October 2014

Question 42: *What strategies have been developed to build credibility and trust in warnings (e.g., understanding difference between forecasts and warnings)? Have SOPs been developed on how to build this credibility?*

Through Monsoon forums with users (including local authorities) and through awareness campaign.

Question 43: *What steps have been taken to minimize false alarms and to improve communications to maintain trust in the warning system? Have they been documented in SOPs or procedures?*

We have no documented SOPs or procedures but we could minimize false alarms to improve communication to maintain trust in the warning system by following the condition and potential phenomena via the real monitoring and observation data.

Question 44: *What fail-safe systems are in place, such as power back-up, office evacuation, equipment redundancy, office evaluations, and on-call personnel systems?*

No specific fail-safe systems are in place at this moment.

Question 45: *Are there SOPs for implementing backup systems, office evacuation, calling in extra personnel, etc.? Which ones are documented? Please provide an example.*

No.

4c: Assessment Process

Question 46: *What is the plan to routinely monitor and evaluate operational processes, including data quality and warning performance?*

DOM has no plans at present.

Question 47: *Are there SOPs on how to perform this monitoring and evaluation on a routine basis? What ones are available? Please provide an example.*

No. There are no SOPs.

Question 48: *What verifications and assessments of warning services are conducted after events to measure performance, identify and correct deficiencies, and capture best practices?*

DOM, DHRW have no experience.

Question 49: *What inter-agency “after action” meetings are held to improve early warning system?*

DOM, DHRW have no experience.

Question 50: *Are there SOPs on how to perform “after action” verifications, assessments, and meetings to include when they are needed, specified time frames, and people involved? What ones are available? Please provide an example.*

None.

Section 5: Dissemination/Communication and Response

5a: Organization

Question 51: *Who are the recognized authorities empowered to disseminate warning messages for coastal hazards?*

The Minister of Water Resources and Meteorology at national level, and Local Authority. For critical situation, the Prime Minister.

Question 52: Are functions, roles and responsibilities of each agency and at all levels (national, district, and local) in warning dissemination process specified in legislation or government policy? What are these?

There is no legislation. When Ministry of Water Resources and Meteorology was created in 1998, the roles and responsibilities of DOM and DHRW were specified.

Question 53: Does each agency have detailed SOPs on how to execute their assigned roles in dissemination? How have these been coordinated with the other agencies and are they integrated to ensure maximum efficiency when used? Which ones are available? Please provide an example.

No. Disaster management agencies do not have detailed SOPs on the dissemination. Based on experience, dissemination is made.

Question 54: What is the communication strategy to ensure that people with disabilities, including people who are deaf or have a hearing disabilities receive broadcasts? Have these been coordinated with other agencies and with people who they serve?

Local Government Agency with National Committee for Disaster Management (NCDM) has their own strategy and mechanism to ensure the disabled people could receive the broadcast, but limited.

5b: Dissemination/Communications

Question 55: How are communication and dissemination systems tailored to reach the entire population and to meet the needs of individual communities (e.g., radio or television for those with access; and sirens, warning flags or messenger runners for remote communities) at all levels (national, district, and locally)? What are the multiple communications processes used?

- ***The billboard is used in the area where flash floods or riverine floods frequently occur,***
- ***National and local Radio, TV,***
- ***Phone and Icon***

Question 56: How do the disaster risk management bodies, the warning agencies, and media maintain active communications during a hazardous event? When is this done? Are there coordinated SOPs available that specific how this will be done and when? What are these?

All agencies maintain the active communication during big disaster events through fax, e-mail, mobile phone and Website.

Question 57: Were agreements developed to use private sector resources (e.g., amateur radios, safety shelters)? With whom and for what? Are these documented as MOUs or some type of agreements?

There are no agreements developed to use private-sector resources, but government pushes and orders to contribute and participate.

Question 58: Are communication systems two-way and interactive for confirmation that warnings have been received and to report impacts? What systems are used?

DOM receives acknowledgement from national and local authorities confirming that warning has been received through e-Mail, Mobile Phone and SMS.

Question 59: Do non-government, people-centered, community-based organizations, such as the local Red Cross/Red Crescent Society, play a role in the receipt and delivery of multi-hazard early warnings to people at the

local level? If yes, please describe their role and activities. Are there MOUs or agreements which document and define these roles?

Yes. CRC plays an important role in delivery of EW at local level.

Question 60: *Are there training programs for the media on coastal, multi-hazards, mitigation, warning, and preparedness? If yes, please describe?*

Yes. DOM in collaboration with NGOs conducts media trainings at least once a year.

5c: Response

Question 61: *How are procedures tested or exercised to improve the response through better planning and preparedness? How is this done, who is involved, and whether it is done regularly? Are these procedures and their frequency documented in MOUs, procedures or some other type of agreement?*

No. (N/A)

Question 62: *Have post-coastal hazard impact assessments been conducted in your country? If yes, what types of data were collected, who was involved, and how were they coordinated. Are these procedures and their frequency documented in MOUs, procedures or some other type of agreement?*

Yes, NCDM conducts post disaster impact assessment for floods and other disasters, based on assessment forms at various levels.

Question 63: *Are there any joint community-level education and preparedness programs for coastal hazards conducted by warning issuers, disaster management agencies, and media? Who was involved and what was done?*

NCDM conducts community-level education and preparedness programs on a regular basis in hazard prone areas.

Question 64: *Do non-government, people-centered, community-based organizations, such as the local Red Cross/Red Crescent Society, play a role in the early warning preparedness and community outreach and education to people at the local level? If yes, please describe their role and activities. Are there MOUs or agreements which document and define these roles?*

NCDM has MoUs with NGOs to assist in building capacity for disaster risk mitigation, including early warning preparedness.

III. Standard Operating Procedures

[All questions (65-76) are N/A.]

Section 6: SOP Development

Question 65: *How were such factors as the age, education, knowledge, skills, experience and training of the person(s) considered in the SOPs?*

Question 66: *Are new SOPs written or current ones modified when new equipment or processes create new work situations? Is there a documented review process?*

Question 67: *Were appropriate different styles of SOPs (simple step, hierarchical step, linear graphic flow chart, annotated pictures, and/or branching flowchart) considered when SOPs were developed?*

Section 7: SOP Content and Use

Question 68: Does the agency and/or government set standards for SOPs? Were these standards used to develop SOPs?

Question 69: Was a certain format used to develop SOPs to ensure standardization and had all required information such as numbers, titles, preparer names, who approved, revision history, purpose and scope identified, number of people required, safety concerns, equipment needed, referenced documents or checklists easily available, and other items required for good SOPs? What format used?

Question 70: Were SOPs that involve a long list of steps broken into separate logical sections of about 10 steps per section? Are SOPs clear, short sentences, not too wordy, and specific?

Section 8: SOP Documentation

Question 71: How is an historical record kept of all SOPs when modifications are made to that process and when a SOP must be revised?

Question 72: Are computer accessible files and at least one notebook as backup of all approved SOPs available? Where are they located?

Section 9: SOP Monitoring, Review and Training

Question 73: How are SOPs used to facilitate training in procedures, for both new personnel, those that need re-training (i.e., after extended absence from a position), or for cross training using the step by step instructions in the SOPs to ensure that nothing is missed?

