ESCAP/WMO
Typhoon Committee

WMO ESCAP
Panel on Tropical Cyclones
for the Bay of Bengal & the
Arabian Sea

MANUAL ON SYNERGIZED STANDARD OPERATING PROCEDURES (SSOPs) FOR COASTAL MULTI-HAZARDS EARLY WARNING SYSTEM

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MANUAL ON
SYNERGIZED STANDARD OPERATING PROCEDURES (SSOPs) FOR COASTAL MULTI-HAZARDS EARLY WARNING SYSTEM

The purpose of this Manual on Synergized Standard Operating Procedures for Coastal Multi-Hazards Early Warning System is to promote community resilience to coastal multi-hazards and to improve the policy and institutional arrangements at national, sub-national and community levels. In addition to this Manual, there is a second document, the "Quick Reference Guide", which contains the basic reference material and information to begin the development process for Synergized Standard Operating Procedures.

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The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and South East Asia Countries generously provided the support for Synergized Standard Operating Procedures (SSOPs) For Coastal Multi-Hazards Early Warning System project. This support is gratefully acknowledged.

The Chief Editor who compiled the Manual expresses his very kind appreciation to the many organizations and individuals who have previously done extensive research and work in the fields of early warning systems and SOPs, without which this manual would not have been possible. Many of these are listed below and in the Appendix entitled "List of References Used to Prepare the SSOP Manual and Additional References". In addition, the reviewers from the partner organizations and the consultants listed below are gratefully acknowledged for the comments, recommendations, and inputs they provided which improved the Manual's contents.

This Manual was produced as Activity 1.3 of the SSOP Project. The lead organizations for the project were the ESCAP/WMO Typhoon Committee and the WMO/ESCAP Panel on Tropical Cyclones. The generous and excellent participation in the project by Bangladesh, Cambodia, China, India, Lao PDR, Malaysia, Maldives, Myanmar, Philippines, Pakistan, Sri Lanka, Thailand, and Viet Nam is sincerely appreciated. The project received valuable assistance and support from a wide cross section of partner agencies which is acknowledged and very much appreciated:

- United Nations Economic and Social Commission for Asia and Pacific (ESCAP);
- Asian Disaster Preparedness Center (ADPC);
- Asia-Pacific Broadcasting Union (ABU);
- Global Alliance on Accessible Technologies and Environments (GAATES);
- Intergovernmental Oceanographic Commission (IOC) of UNESCO;
- UN-Women;
- Regional Integrated Multi-Hazards Early Warning System for Africa and Asia (RIMES);

- United Nations Development Programme (UNDP) Asia-Pacific Regional Centre;
- International Research Institute of Disaster Science (IRIDeS);
- Tohoku University of Japan; and
- World Meteorological Organization (WMO)

Sincere appreciation and acknowledgement is also conveyed to: the experts (from ABU, ADPC, TCS, PTCS, and Project Manager) who conducted the three Pilot Missions to Bangladesh, Pakistan and the Philippines; the WMO Regional Training Center (RTC) Nanjing, China for hosting the June 2014 training; the instructors and speakers (ABU, ADPC, ESCAP, IOC-UNESCO, IRIDES (Tohoku University), PTCS, Shanghai Meteorological Service, TCS, WMO and WMO RTC Director) who provided excellent training in June 2014; the 5 expert consultants (from India, Japan, and Pakistan) who conducted information gathering missions to the 6 countries of Cambodia, Malaysia, Maldives, Myanmar, Sri Lanka, and Viet Nam and provided valuable insights; and the 6 expert consultants (from Australia, India, Pakistan, and USA) who conducted hands-on training missions on SSOP implementation both for immediate application and for future reference in Cambodia, Lao PDR, Philippines, Bangladesh, Maldives, and Myanmar.

The project and the SSOPs manual would not have been possible without the professional, dedicated, and knowledgeable work by the staff of the Typhoon Committee Secretariat under the superior leadership of Mr. Olavo Rasquinho; the outstanding logistical support of Ms. Lisa Kou; the expert technical, formatting, and publishing experience of Ms. Denise Lau and the help of other staff members of the TCS with special emphasis to Dr. Jinping Liu who drafted the initial versions of the terms of reference of the project.

FOREWORD

It has been pointed out in *Early Warning Systems in the Indian Ocean and Southeast Asia - 2011 Report on Regional Unmet Needs* prepared by ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asia Countries that the Typhoon Committee and Panel on Tropical Cyclones regions are the most disaster prone regions in the world due to impacts of many types of natural disasters. Also the report indicated that, an end-to-end disaster early warning system should be a fundamental component of nations' disaster risk reduction strategies, enabling governments from the national to the local levels, as well as communities, to take appropriate actions to reduce the loss of lives and livelihoods in anticipation of a disaster.

Since the December 2004 Indian Ocean Tsunami, many countries surrounding the Indian Ocean as well as Southeast Asian countries have developed standard operating procedures (SOPs) for tsunami early warning systems. However due to low frequency of tsunami, there have been concerns over the continuity of such national level tsunami warning systems in less developed countries. Because there are many other demands on national governments, many countries may not have maintained an effective operational tsunami warning system. Therefore, the concept was developed that an operational coastal multi-hazards warning system could be more sustainable for a longer time.

To create an effective multi-hazards warning system, there is a strong need to create synergies among different types of coastal hazard early warnings, including for tsunami, storm surge, high tide, high wave, strong wind, flood and sediment disasters. The challenge faced by warning providers, media, disaster managers, and coastal communities is in understanding the similarities and differences among different coastal hazards and the characteristics of the warning process.

To establish synergies, synergized SOPs which are created through a cooperative development, review, analysis, and documentation process in a multi-hazards and multi-agency way are required. These synergized SOPs identify, coordinate, integrate, and document a standard set of steps to be followed in the same way each time.

The contents of this manual was developed specifically for the Typhoon Committee and Panel on Tropical Cyclone areas, but it is hoped that it is globally relevant to national meteorological and hydrological services and their partner organizations worldwide.

With Best Regards

Olavo Rasquinho
Former Secretary of Typhoon Committee

EXECUTIVE SUMMARY

This manual was designed to provide flexible approaches, operational guidance, and recommendations based upon best practices and available resources to prepare SSOPs for coastal multi-hazards early warning systems. It includes key concepts, basic principles, and basic standards for SSOPs. It also provides useful information, examples, and references particularly focused on the role of National Meteorological and Hydrological Services (NMHSs) in preparing and implementing effective SSOPs. The manual was developed as part of the SSOP project. This project was jointly implemented by the Typhoon Committee (TC) and the Panel on Tropical Cyclones (PTC) with funding from the ESCAP Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries.

In addition to the Manual, there is a companion document called “Quick Reference Guide on SSOPs for Coastal Multi-hazards Early Warning System.” The Quick Reference Guide is a summary of the basic ideas and methods for development and implementation of SSOPs. It is an operational guide for an organization to quickly and easily start or review implementation of the SSOP process.

This manual was developed as a resource for TC and PTC Members and is not binding or required for any Member. Each Member can decide to use the SSOP Manual and Quick Reference Guide as they see appropriate.

INTRODUCTION

Background and Approaches for Improving Existing SSOPs

ESCAP approved the SSOP project submitted by the ESCAP/WMO TC and the WMO/ESCAP PTC to enhance:

1. Cooperation between TC and PTC in collaboration with other agencies to create synergies to support the EWS among TC and PTC Members for different types of coastal hazards. These synergies can be achieved through a multi-hazard and multi-agency approach; and

2. TC and PTC collaboration as a part of ESCAP strategy to deepen regional cooperation mechanism and strengthen the capacity of high risk TC and PTC Members to meet the challenges of hazardous weather. In this regard, the SSOP project was an innovative idea that ESCAP funded utilizing the provisions of the ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness in the Indian Ocean and South East Asia.

The goal of the project was to promote community resilience, including vulnerable and special needs individuals, to coastal hazards through effective, synergized SOPs for multi-hazards EWS. The goal was to be met through the preparation of this manual and the development of a cooperative mechanism between TC and PTC on coastal multi-hazards EWS.

It was envisioned that improved SSOPs could further enhance ongoing efforts of the TC and PTC Members to support sustainable, socio-economic development of the high economic growth areas of coastal zones. By building upon existing SSOPs and information of TC and PTC Members for coastal hazards, especially those relevant to end-to-end EWSs and community-based disaster risk management, improved SSOPs could be developed. The connections between aspects of SSOPs and socio-economic implications are important to provide policy guidance to those involved in various aspects related to multi-hazards EWS.

Intended Target Readers or Users of the Manual

The project was mainly focused on the meteorological and hydrological services of the TC and PTC regions. However, one agency or organization cannot develop all of the needed SSOPs for an effective multi-hazards EWS in isolation. Coordination, collaboration, support, and assistance are needed not only horizontally with other agencies at the same level of government, but also vertically, to involve all levels of government, citizens, and media. An effective EWS must provide the required information to the people at risk so they in turn can perform the correct actions to save their lives and property regardless of whether they live in a large city or a rural, coastal location. Thus, the intended target readers or users of the manual are those involved in the enhancement of EWS services through a multi-hazards, multi-agency SSOP approach.

Key Strategic Concepts for SSOPs Development and Improved EWS

To fully use the SSOP Manual, certain definitions are needed for a common understanding of its content. These are:

Synergy

- To create SOPs through a cooperative development, sharing, review, analysis, and documentation process in a multi-hazard and multi-agency way so the whole is greater than the sum of its parts.
- Through this process, the overall EWS will be improved and the overall efficiency increased.

Standard Operating Procedures

- To identify, coordinate, integrate and document, in a logical order or sequence, a standard set of steps to be followed to ensure tasks are performed in the same way and to the same standard each time.

- Since these are done before a hazardous event occurs, the standard steps can be created in the most efficient and effective method to prepare, review, and release warnings in coordination with other agencies.

Multi-Hazards

- To identify and incorporate similarities of hazards into SSOPs.
- Hazards are different, occur on different time scales, and affect different geographical areas, but some elements of EWS for these hazards are similar. For example, this may include:
  1. Processes involved in monitoring and observing;
  2. Stages of alerts and warnings, for example, green, blue, yellow, red levels or other standard colors or levels;
  3. Coordination among agencies; and
  4. Processes of issuing and disseminating warnings.
- This approach can make an EWS and supporting SSOPs more sustainable because they would be used more frequently than stand-alone, single hazard methods. Single hazard SSOPs, if infrequently used, can produce operational, coordination, and communications problems when activated.

Integration

- To coordinate and integrate different agencies' inter-related roles and responsibilities into each other's SOPs to avoid conflicting information.
- This can be accomplished through a systematic review of the roles and responsibilities assigned to all agencies within a country involved in the EWS.
- This includes agencies at each level of government and also among different levels of government (national, sub-national, and local communities) involved in the warning chain.

Sub-National

- Levels between the national level and the community level. This would include provinces, territories, states, regions, divisions, governorates, prefectures, districts, and planning areas.
- Thus it will be used to describe all forms of government between the national level and the community level.

Time-line Concept

- Tasks listed in chronological order of how they are to be performed.

Role of SSOPs in EWS

In a EWS, several levels of documentation usually exist and should be strongly considered for incorporation.

1. National, high-level policy document(s) which provides a comprehensive and integrated management approach encompassing all stages of disaster management. These documents define the roles and responsibilities of citizens, public representatives, ministries, departments, agencies, private sector, insurance sector, corporate sector, and non-government organizations (these will differ for different PTC and TC Members). They often specify at a high level the "who" (responsible agency) and "what" (roles and responsibilities) and many times the "when" and "why" of agencies' roles and responsibilities in the EWS.
2. Memorandums of Understanding (MOUs). MOUs helps to ensure different agencies and organizations understand each other's roles and responsibilities and how they can perform in an integrated manner as partners. MOUs can either be bilateral (between two agencies) or multilateral (among multiple agencies). An MOU identifies the parties involved; defines the subject matter and objectives; and establishes agreed upon roles and responsibilities.
3. Different Levels of Procedures. There are effectively two levels of procedures. The "high level" procedures which can be developed into SSOPs are the ones that specify the "who", "what", "when", "where", "why", and "how" tasks or activities associated with natural disasters to support the national level policy documents and are the main focus of this Manual. Modules 6 and 14 focus on

this level of SSOPs and provide synergy ideas of what may be needed. The "lower level" procedures, sometimes referred to as operational directives or checklists, specify the more detailed "how to" and are internal to a particular workplace or agency. These are not shared or synergized because of their specific, internal nature.