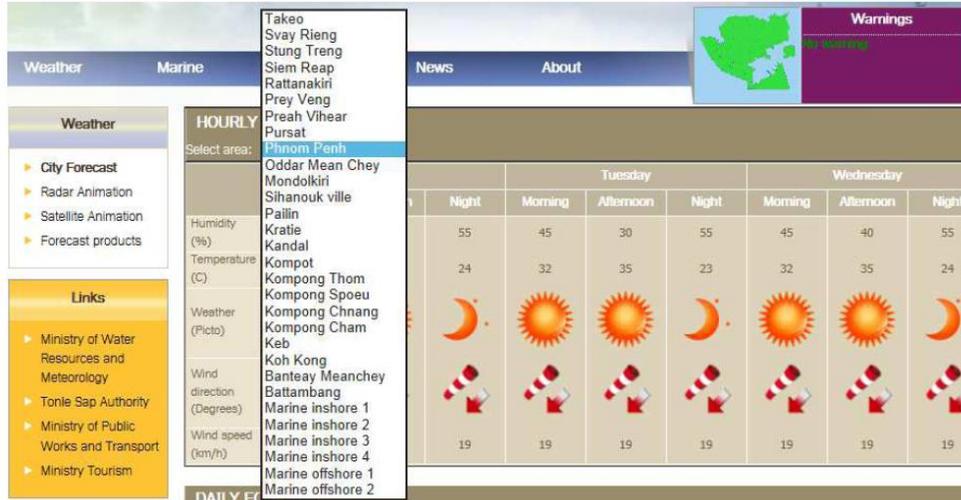
Question 74: Is an annual evaluation and review system established to be certain that over time all the steps of SOP are still correct and appropriate for the production system? How is it performed?

Question 75: How are SOPs used to regularly evaluate work activity and possible improvements? Do workers routinely evaluate existing SOPs, work practice guidelines, and other documents for possible revisions to SOPs?

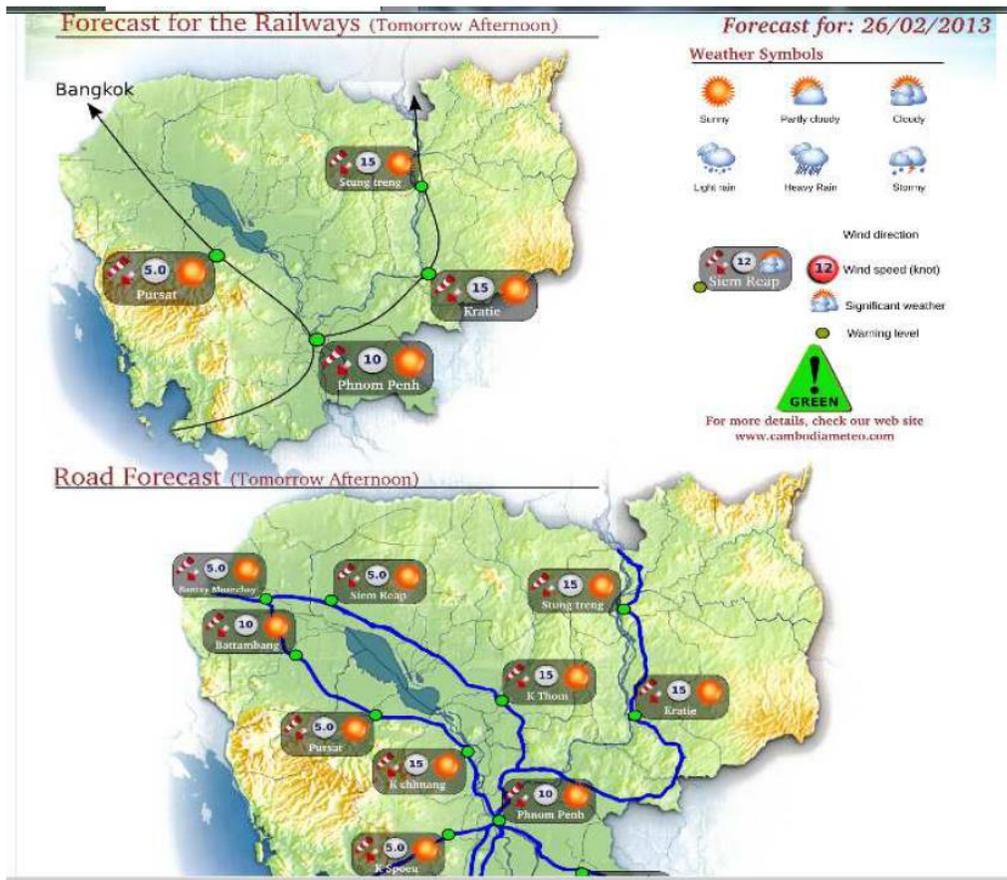
Question 76: What procedures are in place to ensure that SOPs are followed consistently over time?

Appendix III.1.1

Examples of Forecasts (1)



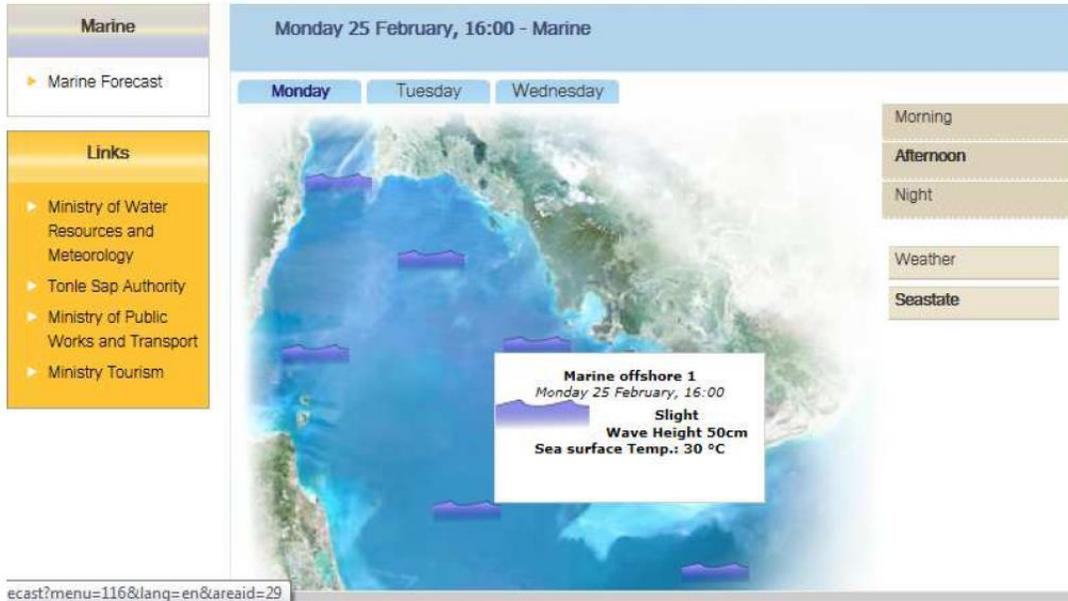
City Forecast



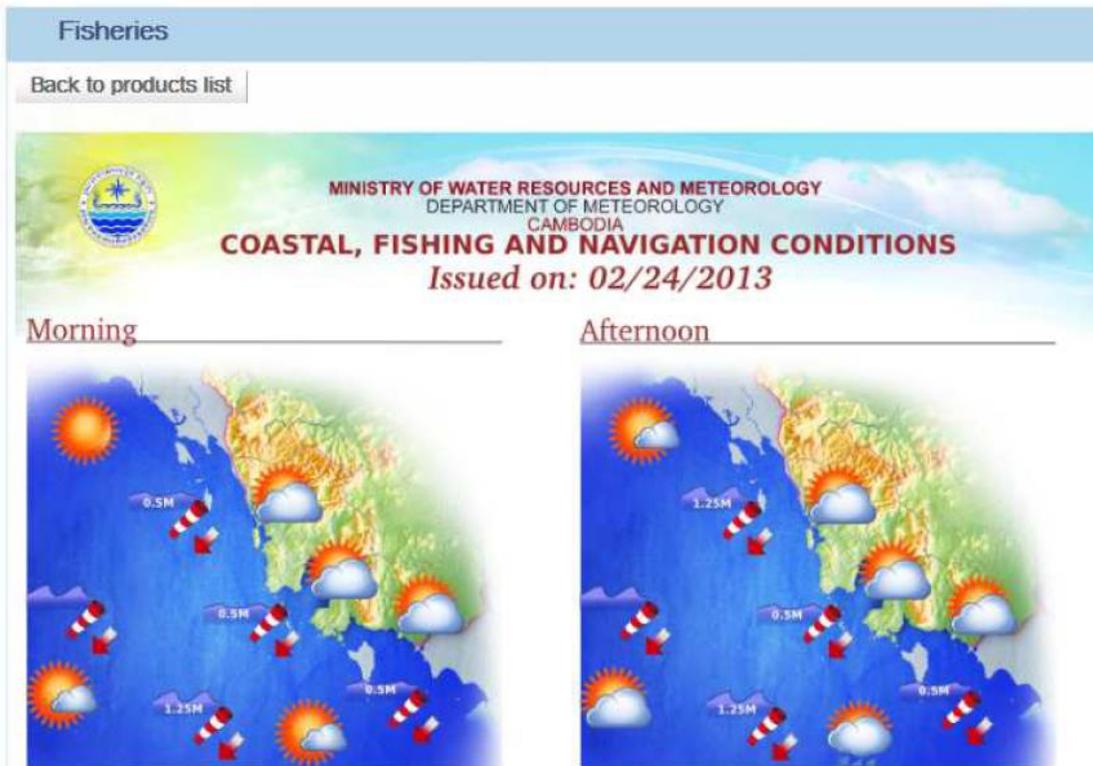
Railways and Road Forecasts

Appendix III.1.2

Examples of Forecasts (2)



Sea State Forecast

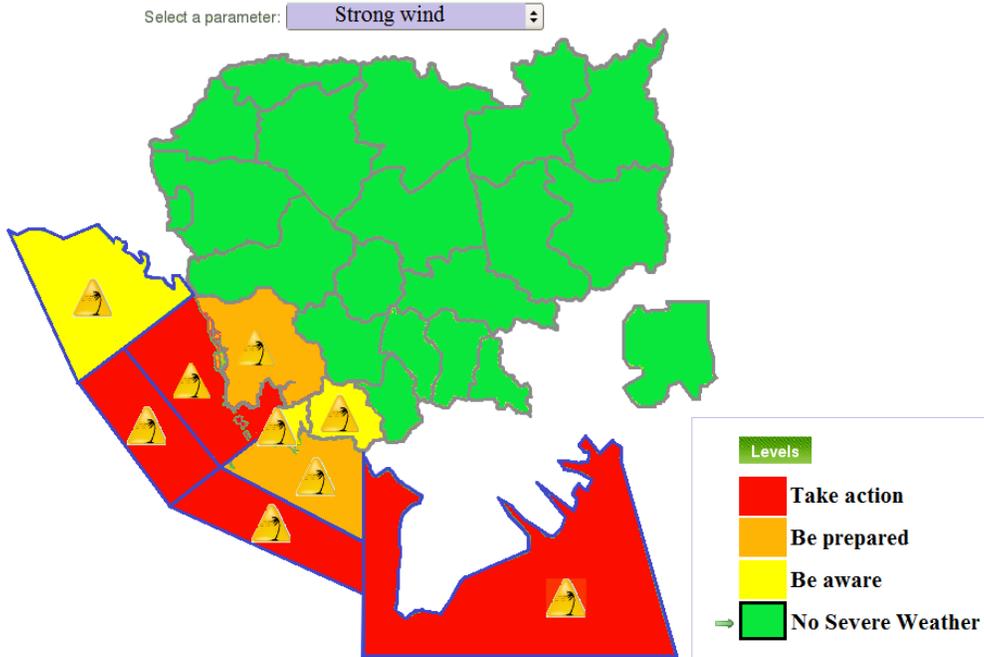


Forecasts for Fishery

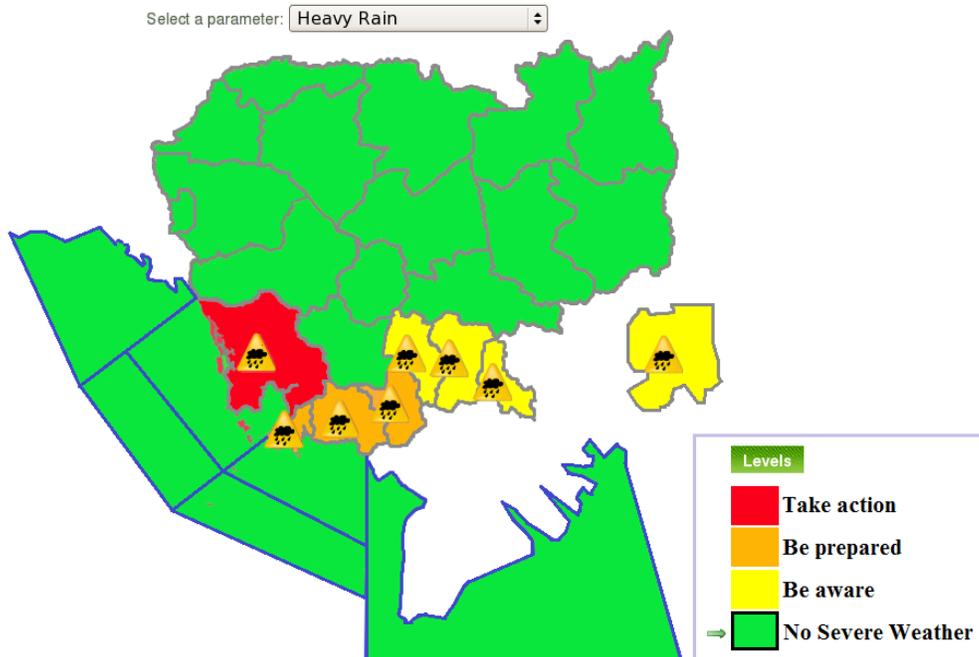
Appendix III.2.1

Examples of Warning (1)