Benefits and Purposes of SSOPs

A large amount of research and operational experiences by countries worldwide have shown the benefits and purposes of SSOPs in an EWS to save lives and protect property. Some of the vital benefits SSOPs can provide in an EWS are to:

- Ensure tasks are preformed within the country's documented EWS;
- Describe and document EWS roles and responsibilities;
- Incorporate concepts of synergy through multi-hazards, multi-agencies, and integration methods;
- Consider vulnerable and special needs individuals;
- Ensure tasks are integrated with other agencies and with all levels of government, especially local communities;
- Follow an identified process for formulation, review, testing, and approval before commissioning and implementation;
- Include a regular, robust, sustainable process for reviewing and updating after implementation; and
- Incorporate training and education programs at all levels for maximum effectiveness.

In addition to these benefits, well written SSOPs can serve valuable purposes, such as to:

- Ensure tasks are performed in the same way and to the same standard each time;
- Provide specific, approved direction;
- Produce predictable, reproducible results;
- Maintain high quality and consistent service in hazardous situations;
- Develop and implement the most efficient and effective method to perform tasks before an emergency occurs;
- Improve cooperation and integration of different tasks among agencies involved in EWS; and
- Reduce training time.

Organization of the SSOP Manual

The manual consists of 15 Modules divided into six parts to highlight the linkage between ongoing efforts with existing SSOPs and methods to improve them to support a multi-hazards, multi-agency early warning system. The six parts are: Technical Background; Strategic Framework of SSOPs; Formalization of SSOPs; Towards an Effective and Sustainable Process of Improvement; Role and Responsibilities of NMHSs in EWS; and SSOPs' Synergy and Continuity Opportunities. Each Module within these 6 parts provides detailed information for the subject listed. There are also 11 Appendixes at the end of the Manual which provide helpful information and examples.

The first two Appendixes are very useful and special emphasis should be placed on their review. These two Appendixes are included here and in the Quick Reference Guide. **Appendix I is** a Basic SSOP Template and Example. Modules 6, 14, and 15 provide more detailed and additional considerations in developing SSOPs. **Appendix II** is a SSOP Checklist which can be used to evaluate current SSOPs and develop new ones.

USEFUL APPENDIXES

I. Basic SSOP Template and Example
II. SSOP Checklist

Text Box I.1: Useful Appendixes

Quick Reference Guide

In addition, there is a separate Quick Reference Guide which is a summary of the basic ideas and methods for development and implementation

of SSOPs. It is an operational guide for an organization to quickly and easily start or review implementation of the SSOP process. It provides ideas on SSOP format, SSOP examples, and a checklist for reviewing the SSOPs. However, it is highly recommended and encouraged to review this Manual to gain a better understanding of ways to promote community resilience and to improve the policy and institutional arrangements at all levels of government using integrated, effective SSOPs for multi-hazards EWS.

PART I : TECHNICAL BACKGROUND

Module One: Early Warning Concepts and Principles

1.1. Four Elements of People-Centered Early Warning Systems

As the foundation for a short overview of an early warning system, the four elements of people-centered early warning systems were defined in the report from the International Strategy for Disaster Reduction (ISDR), *The Conclusions of Third International Conference on Early Warning (EWC-III) from Concept to Action*, 27-29 March 2006, Bonn, Germany. Retrieved from: http://www.unisdr.org/we/inform/publications/606. Since then, these four elements have been reviewed and the wording slightly modified by many different agencies, including WMO, based upon their different experiences and focus areas. Although slightly different wording may be used by some, the basic concepts of the four elements from the ISDR EWC-III have remained.

Within these four elements, based upon discussions, training sessions, and missions to a number of countries selected for this project, the following items were identified as required for an effective EWS:

- Involvement and commitment of high-level government policy makers;
- Legal and legislative framework;
- National plan or policy identifying roles and responsibilities;
- EWS as an integral part at all levels of government;
- Coordination across many/all agencies at national to local levels;
- Operational mechanism defined;
- Identification of budgetary and technical support;
- Designation of an agency for coordination activities; and
- A comprehensive national hazard risk assessment.

There is an excellent checklist for effective EWS

The Four Elements of Effective Early Warning Systems

Analyses of Risk/ Risk Knowledge	Monitoring and Warning Services	Dissemination and Communication	Response Capability
Systematically collect data and undertake risk assessments Are the hazards and the vulnerabilities well known? What are the patterns and trends in these factors? Are risk maps and data widely available?	*Develop hazard monitoring and early warning services* Are the right parameters being monitored? Is there a sound scientific basis for making forecasts? Can accurate and timely warnings be generated?	*Communicate risk information and early warnings* Do warnings reach all of those at risk? Are the risks and the warnings understood? Is the warning information clear and usable	*Build national and community response capabilities* Are response plans up to date and tested? Are local capacities and knowledge made use of? Are people prepared and ready to react to warnings?

Figure 1.1 Four Elements of Effective Early Warning Systems. Diagram from Water Diplomacy Blog, Breach The Bottleneck And Avoid Disaster: Enhance Early Warning Systems For Flood Hazards by Shafiqul Islam Posted on March 22, 2013.

identified at International Strategy for Disaster Reduction (ISDR), *Developing Early Warning Systems: A Checklist*, International Conference on Early Warning (EWC-III) from Concept to Action, 27-29 March 2006, Bonn, Germany. Retrieve from: http://www.unisdr.org/files/608_10340.pdf

1.2 Comprehensive and Integrated Approach for Development of EWS

Australia has adopted a comprehensive and integrated approach to achieve an effective disaster preparedness/management plan. These are:

a. All hazards/Multi-hazards approach;
b. Comprehensive and integrated approach;
c. All agencies/multi-agencies approach; and
d. A prepared community.

All hazards/multi-hazards approach: The all hazards approach refers to the development of arrangements for managing the large range of possible risks and disasters. This concept is useful to the extent that a large range of risks can cause similar consequences, and measures such as monitoring, warning, evacuation, medical services and community recovery will be required during and following emergencies. However, many risks will require specific response and recovery measures and will almost certainly also require specific prevention and mitigation measures. Also see Module 4.

Comprehensive and Integrated Approach. Planning for an effective EWS must adopt the comprehensive and integrated approach to ensure a balance between the reduction of risk and the enhancement of community resilience while ensuring effective response and recovery capabilities. The five components of the comprehensive approaches are:

a. Prevention;
b. Preparedness;
c. Mitigation;
d. Response; and
e. Recovery.

All Agencies/Multi-Agencies Approach. The all agencies/multi-agencies approach recognizes that no single agency can prepare for, and deal with the disruption to community life and infrastructure that can result from a disaster event. The all agencies/multi-agencies approach involves effectively coordinating the activities of the large number of organizations and agencies that are required to contribute to the comprehensive approach spectrum within and across all levels of Government. The all agencies/multi-agencies approach recognizes the need for effective coordination arrangements, containing inputs of the national government, sub-national and local governments besides the likely inputs of the media, civil society, NGOs, etc., to be articulated and set within a legislative and public policy framework. The arrangements must reflect the role of all agencies in the EWS within the context of community safety and sustainability. Also see Module 6.

A prepared community. In a disaster situation, individual and community "self-help" can often provide the most readily available and effective relief, as assistance from external sources may be limited or delayed by other demands on resources. Local government and community organizations provide the basis for organizing effective and immediately available community resources. Local volunteer organizations along with community-based organizations and committees, when effectively integrated into EWS arrangements, can be of vital assistance in giving access to community resources and expertise, and also act as a link in the essential information chain between local government, disaster management agencies and the community. Individuals can assist by being aware of local hazards and recommended precautions against risks. Individuals and families that heed advice on appropriate precautions can also reduce the demands on emergency management agencies, thus helping to ensure that their local government arrangements remain effective. Additionally, individuals can assist by actively participating in all related response activities of volunteer organizations.

The basic requirements for a prepared community are:

a Alert, informed, active and adequately prepared community members;
b. Effective community based organizations with identified, defined and constructive roles in local emergency management arrangements;
c. Local governments that acknowledge their roles in community safety issues and have well established, widely understood and practiced arrangements for discharging their community safety responsibilities; and
d. Organizations and communities being able to work together to respond to the emergency, save lives and property, and assist the community in rescue, relief and recovery.

Also see Module 10, Local Communities.

1.3 Community Early Warning Systems: Guiding Principles

The International Federation of Red Cross and Red Crescent Societies (IFRC) in Geneva published an important document entitled *"Community Early Warning Systems: Guiding Principles*". In this paper, the IFRC identified 13 "Cross-Cutting" Guiding Principles and 13 "Community Level" Guiding Principles for EWS. These 26 principles provide excellent guidance within the framework of the SSOP project, especially in the areas of synergies, Multi-hazards approaches, integration of different levels of government and issues to emphasize in EWS SSOPs. Listed below is only the title and area of emphasis for these guiding principles. For a more complete description and additional information on these guiding principles please see IFRC (2012) *"Community Early Warning Systems: Guiding Principles"* Retrieved from http://www.ifrc.org/PageFiles/103323/1227800-IFRC-CEWS-Guiding-Principles-EN.pdf

The edited titles of 9 of the 13 "Cross-Cutting" Guiding Principles are listed below:

1: Integrate all agencies with EWS responsibilities
2: Aim for synergy across levels: community, sub-national, national and regional/global
3: Insist on multi-hazards EWS
4: Include full vulnerability and hazards
5: Accommodate multiple timescales
6: Account for evolving risk and rising uncertainty
7: Require redundancy in indicators and communication channels
8: Target and reach disadvantaged and vulnerable groups
9: Build partnership and individual engagement

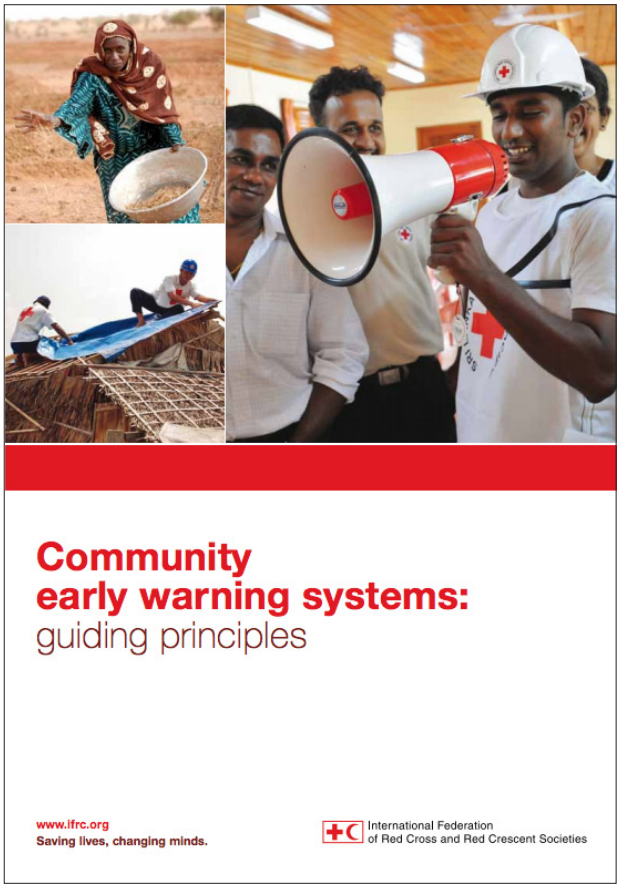


Figure 1.2 Community Early Warning Systems

The edited titles of the 13 "Community Level" Guiding Principles are listed below:

Risk knowledge
K-1: All early warning systems must be founded on risk knowledge
K-2: Ensure local community's priorities are accepted

Monitoring
M-1: Passive receiver of information do not save lives

M-2: Some communities will need to drive their EWS
M-3: Public display of monitoring can motivate communities
M-4: As hazards evolve, so must their monitoring

Response capability

R-1: People respond to warnings, not to disasters
R-2: Organize strong response actions which will not have negative impacts when followed
R-3: Include response options in annually updating contingency plans
R-4: Practice, exercises, and drills increase the chances that procedures will work for actual emergencies

Warning communication

C-1: Clearly identify roles and responsibilities for issuing warnings, calling for evacuations and other EWS actions
C-2: Do not totally depend on high technological warning and dissemination systems, because they may fail
C-3: Use staged warnings (levels and colors) in dissemination

PART II : STRATEGIC FRAMEWORK OF SSOPs

Module Two: Role of SSOPs in an Early Warning System

When an early warning system for a natural hazard is activated, it must work immediately in an effective, efficient, integrated manner to protect the lives and property of the country's citizens, particularly the local communities who usually are most affected. If an effective early warning system has not been established then incorrect, panicky, or no actions may lead to devastating impacts. When a hazard is imminent or occurring, personnel involved in the EWS must know what to do and how to do it in order to provide advanced warning of the hazard to the impacted communities and people.