Strong Wind



Heavy Rain



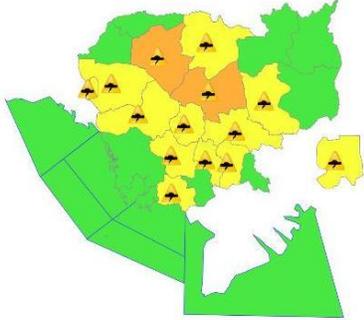
Appendix III.2.2

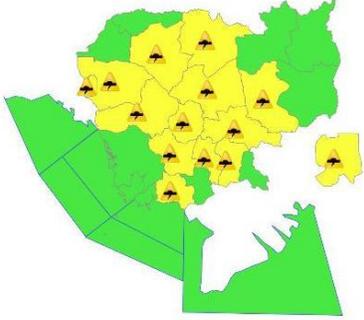
Examples of Warning (2)

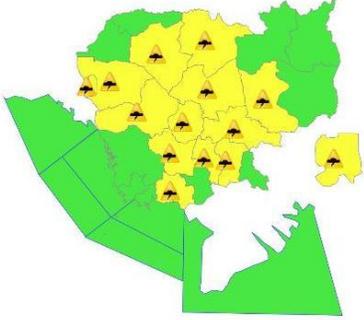
Warning Messages

Warnings

3 days
Friday
Saturday
Sunday







Friday 26 September 2014

Few thunderstorm associated with gusty wind will occur at time and place over the colored area.
Please be attention with the flash flood that can occur eventually.

Saturday 27 September 2014

Expect thunderstorm associated with gusty wind will continue to occur at time and place over the colored area.
Please be attention.

Sunday 28 September 2014

Expect thunderstorm associated with gusty wind will continue to occur at time and place over the colored area.
Please be attention.

Note:

Color Code for Weather Warning/Advisory

Color Code	Alert Level	Weather Phenomena
	No severe weather	
	Be aware	
	Be prepared	
	Take action	

Color Code for Rainfall Warning/Advisory

Color Code	Alert Level	Rainfall Intensity	Impact
	Be aware	5-15 mm/h and will continue to the next 3 hours	Flooding is possible
	Be prepared	15-20 mm/h and will continue to the next 3 hours	Flooding is threatening
	Take action	15-30 mm and will continue to the next 3 hours	- Serious Flooding in Low Lying Area and Coastal Area - Flash Flood in Plateau and Mountain Area

Appendix III.3a

Example of Announcement on Weather Situation (Heavy Rain) (in Khmer language)



ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ
នាណា * នាណា

ក្រសួងធនធានទឹក និងខ្យល់ច្របូកច្របល់

លេខ **៧៤៧** ប.ព
៧៤៧ ប.ព

សេចក្តីជូនដំណឹង

ស្តីពី ស្ថានភាពអាកាសធាតុនៅព្រះរាជាណាចក្រកម្ពុជា

បន្ទាប់ពីបានធ្វើការតាមដាន និងព្យាករណ៍លើស្ថានភាពអាកាសធាតុរួមមក ក្រសួងធនធានទឹក និងខ្យល់ច្របូកច្របល់ សូមជម្រាបជូនដំណឹងដល់សាធារណជនឱ្យបានជ្រាបថា : ក្នុងរយៈពេលពី 02 ទៅ 03 ថ្ងៃខាងមុខ នឹងមានប្រព័ន្ធ សម្ពាធចាបមួយ (ITCZ) កើតឡើង និងអូសបន្ទាយកាត់ពីលើរាងទន្លេមេគង្គក្នុងប្រទេសថៃ និងប្រទេសឡាវ ។ ប្រព័ន្ធសម្ពាធចាបនេះ នឹងមានឥទ្ធិពលមកលើព្រះរាជាណាចក្រកម្ពុជា ដោយបង្កឱ្យមានភ្លៀងធ្លាក់ពីបង្កូរទៅច្រើន ចាប់ពីថ្ងៃទី 25 ដល់ថ្ងៃទី 28 ខែសីហា ឆ្នាំ 2014 នៅតាមបណ្តាជំរក-ខេត្ត មួយចំនួនដូចជា :

- រាជធានីភ្នំពេញ កណ្តាល កំពង់ស្ពឺ ព្រៃវែង កំពង់ចាម ត្បូងឃ្មុំ ក្រចេះ ស្ទឹងត្រែង មណ្ឌលគីរី រតនគិរី ព្រះវិហារ និងខេត្តឧត្តរមានជ័យ នឹងមានភ្លៀងធ្លាក់ច្រើន ។
- ខេត្តតាកែវ ស្វាយរៀង កំពង់ឆ្នាំង ពោធិ៍សាត់ បាត់ដំបង ប៉ៃលិន បន្ទាយមានជ័យ សៀមរាប កំពង់ធំ កោះកុង ព្រះសីហនុ កំពត និងខេត្តកែប នឹងមានភ្លៀងធ្លាក់ពីបង្កូរទៅច្រើន ។

ការធ្លាក់ភ្លៀងនៅតាមបណ្តាជំរក-ខេត្ត ដូចបានជម្រាបជូនខាងលើ អាចបង្កឱ្យមានជំនន់ទឹកភ្លៀងនៅតាម តំបន់ទំនាបជាប់នឹងផ្លូវទឹក ពិសេសខេត្តកំពង់ស្ពឺ និងកំណាត់ផ្លូវជាតិលេខ 4 ស្ថិតនៅក្នុងភូមិសាស្ត្រ ស្រុកកំពង់សីលា ខេត្តព្រះសីហនុ ។

សេចក្តីជូនដំណឹងជម្រាបជូនខាងលើ សូមក្រសួង-ស្ថាប័នពាក់ព័ន្ធ អាជ្ញាធរដែនដី និងសាធារណជន មេត្តាជ្រាប ជាព័ត៌មាន និងបង្កើនការយកចិត្តទុកដាក់ប្រុងប្រយ័ត្នខ្ពស់ ចំពោះស្ថានភាពអាកាសធាតុខាងលើនេះ ដើម្បីចៀសវាង នូវគ្រោះថ្នាក់ផ្សេងៗ ដែលអាចកើតមានឡើងជាមួយគ្នាបាន ។

រាជធានីភ្នំពេញ ថ្ងៃទី **23** ខែសីហា ឆ្នាំ ២០១៤



លីម គានហោ

Appendix III.3b

Example of Announcement on Weather Situation (Heavy Rain) (English Translation)



Kingdom of Cambodia
Nation Religion King

Ministry of Water Resources and Meteorology

N^o: Special Number....MOWRAM

Announcement

On Weather Situation in Kingdom of Cambodia

Through Weather Watch and analysis, the Ministry of Water Resources and Meteorology would like to inform that: during 2 days from 02-03 August 2014 ahead, the Inter Tropical Convergent Zone (ITCZ) will be occurring and lying over the Mekong River Basin of Thailand and Laos PDR. This ITCZ influence will effect to the Kingdom of Cambodia and it will cause to be rain from moderate to heavy rain shower from 25 to 28 August 2014 in some area such as:

- There will be moderate to heavy rain in Phnom Penh, Kandal, Kampong Speu, Prey Veng, Kampong Cham, Tbong Khmom, Kratie, Stung Treng, Mondol Kiri, Rattanak Kiri, Preah Vihear and Oddar mean chey.

- There will be Slice to Moderate rain in Takeo, Svay Rieng, Kampong Chhnang, Pursat, Battambang, Pailin, Banteay Meanchey, Siem Reap, Kampong Thom, Koh Kong, Preah Sihanouk and Kep Province.

This weather situation will cause to be flash flood in low land area are nearby the water ways, especially in Kampong Speu province and the National Road N^o 4 that is in Kampong Sila distric of Preah Sihanouk Province.

As above mentioned, Please all the institutions, relevant agencies, Local Authority and all the people shall be keep attention and highly consideration in this weather situation in order to avoid from any accident that will happen eventually.

Phnom Penh, 23 August 2014

Signature and Stamp
Minister

Lim Keanhor

Appendix III.4

Example of Warnings

Strong Wind Warning issued by DOM at 18:32 Cambodia time on 15/10/2013

Warning statement

Strong wind speed warning (tidal height) for the lake, river and sea region in the Cambodia
Target area: Provincial region location on the seaside
Period of warning/advisory in effect:
Warning strong wind speed: weather unstable from 9 pm of 15 Oct. to 9 am of 18 Oct.
Advisory: until noon of 18 Oct.
Maximum averages wind speed 10 m/s at the sea, lake site, 9 m/s in land

Heavy Rain Warning issued by DOM at 18:32 Cambodia time on 15/10/2013

Warning statement

Heavy rain warning (flood/flash flood disaster) for the northeast and south region in the Cambodia
Target area: five Provincials as.....
Period of warning/advisory in effect:
Warning heavy raining: weather unstable from 9 pm of 15 Oct. to 9 am of 18 Oct.
Advisory: until noon of 18 Oct.
Maximum hourly precipitation: 80 mm

Water Levels Warning issued by DHRW at 19:00 Cambodia time on 15/10/2013

Warning statement

· Be affected for water level rise on date 16-18 Oct. 2013 of rivers for hydrological in the Mekong,
Bassac and Tonle Sap River
Target area: Provincial, municipality,
Warning (flood): 7 am of 16 Oct. to 19 am of 18 Oct. 2013
Advisory (flood): until of 18 Oct. 2013

Appendix IV.1

Example of SOP (1) Weather Forecast and Early Warning Operation

Operation Product	Organizer	Responsibility				
Super Administrator	Director of DOM/	Supervisor				Definition of a new product
All rights	Deputy Director of DOM (in charge of Weather Forecast and Climate)	Supervisor				New end-user
						Control of the warnings and forecasts
	IT Engineer	Meteo-Factory administration				
Forecasts	Senior Forecaster***	Warnings	Cambodia	Gulf of Thailand	Reports	Control of the databases and proposals
All Products	Forecasters		Country database	Marine database		For the warnings
						Control of the reports
Forecasts	Senior Forecaster***	Warnings	Cambodia	Reports		
Country	Forecasters	Country	Country database			
Forecasts		Warnings	Gulf of Thailand	Reports		
Marine		Marine	Marine database			
Administration	IT Engineer	Production Control	Sending of the products			
All rights						

*** In case of special event, warning and databases done by Senior forecasters
Daily tasks: control of the databases and reports before submission

Warnings

Warning based on the model analysis
Immediate Warning: Using Weather Radar and Satellite Imagery

Appendix IV.2

Example of SOP (2) Checklist for Reporting

General Reports

Hours are UTC hours

Title	Key	Production time	Deadline	Frequency	Actions
Tsunami Message - NEVER DELETE	TsunamiA_349	00h00	23h59	Mon Tue Wed Thu Fri Sat Sun	
JMAEPS	JMAEPS_359	00h00	00h00	Mon Tue Wed Thu Fri Sat Sun	
Earthquake	Earthqua_362	00h00	00h00	Mon Tue Wed Thu Fri Sat Sun	
RIVERS FLOOD	MEKONGRI_359	00h00	00h00	Mon Tue Wed Thu Fri Sat Sun	
6 months seasonal prediction	6monthss_354	00h00	00h00	Mon Tue Wed Thu Fri Sat Sun	
6 months seasonal prediction in Khmer	6monthss_364	00h00	00h00	Mon Tue Wed Thu Fri Sat Sun	
Cyclone Message	CycloneM_356	00h00	00h00	Mon Tue Wed Thu Fri Sat Sun	
Flood	Flood_361	00h00	00h00	Mon Tue Wed Thu Fri Sat Sun	
Marine	Marine_365	00h00	00h00	Mon Tue Wed Thu Fri Sat Sun	
ECMWF_EPS	ECMWFEPS_366	00h00	06h00	Mon Tue Wed Thu Fri Sat Sun	
PP_EPSGRAM	epsgram_357	00h00	00h00	Mon Tue Wed Thu Fri Sat Sun	
Main guidance from DOM	Mainguid_343	00h00	02h00	Mon Tue Wed Thu Fri Sat Sun	
Drought Seasonal warning	DroughtS_350	00h00	23h58	Mon Tue Wed Thu Fri Sat Sun	