2.1 Vital Role of SSOPs in EWS

SSOPs are vital to an effective EWS because they are developed before an emergency; indicate the most efficient and effective ways to perform an operation (e.g., producing warnings, communications, response, evacuation, rescue, etc.); and help produce predictable, reproducible results while maintaining the quality and consistency of service.

Figure 2.1 Bangladesh's High Level Policy Documents

2.2 Concept of Operations (CONOPS)

Many countries have high-level policy documents containing their CONOPS such as Bangladesh's "*National Plan for Disaster Management"* and "*Standard Orders on Disasters*"; Myanmar's "*Standing Orders on Natural Disaster Management in Myanmar (Restricted)";* or Malaysia's "*National Security Council Directive No. 20: The Policy and Mechanism on National Disaster Management and Relief".* These documents provide a comprehensive and integrated management approach encompassing all stages of disaster preparation and response. This CONOPS defines the roles and responsibilities of citizens, public representatives, ministries, agencies, and non-government organizations and often specifies the "who" (responsible agency), the "what" (roles and responsibilities), and often the "why" of an EWS.

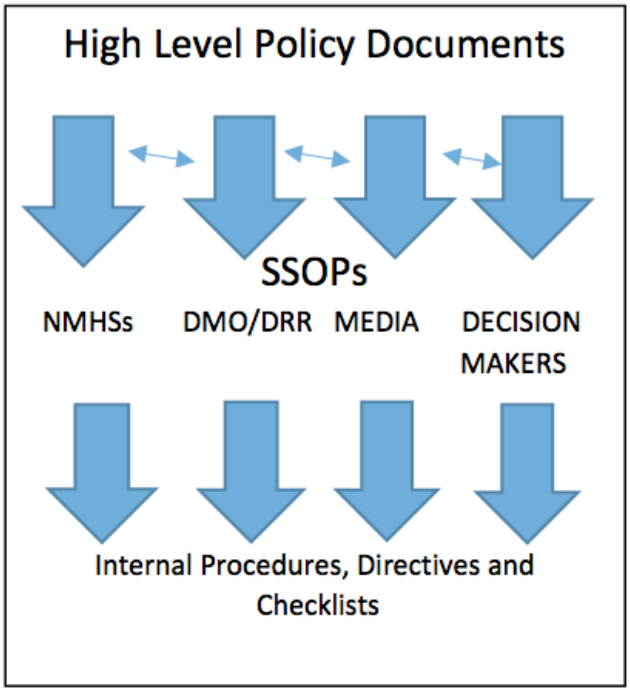


Figure 2.2 SSOPs Levels

2.3 Levels of SSOPs and Related Information

In most countries, there are effectively two levels of SSOPs. The higher level SSOPs are the ones

that provide additional information on the "who", "what", and "why" and also describe the "when" and "where" associated with natural disasters. These are the ones that are the main focus of this Manual and Module 14 provides some ideas of what may be needed.

The lower level SSOPs specify the detailed "how to do it", are specific to a particular agency, and include references to internal procedures, internal websites and staff telephone numbers. These are sometimes referred to as checklists or operational directives or checklists and would not normally be shared with other agencies or synergized because of the specific needs and ideas of each country.

Figure 2.3 from Lao PDR shows the interactions of the four elements of an early warning system and includes checklists and SSOPs into these interactions. This diagram shows the Monitoring and Warning Services element and the use of internal checklists and/or SSOPs depending upon the country and its procedures. However once the Dissemination and Communication element is being accomplished, it is recommended that SSOPs be used to ensure multi-hazards and multi-agency aspects are included and also to ensure the steps are completed in the same way each time.

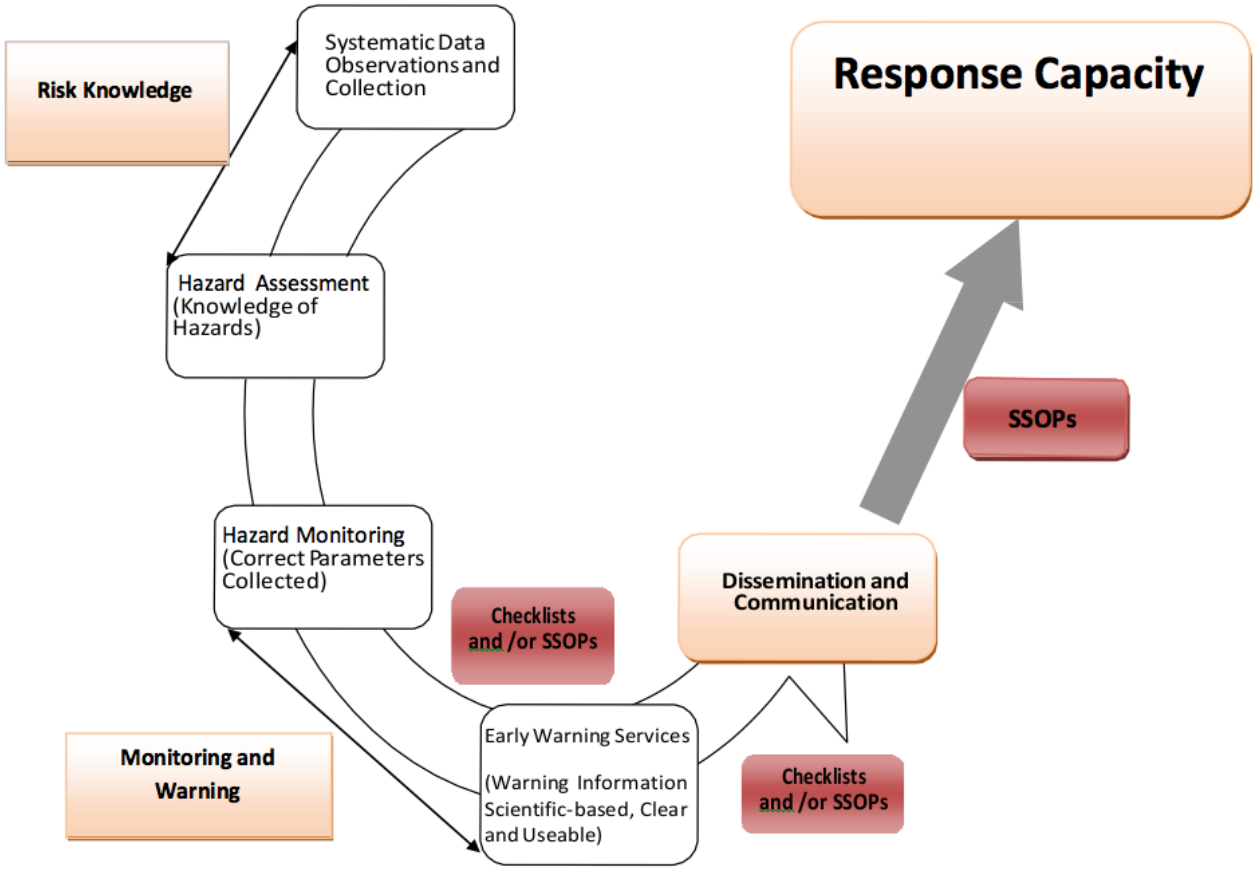


Figure 2.3 Interactions of Four Elements of EWS Along With Use of Checklists and/or SSOPs (Based Upon a Diagram Provided by Lao PDR)

Module Three: Memorandums of Understanding (MOUs)

As stated in "Concept of Operations" in Module 2, most countries have broad policy laws and documents which describe roles, responsibilities, tasks, and functions of different agencies or organizations within a country during a disaster. These usually provide broad direction and responsibilities but not the details or the exact manner in which the different agencies and organizations will work together to integrate their activities to achieve maximum efficiency and effectiveness.

3.1 Role of MOUs

MOU is one method to ensure different agencies and organizations understand each other's roles and responsibilities and how they can perform in an integrated manner as partners in disaster situations. MOUs can be bilateral or multilateral depending upon the need and the number of agencies involved in a specific area of the EWS. An MOU identifies the parties involved; formalizes a relationship; defines the subject matter of the agreement and its objectives; the benefits for the agencies involved; agreed upon roles and responsibilities; summarizes the essential terms of the agreement; and signed by the participating parties. For multilateral MOUs, the benefits of a large number of agencies included in a single MOU must be balanced by possible constraints in drafting, training, implementation, revising, and updating.

For NMHSs, it is recommended that they have a MOU between themselves and, if applicable, other warning agencies (e.g., Tsunami Warning Center, Ocean Services, and Hurricane Center), between themselves and the DMO/DRR agencies, and the important media outlets, or a multilateral one including these and others because of the important role that each plays in the EWS. It also can be advantageous to have MOUs between different levels of government to ensure a smooth transition of the required information and warnings from the national to local levels.

3.2 Guidelines for Creating a MOU

WMO-No. 1099, PWS-26 also contains a template and several examples of MOUs, which can be found at http://www.wmo.int/pages/prog/amp/pwsp/publicationsguidelines_en.htm.

In addition to the references in the WMO manual, Appendix IV contains an MOU-type document, "***Standard Emergency Warning Signal (SEWS) and Its Use in Queensland"***. Although not specifically named an MOU, it has all of the parts of a good MOU. It contains a multi-hazards approach and also multi-agencies aspects and provides an excellent example of some ideas on format and content to include.

Guidelines for Creating a Memorandum of Understanding and a Standard Operating Procedure between a National Meteorological or Hydro-meteorological Service and a Partner Agency

1. PRINCIPLES

- A mutual desire by agencies for an MOU, with a shared and equal commitment to working together;
- Provisions in the MOU should not conflict with existing arrangements or policies;
- Incorporating the input and views from all stakeholders included in the MOU;
- Structure and content of the MOU should be clear, simple, and unambiguous to avoid misunderstandings;
- The MOU is a 'living' document and should include provisions for reviewing, updating, or canceling; and
- The MOU should be developed with relevant legal, financial, and other experts to avoid unintended implications.

From World Meteorological Organization (2012) Guidelines for Creating a Memorandum of Understanding and a Standard Operating Procedure between a National Meteorological or Hydro-meteorological Service and a Partner Agency, WMO-No. 1099, PWS-26

Module Four: Multi-Hazards SSOPs

Given tsunamis' or certain other coastal hazards' relatively low frequency of occurrence, operational, communications, and coordination problems may develop in stand-alone, single hazard early warning systems. Because there are many significant and varied demands on national, sub-national, and local governments, it may also not be cost effective to maintain a warning system for each hazard. Instead, the concept of multi-hazards early warning system has been developed, and is likely to prove more sustainable and cost-effective for a longer time, especially with respect to coastal hazards.

4.1 Coastal Hazards

Common coastal hazards include:

a. Tsunamis (both locally and distantly generated);
b. Tropical Cyclones (heavy rain, strong winds, and storm surge all of which vary based upon the distance and intensity of the system);
c. Thunderstorms (varying levels and occurrences of heavy rain, strong winds, hail, waterspout, and tornado);
d. Very Heavy Rain (associated with monsoons and other phenomena); and
e. Strong Winds and Associated High Waves (produced by near and distant low pressure systems).

It is important to note here that the motivation behind the SSOP initiative was especially focused on the impacts of tropical cyclones and tsunamis being most keenly felt by large cities and smaller communities along the coastal region. The impacts from these two hazards can be very devastating for mega-cities on a large scale and just as devastating to communities on a smaller scale.