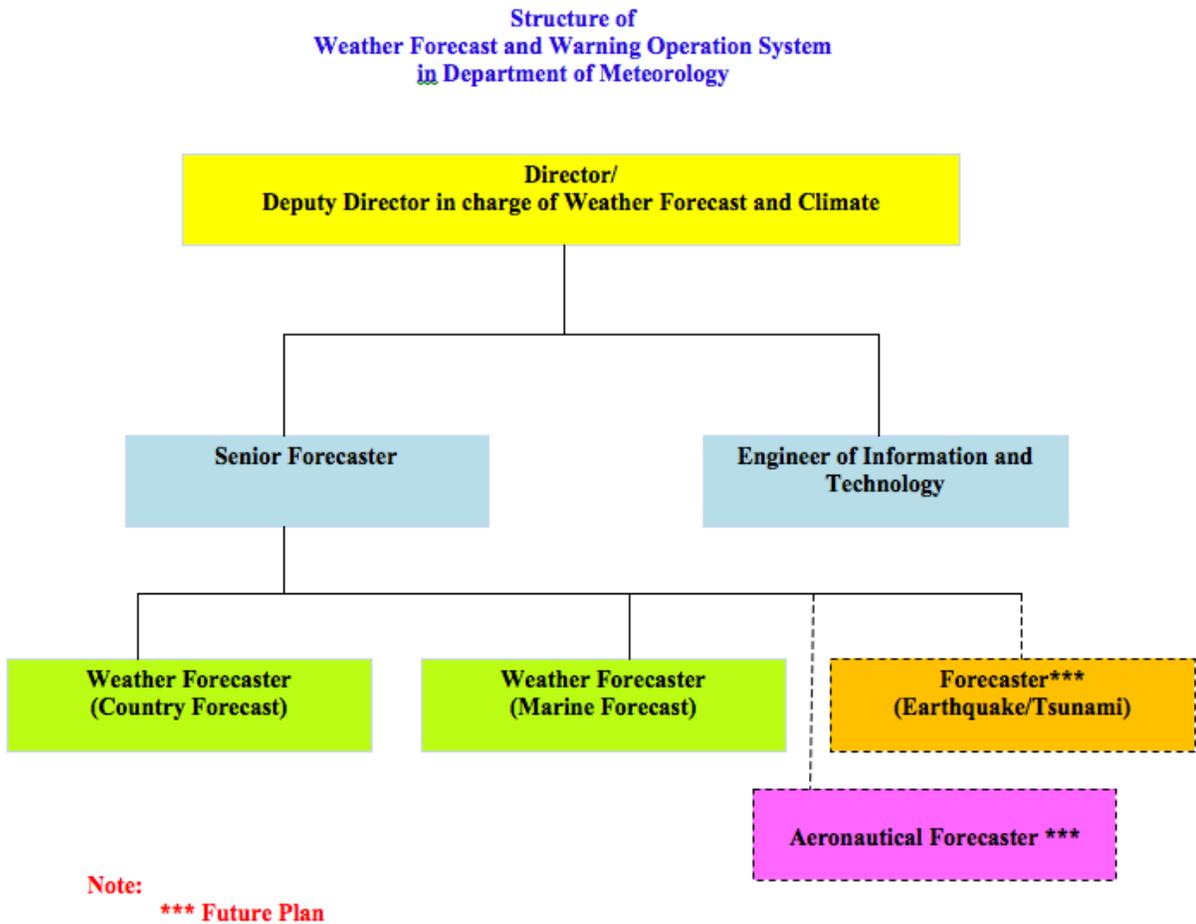
Customized Reports

Hours are UTC hours Report list for area(s) : Cambodia-Gulf of Thailand

Title	Key	Production time	Deadline	Frequency	Actions
Aviation Forecast	AirportF_341	06h00	10h00	Mon Tue Wed Thu Fri Sat Sun	
Marine Report	Fishinga_338	09h00	12h00	Mon Tue Wed Thu Fri Sat Sun	