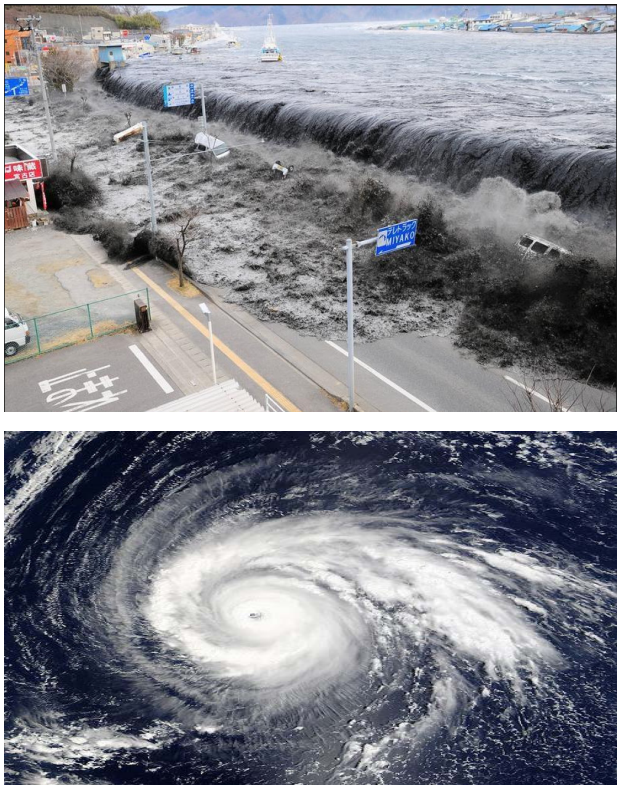


Figure 4.1 Tsunami and Tropical Cyclone Pictures (By George Dvorsky and REUTERS/Mainichi Shimbun)

4.2 Acknowledgement of Hazards Differences

Although hazards behave differently and may occur on very different time scales and affect different geographical areas, core elements of many EWS for coastal hazards are similar. However despite the synergies involved, great care must be taken in developing a coastal multi-hazards EWS. For example, tsunamis and storm surges have both similarities and differences. Storm surges caused by tropical cyclones usually have a longer lead time than tsunamis and the duration of the inundation can be longer, especially for slow moving tropical cyclones. Because there is not earthquake early

MULTI-HAZARDS SSOPS

Emphasize Similarities
Careful Consideration of Differences

Text Box 4.1 Multi-hazards SSOPs

warning, inundation by tsunami can be more difficult and less dependable to forecast than storm surges. Differences in the warnings need to be clearly understood at the operational level and good communications need to be maintained between different warning providers. SSOPs need to be well developed for the warning providers as well as media and disaster managers to ensure that the correct actions are taken for different hazard types and that the general public can take appropriate actions during the warning.

4.3 Multi-Hazards Aspects of SSOPs

In the development of multi-hazards EWSs, a country can conduct a systematic analysis of similarities and differences of their coastal threats and hazards. Although not perfectly aligned, consideration should be given to incorporating these similarities into multi-hazards SSOPs.

- Tropical cyclones and tsunamis differ in time scales and in magnitude of inundation, certain similarities exist such as expected inundation areas, planning inundation charts, monitoring, and inundation measurements;
- To indicate potential risk/impact for different stages or phases of hazards, a number scale such as 1 through 5 or color scale such as green, orange, yellow, red, black levels or other colors may be beneficial. It is easier to train and to communicate the threat to the public, media, and others by using a standard set of colors or number scale. If different colors or numbers are used for different hazards, agencies and people can be confused on the meaning and actions to be taken;

Hazard Color or Number Scales

BETTER TO COMMUNICATE AND UNDERSTAND

INCREASED EFFECTIVENESS OF TRAINING

Text Box 4.2 Hazard Color or Number Scales

- For tropical cyclones, tsunamis, and other coastal hazards, similarities can be identified in disseminating warnings and then incorporated into the SSOPs for different hazards. If similar dissemination systems and processes are used for all hazard warnings, then the systems and processes are tested on a more frequent basis, people and agencies become knowledgeable and experienced on the dissemination with less chances of miscommunications or misunderstandings, and the people at risk will receive and understand warnings in a timely manner to save their lives; and
- Similar coordination processes can be used among agencies and organizations at the same levels of government and also vertically from national to local communities. Therefore similar communications processes can be executed on a more frequent basis than different processes for each hazard. This helps to ensure, when needed, the communication process will work as planned.

If these similarities can be identified and incorporated into the EWS, a multi-hazards approach can:

- Produce more frequent activation of EWS plans and procedures throughout the year;
- Result in greater efficiency of limited human and financial resources;
- Minimize system maintenance and number of required staff/volunteers; and
- Assist in training.

For these reasons, users may experience less confusion on where to seek early warning information; during a period when one hazard is dormant, another hazard may require the activation of the EWS; and in periods where all hazards are dormant, vulnerability or resilience may still be monitored.

Module Five: Multi-Agency, Multi-Level Integrated SSOPs

5.1 Need for Integrated SSOPs

As stated in a previous Module, one agency or organization cannot develop all of the needed SSOPs in isolation. Coordination, collaboration, support, and assistance are needed not only horizontally with other agencies at the same level of government, but also vertically to involve all levels of government, citizens, and media to ensure integration. An effective EWS requires multi-agency, multi-level, multi-hazardsSOPs which can provide the required information to the people at risk so they in turn can perform the correct actions to save their lives and property regardless of whether they are in a large city or a rural, coastal location.

5.2 Importance of Communications

To accomplish the various items within this Module, the importance of communications with other agencies and stakeholders are very, very important! Communications should be a continuing process and not just one time. Communications and cooperation should be emphasize in every aspect of SSOP development: planning, writing, editing and implementing and in all aspects of SSOP use during: a hazardous situation and the review process after the hazard has ended.

Figure 5.1 Importance of Communications and Partnerships in Development of Multi-agency, Multi-level Integrated SSOPs
Images by Jackie Black, Ph. D., BC

Fostering Partnerships and Good Relationships

Good partnerships and relationships are very important in the preparation, coordination, and implementation of multi-agency, multi-level, integrated SSOPs. If good, trusting relationships exist, then this process will proceed smoothly and timely. Without good, trusting relationships, the SSOP process could be contentious and take a very long time to complete. Therefore it is recommended, as much as possible, within the country and the country's culture for the NMHSs to do the following to help create partnerships and relationships:

a. Visit each other's workplaces to gain familiarity with operations;
b. Provide training to DMOs/DRRs and media where appropriate;
c. Secure hotline between the NMHS and DMO/DRR operational centers;
d. Hold yearly preparedness meetings to discuss assigned actions, operational changes from last year and necessary updates to phone numbers and email addressees.
e. Joint pre-season public awareness campaigns with DMOs/DRRs;
f. Give a "heads up" to DMO/DRR prior to issuing a public warning (if time permits);
g. Include suitable Response Statements in warnings which have been jointly prepared and approved by the DMO/DRR;
h. Place an NMHS officer in the DMO/DRR operational center during major events (if sufficient personnel are available and approved by DMO/DRR), and invite the DMO/DRR to place an officer at the NMHS;
i. Joint media conferences with DMOs/DRRs during major events;
j. NMHS and DMOs/DRRs on the same consultative committees and disaster management groups;
k. Involve DMOs/DRRs and the media in

improving the warning system;

l. Develop MOUs/SSOPs with DMOs/DRRs and the media; and

m. Note that mutual respect, trust and confidence has to be built and earned over time – but it is recommended that it be a goal.

5.3 Required Review for SSOP Development

There are several ways to develop multi-agency, multi-level integrated SSOPs, but a thorough review of the hazards, vulnerabilities, exposure, roles and responsibilities, and the various needs of the users of the EWS is a good place to start.

As discussed in Module 2 under Concept of Operations, most countries have high-level policy documents which include roles and responsibilities of the different agencies and levels of government involved, as well as the other stakeholders, such as the media, private sector, and other stakeholders. Once the roles and responsibilities are understood for each hazard and for each level of the hazards, SSOPs can be developed to specify the "how to do it" for each task and the responsibilities for meeting the requirements identified.

5.4 Coordination for SSOP Development

Developing SSOPs for different hazards and for different phases is often time consuming and must involve key stakeholders. Within each agency, people must understand their roles and responsibilities in an EWS as stated above and then develop internal, technical SSOPs to perform their missions. However, while some activities are entirely within one agency, many activities require interaction with other agencies/stakeholders at their level of government and with agencies and people at all levels of government. Therefore each agency or organization must collaborate with other agencies/stakeholders to ensure the required information gets to the people at risk in a timely, clear and understandable manner. This is needed so the people at risk can take the correct actions to save their lives and property regardless of whether they are in a large city or a rural, coastal location.

SSOPs can help to ensure that people involved in the EWS take the most effective and efficient steps during a natural disaster emergency to provide life-saving information and direction when needed.

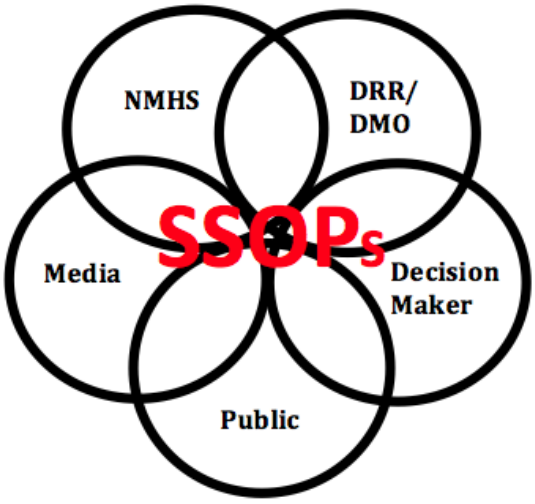


Figure 5.2 Role of SSOPs

5.5 Items for Coordination and Integration

Some of the items that are recommended to be coordinated and integrated among agencies and different levels of government are:

- **Transmission, reception, and sharing of information among agencies at all levels.** MOUs and implementing SSOPs should state what information or data is required; how the data will be collected and by whom; and how that information will be shared. All agencies should work from the same set of data and assumptions to ensure integrated actions; prevent actions which may cause additional problems; prevent conflicting actions; and convey to the public a sense of confidence from unified action. The flow of information includes data being passed "down" and throughout the system. But it also includes methods to receive data and information "up" from agencies and trained individuals who are experiencing the hazard. Communications "up" can also include information on status of situation and clarification/confirmation of rumors concerning the hazard or its impacts.

Figure 5.3 Sharing Information

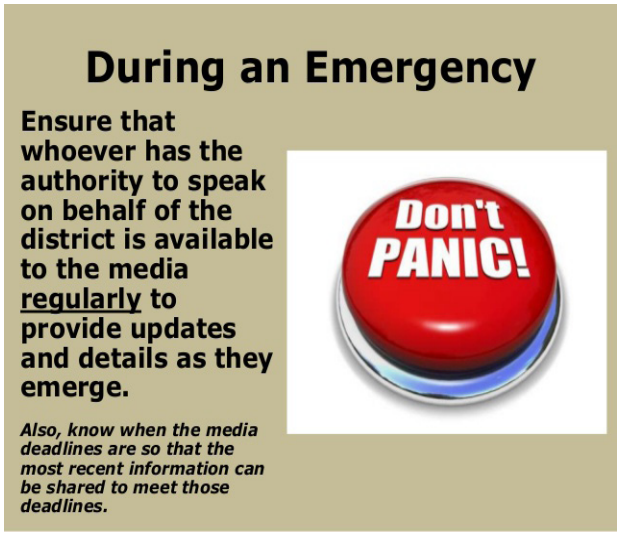


Figure 5.4 During an Emergency
Picture by Nerdy Vet/Florida School Board

- **Designated person(s) for release of official information.** It has been found in many different situations, that it is best to have a single person/position or a small team of designated spokespersons to release official information. This designation should be identified in MOUs and implemented in SSOPs. This helps to ensure only official, accurate information is disseminated. It also assists the media and others to know who to go for comments or information. One method to ensure timely release of official information is for the designated person(s) to schedule and hold regularly scheduled press conferences. If press conferences cannot be held, then regular scheduled times should be identified when updated, additional official information will be provided through official channels. The schedule for press conferences and/or scheduled release of updated information, once set, should be followed to ensure the media and others know when they can receive accurate, dependable information.

- **Preventing conflicting information from being disseminated.** In addition to designating a spokesperson, all SSOPs for all agencies and personnel involved in the EWS process, should address what information can be released and by whom. This recommendation is not to reduce or prevent the flow of vital, accurate data during an emergency to the agencies and people who require it. But often in emergencies/disasters situations rumors, conflicting information, and unsubstantiated reports rapidly spread through the population and cause panic or unsafe actions. The people involved in the EWS can help to prevent most of the misinformation by following their agencies' SSOPs on validating, confirming, reviewing, and releasing information on the emergency. There are two important subsets on releasing information which directly applies to NMHSs. These are:

  - *Release of warnings*. Different countries have different ways to prepare, review and release warnings. These different methods are developed to meet the needs of each country. However once identified, all agencies need to know and understand the process to prevent misunderstanding and the dissemination of incorrect information. Coordinated, integrated SSOPs can define steps to determine whether or not a warning is required. Then SSOPs can identify sequential tasks that need to be completed to prepare, review and release warnings. These SSOPs, developed before an emergency occurs, ensure the most efficient and effective process is performed in the same way and to the same standard each time.