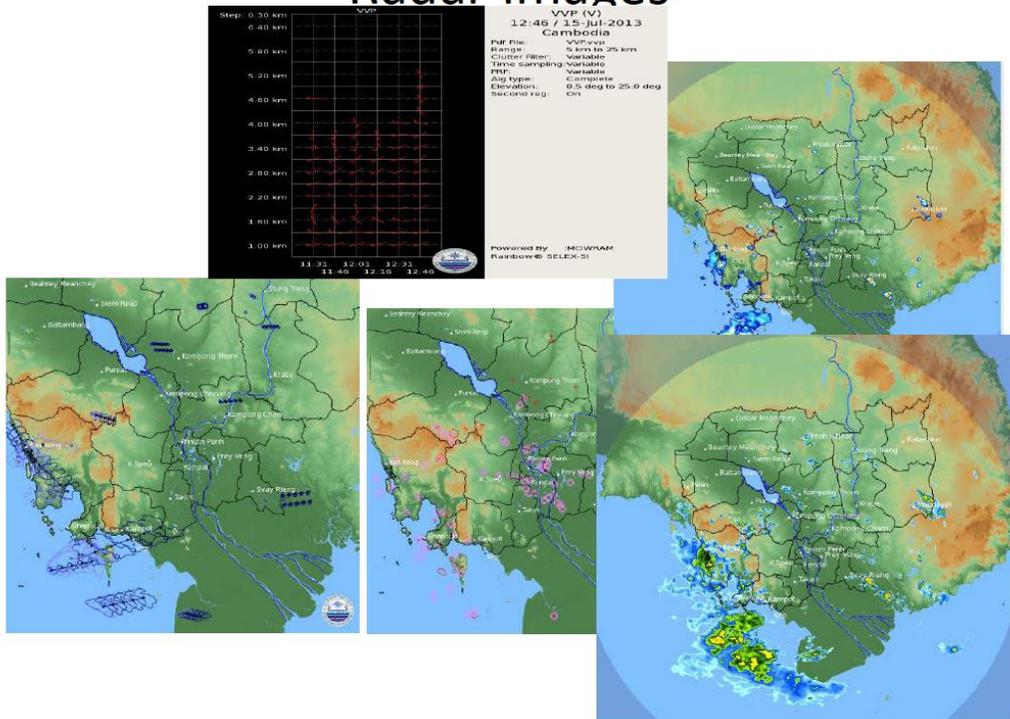
Appendix V

Pictures, Diagrams, flowcharts and ideas collected

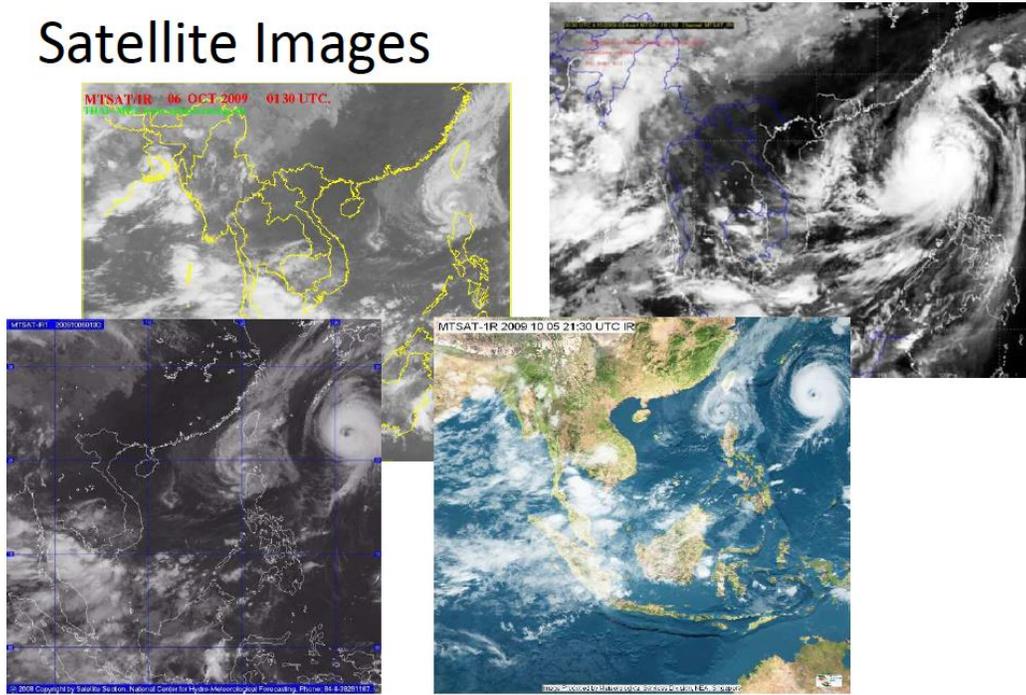




Radar Images



Satellite Images



News

 **MINISTRY OF WATER RESOURCES AND METEOROLOGY**
DEPARTMENT OF METEOROLOGY
CAMBODIA

Weather Marine Warnings News About

Warnings

Links

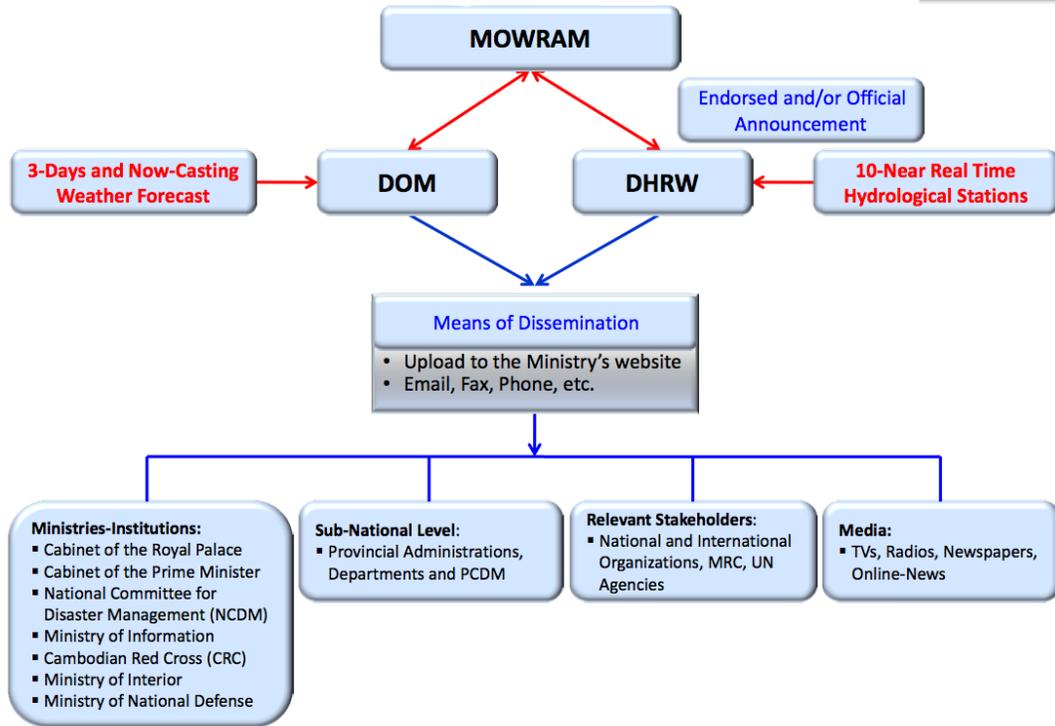
- ▶ Ministry of Water Resources and Meteorology
- ▶ Tonle Sap Authority
- ▶ Ministry of Public Works and Transport
- ▶ Ministry Tourism

Weather Station: Radar Station TECHO SEN
written by - Wednesday 14 November, 07:09

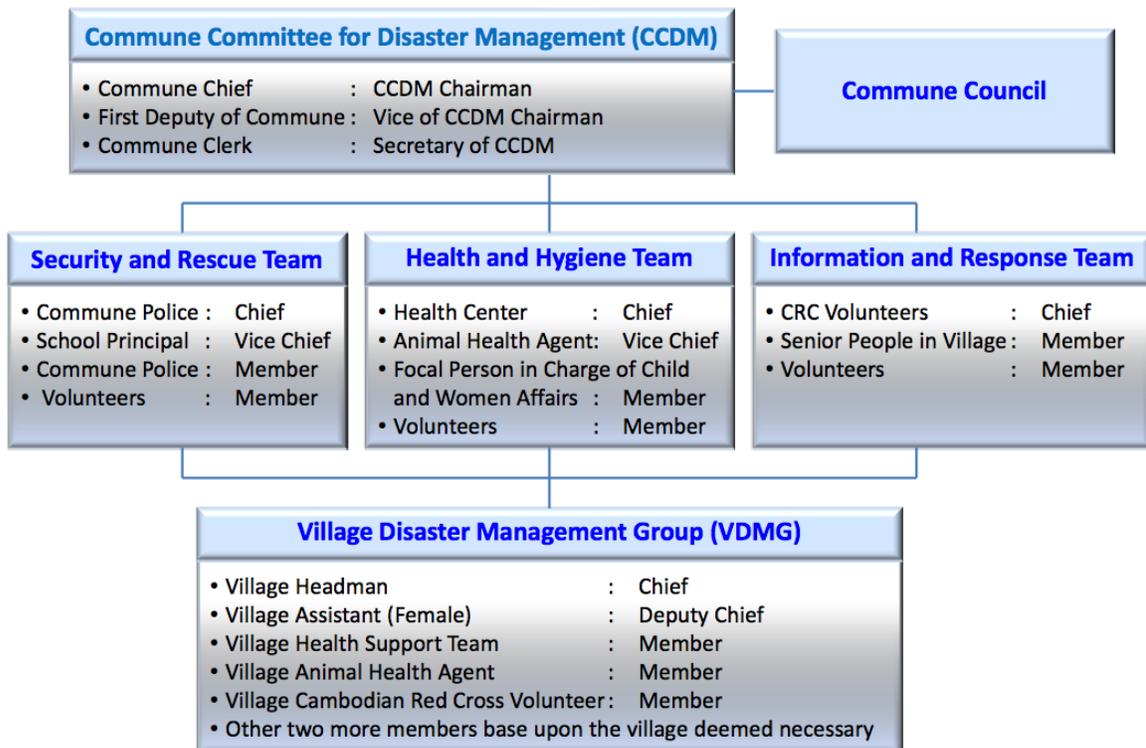
សេចក្តីជូនដំណឹង

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ
ROYAUME DU CAMBODGE

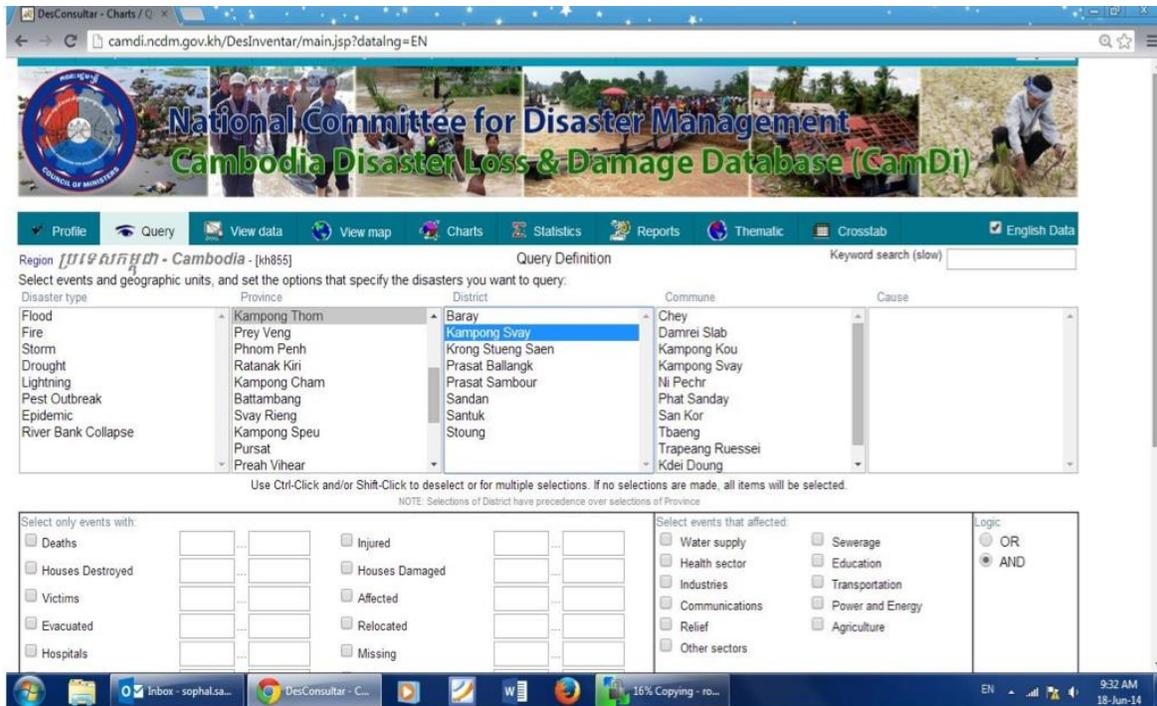
ក្រសួងធនធានទឹក និង អាកាសធាតុ
ព្រះរាជាណាចក្រកម្ពុជា
ROYAUME DU CAMBODGE