  - *Release of observational and forecast information by NMHSs.* Many times the

media will come directly to the NMHS for observational and forecasted information on the hazard. During the planning stages before an actual occurrence of a hazard, the NMHS should coordinate with the other agencies involved in the EWS and identify the information they are authorized to release. For example during a tropical cyclone event, a NMHS usually releases the intensity, forecast track, and expected impacts of the tropical cyclone along with basic precautions/actions to be taken. Other information such as evacuation orders and areas, available shelters, and actions other government agencies are taking should be released by the designated spokesperson(s). Once again, this should be coordinated in the planning stages, so conflicting information is not released and no one in the EWS process is surprised by the release of any information.

- **Dealing with the Media.** When Typhoon Haiyan impacted the Philippines, "… some TV crews disrupted PAGASA's operations at the headquarters and the Tacloban station due to the lack of its internal non–access policy." (WMO, ESCAP and ESCAP/WMO Typhoon Committee Post-Typhoon Haiyan (Yolanda) Expert Mission to the Philippines, Manila and Tacloban, 7 – 12 April 2014 Mission Report). The strict non-access policy mentioned in this report will not work in many countries and may not be the best approach. The media requires official information very quickly and updates as required from the experts. The media plays a major role in disseminating information and thus is an important part of the EWS. Therefore, in addition to MOUs/SSOPs with DMOs, MOUs/SSOPs should be developed and coordinated with the media. The coordinated and integrated MOUs/SSOPs jointly developed should explicitly state the most effective methods for the operational forecasters to have an undisturbed work area and also a process for the media to quickly receive information and updates. In addition, the coordinated, integrated MOUs/SSOPs with the media and DMO/DRR should defined a controlled process for access to designated official spokespeople and locations.

Figure 5.5 Media Press Conference Philippines Department of Agricultural
Photo by Joseph Vidal

PART III : DEVELOPMENT AND IMPLEMENTATION OF SSOPs

Module Six: Writing Effective SSOPs[1]

The purpose of SSOPs, along with the definitions of synergy, SSOPs, multi-hazards, and integration for this Manual are listed in the Introduction. It is recommended that these be reviewed before beginning this module.

Purpose of Well Written SSOPs

- Ensure various aspects of EWS tasks are performed in the same way and to the same high standard each time;
- Provide specific, approved tasks to produce predictable, reproducible results;
- Discuss, determine, and approve the most efficient and effective method to perform assigned tasks before an emergency occurs;
- Improve cooperation and integration of different tasks and communications among agencies involved in EWS;
- Maintain high quality and consistent service and products to provide accurate, timely information to save lives and protect property in hazard situations; and
- Reduce training time.

Text Box 6.1 Purpose of SSOPs

6.1 Necessity of SSOPs

- Ensure tasks are performed in compliance with government regulations and specified roles and responsibilities;
- EWS roles and responsibilities are described and documented;
- Multi-hazards, multi-agencies, and integration approaches can be incorporated;
- Vulnerable and special needs individuals can be considered;
- A standard training program can be established;
- Operations are done consistently with minimum variability on a prescribed schedule;
- Other staff members will know what their co-workers are doing;
- An effective training for procedures can be developed for new personnel, those that need re-training, and cross training;
- Regular evaluation of work activity and continuous improvement in how things are done; and
- A historical record can be created of how, why and when things were accomplished for investigations, improvements, application in similar situations and other reasons.

6.2 Approach

- Emphasis on impact-based warnings and alerts

The type of weather producing the hazard can be different (heavy rain, inundation, strong winds, etc.) but produce similar effects/impacts at the community level. This then can serve as a possible basis for synergy and multi-hazards approaches. For example, a coastal community may be vulnerable to inundation effects or impacts (from different or a combination of hazards such as tsunami, storm surge, high waves, river flooding, poor drainage in heavy rain, etc.). Thus an SSOP can be developed for inundation, which would include who and how to respond to inundation impacts. Another community might be on a high ridge overlooking the ocean and is not affected by inundation but are exposed to very high winds and heavy rain. These aspects would then have to be considered in a SSOP.

- Bottom-Up Approach

SSOPs are mostly developed at a national level, then

Impact-based "Bottom-up Approach" for SSOP Development Effective

Text Box 6.2 Bottom-up Approach

[1] This Module is a compilation of information on effective SSOPs found in References 2, 4, 5, 6, 7, 8, 9, 13 and 14 in Appendix IX

downward to the sub-national and then to the local levels. With new emphasis on impact-based warnings and forecasts, a "bottom up" concept may be more effective. It may be easier to incorporate synergy for multi-hazards, multi-agency, and multi-levels of government by beginning the development of SSOPs at the local community level rather than national level. By involving the communities at a very early stage of SSOP development, impacts and the specific needs of the communities can be the foundation rather than having many national and sub-national level SSOPs which would have to be merged into one meaningful system.

- Good, trusting partnerships and relationships

Good trusting partnerships and relationships with other agencies and stakeholders are very important in the preparation, coordination, and implementation of multi-agency, multi-level integrated SSOPs. This helps to ensure the required information gets to the people at risk in a timely, clear and understandable manner and often reduces the time required to prepare effective SSOPs.

6.3 When Should You Write or Rewrite an SSOP

Before preparing a SSOP, consider:

- What is the specific task to be accomplished and what is the expected outcome?
- Who will be using the SSOP?
- In what ways will the SSOP be used?
- Who should be involved in the development of the SSOP?
- Will vulnerable and disabled persons be affected and how?
- What type of synergy can be incorporated into the SSOP?

Write SSOPs for:

- The person(s) who will perform the tasks;
- People with a consideration of such factors as age, education/training, knowledge, skills, and experience;
- Multi-agencies to identify and document different, interrelated tasks; and
- A single agency when agency specific tasks are required internally for the agency or for tasks required by a multi-agency SSOP.

Write or rewrite SSOPs when:

- No SSOPs are currently available for specified tasks;
- New information suggests there is a way to improve performance;
- Workers' evaluations identify required changes in existing SSOPs;
- An incident occurs that indicates limitations in effectiveness or efficiency; and
- New equipment, processes, or responsibilities create new work situations.

Who should write and review SSOPs:

- A knowledgeable person should be identified or designated to lead the development effort;
- A team of people from different areas with different knowledge and experience should be involved in the development process;
- Your agency and other agencies if there are interrelated tasks to be performed to incorporate multi-agency aspects; and
- Persons not involved in the SSOP development process should review and test the SSOP to ensure accuracy.

Benefits of using a team to write an SSOP:

1. Ensure that knowledge acquired from different perspectives is included;
2. Create "buy-in," by the people involved and increases the likelihood that the SSOPs will be implemented;
3. Trained people who can train others, because SSOP writers know the information and are more likely to be effective trainers (coaches) themselves;
4. People involved from diverse parts of the operations, which helps when new and modified processes are implemented and SSOPs must be updated; and
5. Encourage employees to follow the SSOP and listen to supervisors because the employees understand and appreciate the invested time and effort of the writing team on behalf of employees.

When SSOPs need to be revised, it is suggested

that the group(s) or individual(s) who originally prepared and reviewed them be requested to revise them.

Key Factors for Writing Effective SSOPs

Text Box 6.3 Key Factors for Writing SSOPs

6.4 Consolidated List of Tips to Consider When Writing SSOPs

Note: The users should review the list and then decide to use those that are necessary for their application.

1. Include an overall view of the situation and how this SSOP fits in. How much someone knows about an entire process affects the way they do their part.
2. Explain the reasons behind certain steps so that SSOP users will understand the importance of following all the steps in the proper order.
3. SSOPs should be clear and simple, written in short sentences beginning with an action verb, and only be as long as necessary. Acronyms and abbreviations should be kept to a minimum.
4. For long or complex tasks performed infrequently, detailed SSOPs are best. If the task is simple or employees are familiar with the task, then a shorter SSOP will work.
5. If the SSOP involves a long list of steps, then it may be better to break it into sections such as "Getting ready for the process," "Initial steps," "Final steps."
6. When two or more people must use a single SSOP at the same time, the SSOP must explain when and how each person is to perform a specific step.
7. Consider the age, education, knowledge, skill, experience, work culture, language proficiency, and special needs (hearing, eyesight, etc.) of the individuals who will be performing the SSOP steps.
8. Once the SSOP is completed, have several trained workers test it against actual practices and for safety, health, and environmental aspects (as appropriate).
9. Inform all appropriate personnel of the completed and approved SSOP.
10. Train the personnel who will be using the SSOP and allowed them time to practice the steps. Personnel who helped to develop the SSOP can help to train other personnel.
11. Review the operational effectiveness of SSOPs after a few weeks and make necessary changes. Review SSOPs when processes and equipment are changed or after an actual hazardous event.
12. Keep a computer accessible file, if possible, and at least one notebook with paper copies as backup of all approved SSOPs.

Caution: Required Time to Prepare Effective SSOP

Preparing, documenting, reviewing, testing, approving and implementing of SSOPs will require more time and coordination than a person usually estimates. Therefore begin preparation of required SSOPs far in advance of when they might be needed to allow sufficient time to accomplish all of the needed steps.

6.5 Different Styles of SSOPs

There are many different styles of SSOPs depending upon: the task to be completed, the complexity of the task, the length of the task, and the level of the SSOP. In the following paragraphs, 5 different formats are provided and suggestions on when these might be used. An SSOP can follow one of these formats, a combination of two or more formats, or a format developed by the country involved. Whatever format that allows personnel to perform the task most effectively and efficiently is the one that should be used.

Table 6.1 Standard Operating Procedure Format Choices And Criteria		
Many Decisions?	**More Than 10 Steps?**	**Best SSOP Format**
No	No	Simple Steps
No	Yes	Ranked Order Steps or Graphic
Yes	No	Flow Chart
Yes	Yes	Graphic or Branching Flow Chart

1. **Simple steps or a checklist.** These are easy to write and follow and work well for short, simple, straightforward tasks.

2. **Ranked ordered steps.** This is an extension of the simple steps format. It works better for tasks that require additional detail or sub-steps within each primary step.

Modified Example from Malaysia's Guidelines for Media Management Center (MMC) on Disaster/Crisis Section, Section 6, Early Response of MMC

Duties of the MMC Officer immediately after reporting to Disaster Operations Commander (DOC) are to:

1. Set up and operate MMC;
2. Place directional signs to MMC at a strategic location at the disaster site for the local and international mass media;
3. Request all the local and international media to register and provide them with the pass for access to MMC;
4. Obtain the necessary information on the disaster from DOC for dissemination to the media. DOC must sign the information document before disseminating it;
5. Prepare and coordinate the schedule and information for approved government officials/leaders to brief the media; and
6. Arrange the necessary equipment for the media.

Text Box 6.4 Example Simple Step SSOP

Expanded Example with Sub-Steps based upon Malaysia's Guidelines for Media Management Center (MMC) on Disaster/Crisis Section 6. Early Response of MMC (Expanded sub-sections not part of Malaysia's SSOP, but added for this Manual as an example)

Duties of the MMC Officer immediately after reporting to Disaster Operations Commander (DOC) are to:

1. Set up and operate MMC:
   a. Locate building where the MMC will be located;
   b. Locate and place 3 tables, 1 podium, 15 chairs, 2 desks in the MMC;
   c. Position MMC computer on one desk and ensure there is internet capability;
   d. Set up projector to display graphics for media presentation;
   e. Locate sound system and ensure microphones are on and operational; and
   f. Prepare blank media pass before opening the MMC so they can be rapidly completed as the press arrives.
2. Place directional signs to MMC at a strategic location at the disaster site for the local and international mass media:
   a. There are 5 directional signs. Place these at different locations within the disaster site;
   b. Place the large MMC sign at the entrance to the MMC; and
   c. Inform various officials and emergency personnel of the location of the MMC in case they are asked for comments or location of MMC.
3. Request all the local and international media to register and provide them with the pass for access to MMC:
   a. Place a table by the entrance of the MMC and ensure it is staffed at all time;
   b. Prepare a register sheet with entries for name, news affiliation, local address, cell phone number, and email address and ensure every media representative completes all sections; and
   c. After registering, provide each media representative a pass with their names, news affiliation, and picture (if possible) on it.
4. Obtain the necessary information on the disaster from DOC for dissemination to the media. DOC must sign the information document before disseminating it;
   a. Coordinate with DOC in person if possible or via cell phone if cannot coordinate in person;
   b. After reaching agreement on the information to disseminate, type the information to be released, print a copy, and have DOC review and sign it; and
   c. Once the signed information document is completed, make copies and distribute it to the media.
5. Prepare and coordinate the schedule and information for approved government officials/leaders to brief the media:
   a. Coordinate with the DOC and obtain approval for the list of government officials/leaders who will provide interviews;
   b. Coordinate schedule of approved speakers with the individual speakers to ensure their availability. Provide schedule to the media;
   c. Attempt to schedule at least on interview every hour to maintain a constant flow of information to the media;
   d. Prepare a briefing based upon DOC approved information for officials/leaders to brief the media; and
   e. Ten minutes before each interview, remind speakers of time and place, and remind media representatives of the upcoming interviews.
6. Arrange the necessary equipment for the media:
   a. Print media will usually need a place to prepare their reports and then a method to send them and
   b. Video media will need a place to conduct interviews or to film their segments. Ensure the appearance of this is good and well-lit.

Text Box 6.5 Example Ranked Ordered Steps

3. **Graphic flow chart.** This is a graphical version of the two previous formats. It works well for tasks where activities must be done in a specific order and where an easy-to-follow reminder at the job site is useful.

Example: Malaysia Flowchart for Issuance and Dissemination of Tropical Cyclone Advisory/Warning

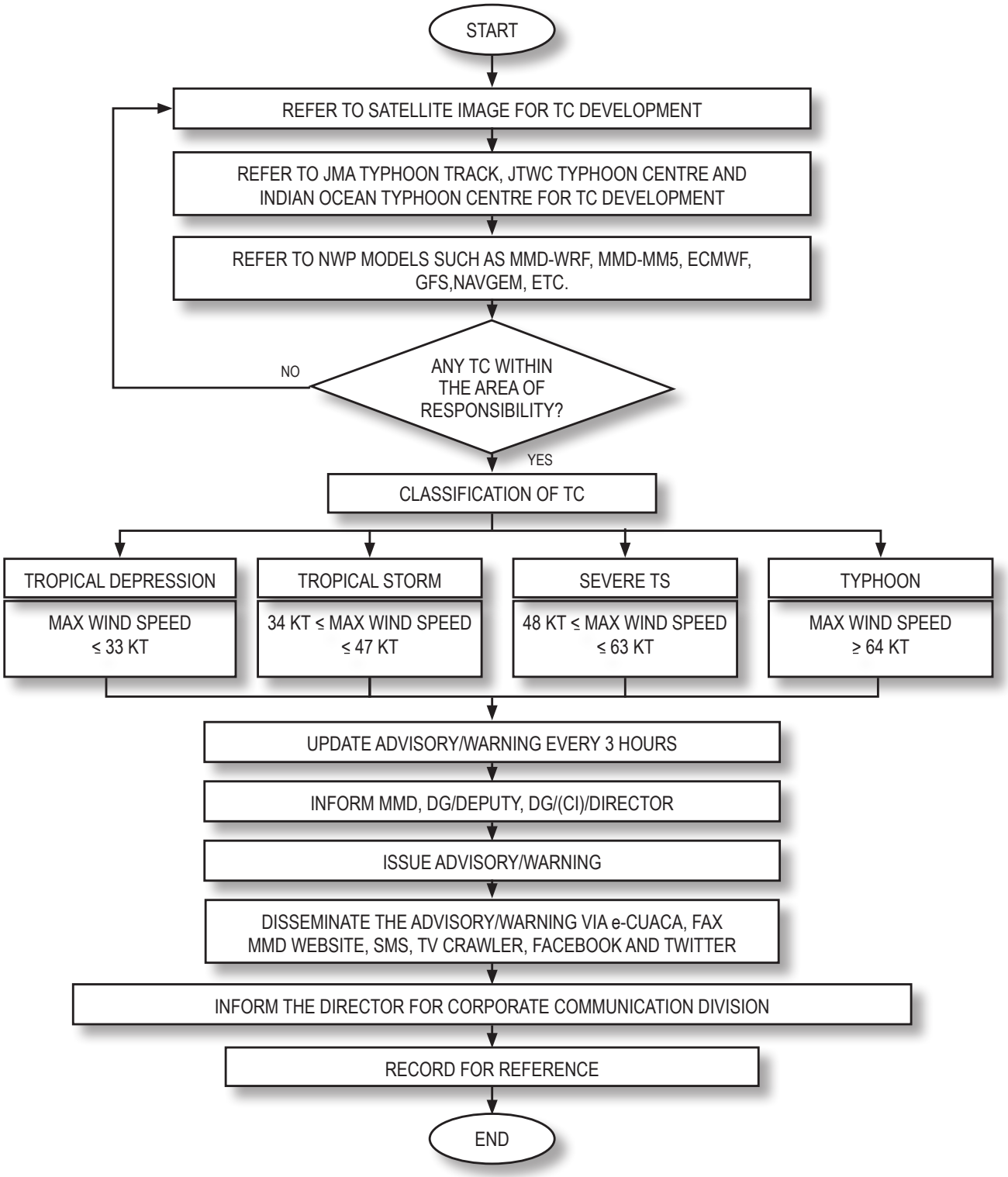


Figure 6.1 Example Graphic Flow Chart SOP - Malaysia

Example: Shanghai Meteorological Service Flowchart for Fast Track Mechanism Used During Emergencies.

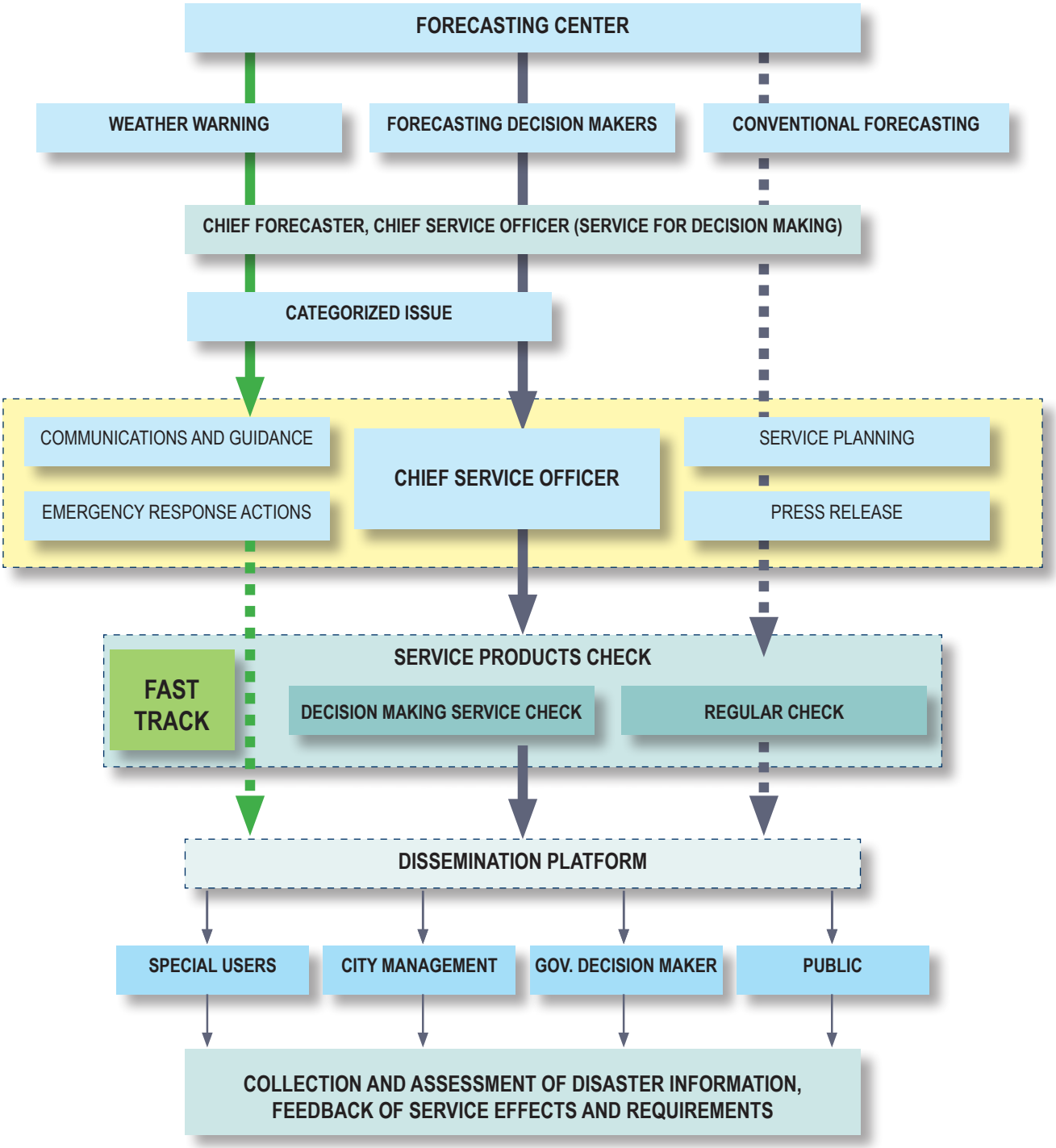
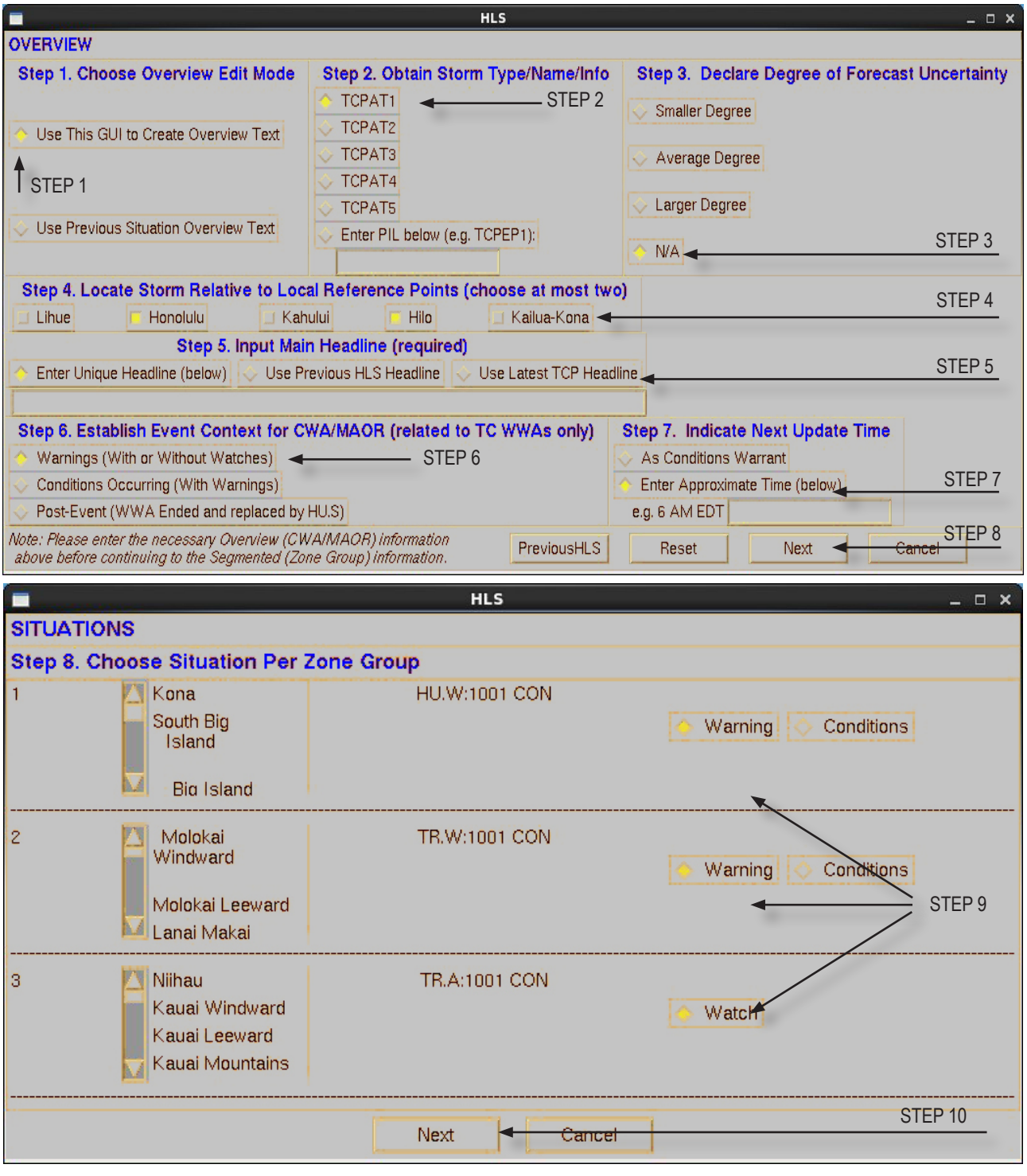


Figure 6.2 Example Graphic Flow Chart SOP - Shanghai, China

4. **Annotated Pictures.** This format works well in complex processes, where entry are required into a computer program, or where a language barrier may exist. Because, pictures can dramatically reduce the need for written explanations, this format helps to shorten complex and detailed SSOPs. SSOP pictures can make excellent work site reminders. For example, a photo illustrating how a work site should be set up or arranged, or the proper locations of shields, levers, switches and handles on a piece of equipment can be very useful.