Dissemination of Forecasting and Early Warning Information



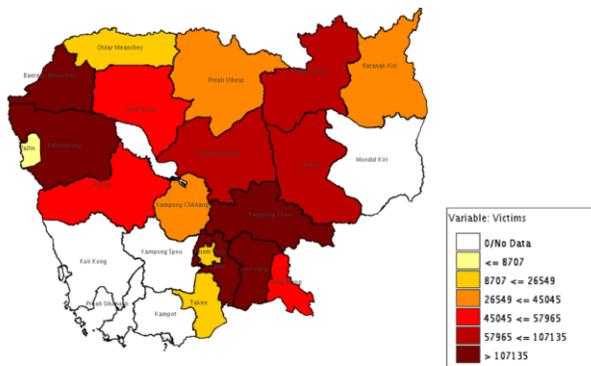
Commune Coordination Mechanism



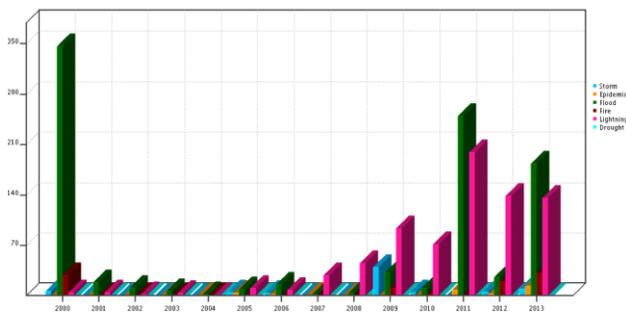
Sources: (CamDi), <http://camdi.ncdm.gov.kh>

Cambodia Disaster Loss and Damage Database (CamDi)

2013 Map of Flood Victims (CamDi) | Deaths From Multi-Hazards By Year (2000 – 2013)

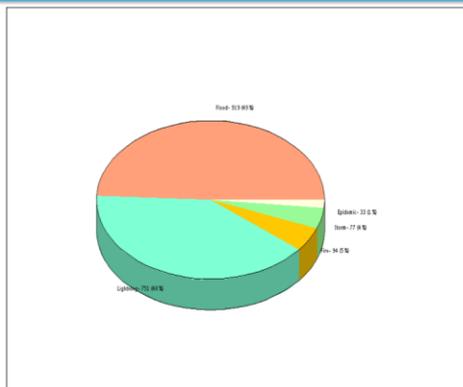


Sources: (CamDi), <http://camdi.ncdm.gov.kh>



Sources: (CamDi), <http://camdi.ncdm.gov.kh>

Percentage of Deaths Caused by Multi-Hazards (2000 - 2013) | Disaster Damage and Loss



Sources: (CamDi), <http://camdi.ncdm.gov.kh>

Summary of Damage and Losses (DaLA)									
Sectors and Sub-Sectors	2009 Ketsana Typhoon			2011 Flood			2013 Flood		
	Effects (US\$ Million)			Effects (US\$ Million)			Effects (US\$ Million)		
	Damage	Loss	Total	Damage	Loss	Total	Damage	Loss	Total
Infrastructure	17.26	11.49	28.75	375.70	34.70	410.40	134.27	0.00	134.27
Social Sector	39.55	3.33	42.89	34.70	n/a	34.70	16.46	38.45	54.91
Productive Sector	1.05	59.01	60.06	40.80	138.80	179.60	2.54	164.59	167.13
Cross-Cutting Sector	0.21	0.10	0.31	0.00	n/a	n/a	n/a	n/a	n/a
TOTAL	58.07	73.93	132.01	451.20	173.50	624.70	153.27	203.04	356.31

Sources: Ketsana Comprehensive Post-Disaster Needs Assessment (March 2010), ADB Flood Damage Emergency Reconstruction Project (Preliminary Assessment, March 2012), and Post-Flood Early Recovery Needs Assessment (April 8, 2014)
 Note: Damage and Loss Assessment (DaLA)

Appendix VI

List of Abbreviations

ABBREVIATIONS

AHA	ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management
AWS	Automatic Weather Station
BOM	(Australian) Bureau of Meteorology
CRC	Cambodian Red Cross
DCDM	District Committee for Disaster Management
DHRW	Department of Hydrology and River Works
DMIS	Disaster Management Information System
DOM	Department of Meteorology
DRR	Disaster Risk Reduction
ECC	Emergency Coordination Center
ECMWF	European Centre for Medium-Range Weather Forecasts
EOC	Emergency Operations Center
ESCAP	Economic and Social Commission for Asia and the Pacific (UN)
EWS	Early Warning System
GFS	Global Forecast System
GSM	Global Spectral Model
GTS	Global Telecommunication System (WMO)
HFA	Hyogo Framework for Action
HYCOS	Hydrological Cycle Observing System
JICA	Japan International Cooperation Agency
JICS	Japan International Cooperation System
JMA	Japan Meteorological Agency
JTWC	Joint Typhoon Warning Center
KMA	Korea Meteorological Administration
MFI	Météo-France International
MOWRAM	Ministry of Water Resources and Meteorology
MOU	Memorandum of Understanding
MRC	Mekong River Commission
MSS	Message Switching System
MTSAT	Multifunctional Transport Satellite (Japan)
NCDM	National Committee for Disaster Management
NDMO	National Disaster Management Office
NGO	Non-Governmental Organization(s)
NMHS	National Meteorological and Hydrological Services
NOAA	National Oceanic and Atmospheric Administration (USA)
NWP	Numerical Weather Prediction
NWS	National Weather Service (USA)
PCDM	Provincial Committee for Disaster Management
PTC	(WMO/ESCAP) Panel on Tropical Cyclones
PTWC	Pacific Tsunami Warning Center
RGC	Royal Government of Cambodia
RSMC	Regional Specialized Meteorological Centre (WMO)
SAR	Search and Rescue
SATAID	Satellite Animation and Interactive Diagnosis
SMS	Short Message Service
SOP	Standard Operating Procedure
SSB	Single Side Band (transmitter)
SSOP	Synergized Standard Operating Procedures
TC	(ESCAP/WMO) Typhoon Committee

3 October 2014

TCS	Typhoon Committee Secretariat
TMD	Thai Meteorological Department
UN	United Nations
WMO	World Meteorological Organization