Example:



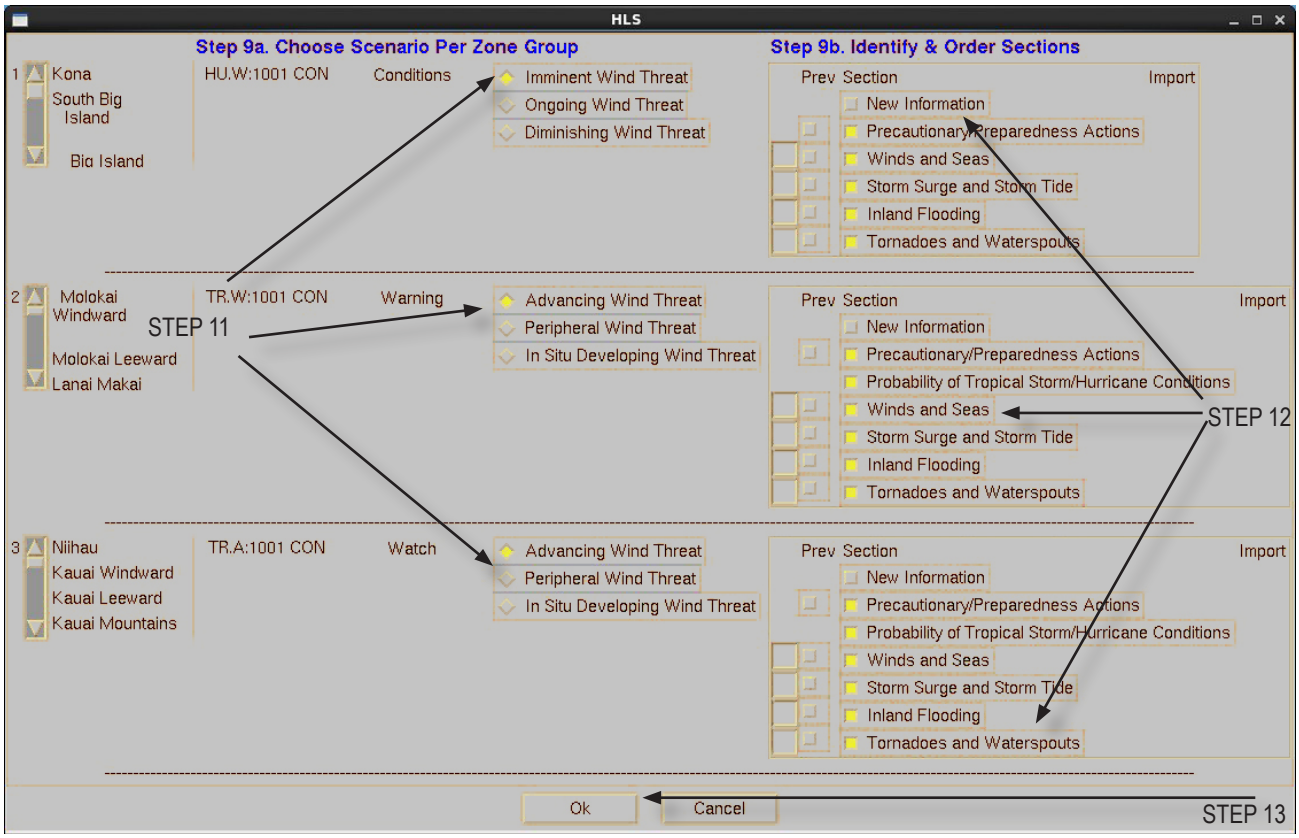


Figure 6.3 Example Annotated Pictures SOP - USA

Step 1: Select whether you want to use a new over view or the previous one.

Step 2: Select the correct WMO Header for this product.

Step 3: Select the degree of uncertainty associate with this tropical cyclone forecast.

Step 4: Determine and enter closest reference point for the location of the tropical cyclone. Up to two references can be used.

Step 5: Enter the mandatory main headline for the system.

Step 6: Select warning, watch, or none for the area affected.

Step 7: Enter the next update time. Can choose a specific time or as conditions warrant.

Step 8: Select “Next” and click on it to go to the next page. If errors were made, reset and start again. If the product is no longer needed it can be canceled.

Step 9: For each of the five designated areas, select Watch, Warning, or Non-Event/Pre-Event (need a headline for these if different).

Step 10: Select “Next and click on it to go to the next page. The process can also be canceled here.

Step 11: Choose wind threat for warning areas, impacts for post-events, and continue or cancel a non event.

Step 12: Based upon Watch, Warning, or Non-Event/Pre-Event category, select the statements to be included and the priority that these statements will be listed.

Step 13: Select “OK” to generate the product and to dissemination it through the correct dissemination channels. It can still be cancelled at this point.

5. **Branching flowchart.** This format makes complex SSOPs, especially those with a number of decisions that affect subsequent steps, easier to follow. Boxes within the flow chart can also be expanded to include checklists or sub steps.

Example: Example: A branching flowchart SSOP used by Sri Lanka for identifying and issuing warnings for tsunami. The information below applies to the flowchart.

*** Vulnerable Location is defined as the western part of the SUNDA or MAKRAN subduction zones.**

DGM: Director General of Meteorology
DM3: Director (Forecasting & Decision Support)
MiC: Meteorologist in Charge (Forecasting Div.)
DM1 : Director (Research & Development)
DM2 : Director (Observation Network & Instrument)
DM$: Director (Data Processing & Archiving)

SEC /DM : Secretary, Ministry of Disaster Mangmt
SEC/HE President : Secretary to the President

DGM: 0718460124, 0112694104, 0112687343
DM3: 0716281134, 0112691443, 0112656309
MiC: 0774368390, 0112682661, 0112973836
DM1: 0777391366, 0112686499, 0112701694
DM2: 0773437063, 0112692756, 0112235412
DM$: 0714293358, 0112665088, 0112893512

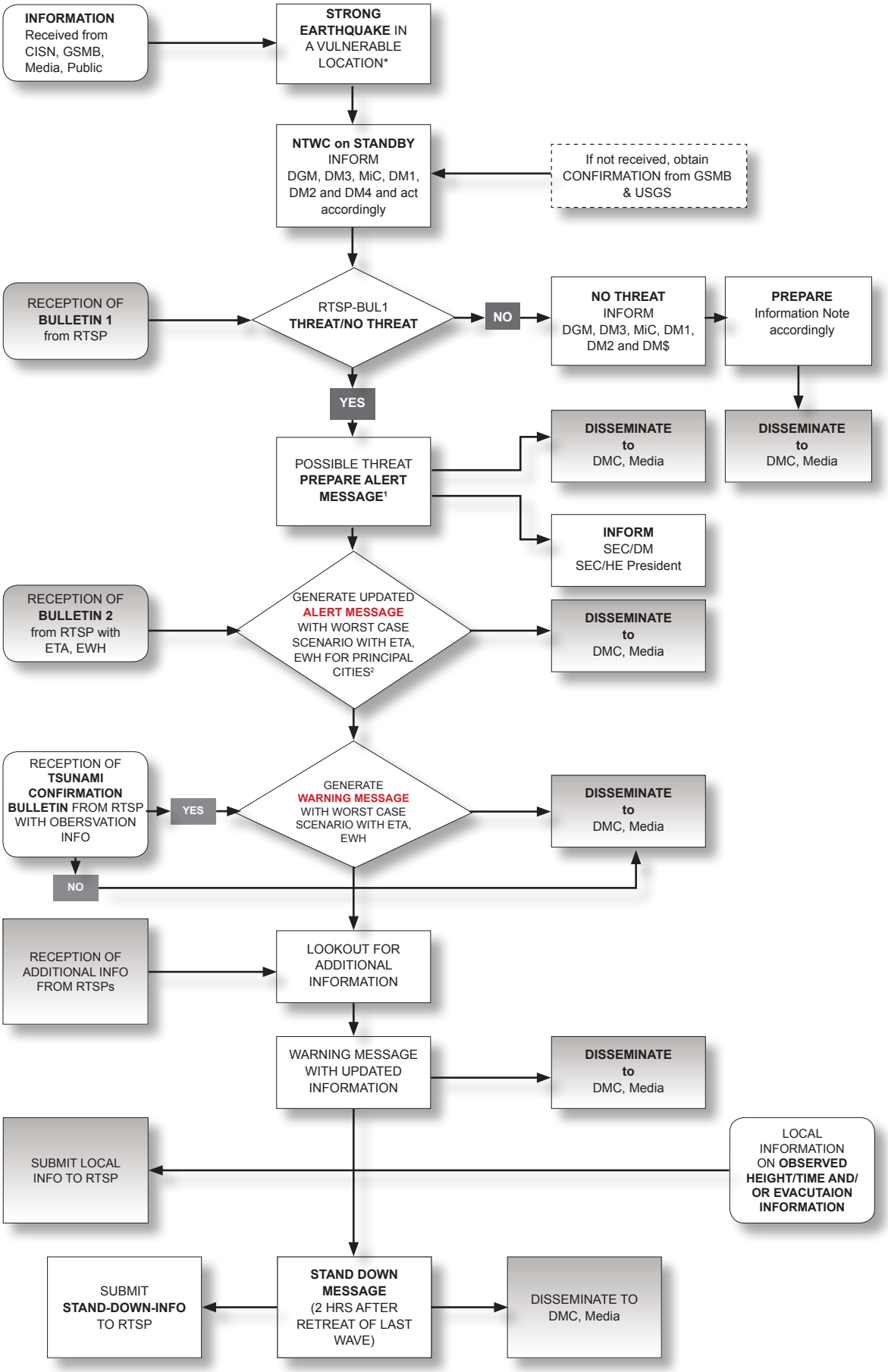


Figure 6.4 Provided by Sri Lanka Department of Meteorology

6.6 SSOP Development and General SSOP Format

Time-line Concept:
Most SSOPs should follow a time-line concept, so tasks are in chronological order of how they are to be performed. If multiple tasks must be performed at the same time, a multi-column ranked order step SSOP can be used with the parallel columns describing the different steps which need to be taken in conjunction with each other. Another useful approach is to use a flow chart with a varying time at the top and different flow chart lines to depict the various tasks to be completed at the same or different times. This is the most important concept for tsunami EWS.

6.6.1 Suggestions When Writing SSOPs

NOTE: Consider the following items and the items under under 6.6.2 General SSOP Format Guide as suggestions to consider. Not every item needs to be included. Each item should be considered, but only include those that fit your need and situation. Also, it may be useful for some countries to alter the order of the suggestions sections to fit their need.

1. Explain the reasons behind certain steps. This might help people to understand the importance and order of the tasks/steps.
2. Make SSOPs clear and simple, write in short sentences, and when possible, begin with an action verb. Uncommon or unclear acronyms and abbreviations should not be used.
3. Create detailed SSOPs for long or complex tasks, especially if performed infrequently. If the task is simple or employees are familiar with the task, then a shorter SSOP will work.
4. Break into sections SSOPs that are a long list of steps. For example, “Getting ready for the process,” “Initial steps,” and “Final steps.”
5. Explain when and how each person will perform specific steps when multiple people must use the same SSOP.
6. Inform all personnel when an SSOP is completed and approved SSOP.
7. Train the people who will be using the SSOP.
8. Review the operational effectiveness of SSOPs after a few weeks or when a significant event occurs.
9. Keep a computer accessible file, if possible, and at least one notebook with paper copies as a backup.

6.6.2 General SSOP Format Guide

Title Page
The first page of each SSOP should be a title page and can have the following information:

- The emblem representing the agency of country.
- The name of the organization.
- The name of the weather item covered by this the SSOP. For example, tropical cyclone, marine, flooding, or other areas.
- An identification number or document control number. These numbers can be based upon the weather item for the SSOP. Such as TC-1, TC-2, TC-3 for tropical cyclones and M-1, M-2, M-3 for marine program.
- Name of person or team who developed SSOP.
- Name, signature and date of the person who approved the SSOP.
- Implementation date.
- Distribution list.
- Partners or other agencies involved if it is for inter-agency use.
- Acknowledgements.
- Revision history log.

See Basic SSOP Template and Example **(Appendix I)**.

Header on top of each page and a footer for each page
The header can be the SSOP number, a short title identifying the activity and the implementation date. A footer can include the page number or other information. For example:

Header
SSOP TC-1 (Before Season) 26 September 2014

Footer
Page 1 of 12

Table of Contents
This is needed to quickly locate specific sections. If the SSOP is short then this may not be needed.

Include Specific Information as Needed

This specific information should be considered and incorporated into the SSOP as necessary.

1. **Background.** The hazard may need to be defined along with important geographical and climatological information concerning the hazard, but this is a country/member decision;
2. **Purpose.** Describe the requirements as listed in laws or agency directives;
3. **Scope**. Indicate which specific tasks are included in this SSOP and which are not. Can also include geographic and climatology information if needed;
4. **Applicability.** Specify who or what section of the organization does this SSOP apply to;
5. **Task.** Develop an overall task description. Include the number of people required, skills required, the equipment and supplies needed, and a description of the finished product or result;
6. **Summary of SSOP.** Briefly summarize the procedure;
7. **Definitions.** Identify any acronyms, abbreviations or specialized terms used;
8. **Cautions.** List any cautions or possible interference people should be aware of as they perform the tasks; and
9. **Procedures.** The procedure part of the SSOP can contain:

    a. Identify all pertinent steps, specific order, timing sequence, estimate of time to complete, and materials needed to accomplish the procedure;
    b. Include information on any SSOP which is referenced or interconnected with this SSOP. Cite any other SSOPs, attach a copy, or develop a flow diagram to show the interactions of SSOPs (see Figure 6.5 for example);
    c. Checklists.
        - Many activities use checklists to ensure that steps are followed in order and documents completed actions;
        - Any checklists should be referenced in the appropriate step;
        - Include on the checklist or in the step how the checklist should be completed;
        - Specify where blank and completed copies of the checklists should be located.
        - A checklist is not an SSOP, but a part of one.

Figure 6.5 Flow of SSOPs. SSOP 1 leads to SSOPs 2 and 3, SSOP 2 leads to both SSOPs 4 and 5, and SSOP 3 leads only to SSOP 6.

10. Reference Section.
Include information on any additional documents or procedures that relate and or could be helpful for this SSOP. The reference material provided in this section should not be used doing a real hazardous situation, but used for training or reviewing in preparation of an event.

Module Seven: Review, Testing, Approval, Training and Implementation of New SSOPs

7.1 Review and Testing

SSOPs should be reviewed by someone who has the appropriate training and experience with the task. The reviewer submits their comments to the author of the SSOP, who is responsible for incorporating comments into a revised version. Then as part of the validation process, the revised SSOP should be tested by a person other than the original writer to ensure it performs as expected. In addition, it may be useful to have a person not familiar with the work to follow the steps of the SSOP**. Note:** For each review, the person should test the SSOP by performing each step exactly as it is described.

7.2 Approval

After the review and revision of a new SSOP or a revision of an existing SSOP, the SSOP must be approved as described in the agency's procedures or in the agency's SSOP for preparation of SSOPs. Generally the immediate supervisor, section or branch chief, or a person who knows the agency's SSOP process provides the final review and approval for each SSOP. Signature approval indicates that an SSOP has been both reviewed and approved by management.

7.3 Distribution, Training, and Implementation

Each agency should have an established documented process (either as a SSOP or another document) describing how the new or revised SSOP is distributed and implemented. Often there must be a process to explain the purpose of the SSOP, training needed, and implementation date. These are explained as follows:

- Purpose of SSOP. As part of the training or through discussions with each person who will use the SSOP, the purpose of the SSOP and how it fits into the overall area of the EWS that the agency is dealing with should be stated.
- Training. Implementation of a new SOP often requires training or retraining for everyone to ensure everyone understand and can complete the procedures in the same way and with the same high level of quality. The trainer should explain and demonstrate both why and how each step in the SSOP is performed and then give the learner a chance to practice. The trainer can also share the reasons why procedures must be performed correctly. People are much more likely to follow procedures exactly when they understand why they are important. In addition, sharing the "why" demonstrates that you care about the workers and it helps to improve the worker's job knowledge.
- Implementation Date. The distribution and implementation documentation should include the implementation date with a statement that says that after the implementation date these procedures in the SOP are mandatory to maintain the same high quality of service regardless of who is performing the task.

7.4 Follow-up

Several months following the SSOP implementation, a review should be conducted to ensure people understand and use the SSOP. If the SSOP is not being used correctly or individuals' evaluations indicate a problem, an analysis of the reasons should be done and changes made as necessary. Findings of the review process may be documented for future reference and used to improve the SSOP process.

PART IV : TOWARDS AN EFFECTIVE AND SUSTAINABLE PROCESS OF IMPROVEMENT

Module Eight: Framework for Sustaining an Improvement Process of SSOPs, Including Subsequent Review and Updating

Once an SSOP is developed, reviewed, and implemented, the process is not completed. The SSOPs must be reviewed and updated because conditions change, new equipment is acquired, new research shows better ways to prepare and transmit warnings, and many other things may occur. In addition, the various agencies in all levels of government should engage in contingency planning which may produce needed changes in SSOPs. Therefore the SSOP process should be a continuous one with the goal to continually improve the service for the early warning system. This long term improvement in services should often be based upon achieving the goals and objectives contained in the national strategic plan for EWS. Therefore the management of SSOPs built upon strategic planning will need to consider and completed the following sections.

8.1 Key Factors for an Effective and Sustainable Process of Improvement

In order to ensure effectiveness and sustainability of the process of improvement, it is necessary to ensure commitment of top leadership and participation of all key stakeholders using strategic planning and management concepts. The key factors of strategic planning and management would include the following:

- Complete commitment of top leadership to integrating EWS into the socio-economic development and resilience;
- Translation of the complete commitment into a shared vision for all key stakeholders;
- Establishment of performance indicators to ensure effective implementation and an appropriate system of accountability; and
- Development of an effective program of support for the implementation.

8.2 Scheduled Regular Review

SSOPs should be systematically reviewed on a periodic basis, e.g., every 1-2 years, and after an event, to ensure that the policies and procedures remain current and appropriate. Some agencies have an online system which provides an alert when a SSOP is due to be reviewed. If an SSOP describes a process that is no longer appropriate, it should be withdrawn from the current file and archived. The review process should not be overly cumbersome to encourage timely reviews. The frequency of reviews and the individual(s) responsible for the reviews should be indicated by management in the organization's SSOP Plan. In addition, whenever procedures are changed, SSOPs should be updated, shared, training provided, and re-approved. The review date should be documented for each SSOP.

8.3 Evaluation of Service

Each country's NMHS, disaster management agency along with the other agencies involved in the EWS, can use a variety of methods to assess their service after hazardous weather events. When possible, each agency should document important good items and items needing improvement before, during, and after an event in order to perform service evaluations.

1. A service assessment or a formal national assessment which is an evaluation of the NMHS's, disaster management agency's, and other agencies' performance, in the form of a report, generated by a service assessment team, can be conducted. A national service assessment follows a highly significant hydro-meteorological, oceanographic, or geological event that usually results in loss of life. The report serves as an evaluative tool to: (a) identify and share best practices in operations and procedures; (b) identify and recommend service enhancements; (c) identify and address service deficiencies; (d) identify SSOPs which need to be modified,

added, or coordinated; and any limitations or operational issues. Sub-national service assessments are similar to national service assessments, but are conducted for hazardous events at a lower threshold and occurred only in the specific sub-national level. They are intended to be completed in a shorter period of time.

2. After-Action Reviews (AAR) are less formal and can be performed during a meeting with all EWS agencies (disaster management, media, government officials, and general public). At this meeting, the participants determine the effectiveness of the service and make recommendations to improve services and operations. This information can be provided to decision makers to determine:
   - What happened? Consider the entire event from the initial outlook through support to recovery efforts;
   - Significant events and decision points in timeline;
   - What went well? Start with the positives. Pick several things that you thought went well;
   - What can we improve? Identify those SSOPs or other things that could be improved; and
   - Address key areas such as communications, resource management, equipment, meteorological knowledge, and operations of the equipment.

3. Internal meetings are recommended for the warning offices of their own personnel to get their insights and ideas on how they performed, what went well, what SSOPs and other things should be improved, and suggested methods for improvement.

4. In addition, the NMHSs can solicit data from sub-national agencies on the effectiveness of the warning process. Appendix VIII shows a questionnaire format that Lao PDR NMHS uses to solicit information.

5. A file can be established containing agency's or individual's experiences or thoughts on prediction and dissemination issues which occurred during previous hazardous events.

8.4 Documentation of Changes to SSOPs

Required changes to SSOPs can be determined based upon a finding in a service report or identified by one of the SSOP users after the hazardous event has occurred. If changes are needed to a SSOP:

- The whole SSOP can be revised or if desired, only the pertinent section can be revised.
- Update the revision history table associated with the SSOP each time an SSOP is updated and approved. Each approved revision should have an identification number such Revision 1.0 or Revision 2.0.
- Include in the revision history table (and in the SSOP Table of Contents if appropriate), revision number, the approval date, a description of the changes, the author of each set of changes and effective date.
- The revision number and date of the change should be inserted in the header of each page of the SSOP to ensure the users know they are using the most current information.

8.5 Continuous Training

To maintain proficiency in doing the SSOP's tasks correctly, there should be a continuous training program as described in Module 9. This training and exercises are for all agencies in the EWS and for the public. Some agencies have an online system which provides an alert when training is needed or when someone hasn't completed the required training. The training should be documented on either a hard copy or in an electronic data base to ensure everyone has completed the required training and to provide documentation of training in the event of disastrous event.

8.6 Quality Management System (QMS)

Quality Management is designed to allow self-verification of work processes, products, and services which satisfied stated users expectations,

identified roles and responsibilities which were accomplished and quality and consistency of the work is maintained. A quality management system should include:

- Demonstrated ability to consistently provide products and services that meet customers' needs and expectations, and
- An effective system which enhances customer satisfaction, includes processes for continual improvement of the system, and assures conformity to customer' current and future needs.

In addition, the system should include:

- The preparation of Quality Control (QC) procedures and QC material which contain specific criteria to demonstrate that services and products are meeting the designed purposes;
- The reasons for QC criteria and related decisions;
- The frequency of required QC checks;
- The agency/organization that is responsible for each Quality Assurance (QA) activity, what and how QA activities will be conducted, how the QA activities will be verified, and whether the activities met the required standards; and
- The agency/organization assigned the responsibility for taking corrective action based upon the results of the QA activities.

The main thrust of a QMS is to define the processes which will result in the production of quality products and services, rather than identifying incorrect products or services after they have been produced.

Module Nine: Understanding, Preparedness, Awareness, and Exercise Training

A synthesis of the World Meteorological Organization (2012), *Multi-Hazards Early Warning Systems (MHEWS) Web Page, Detailed Synthesis – 10 Common Principles*, based upon World Meteorological Organization (2012), *Institutional Partnerships in Multi-Hazards Early Warning Systems - A Compilation of Seven National Good Practices and Guiding Principles*, Golnaraghi, Maryam (Editor), revealed ten principles common to all EWSs, irrespective of the political, social, and institutional setting in each country. The ninth item identified was "Regular training and education programs in risk awareness and emergency response actions." This reflects the importance of regular understanding, awareness, preparedness, and exercise training to ensure an early warning system works effectively and efficiently when needed.

An SSOP can contain the process, timeline, methods, person responsible, and partner agencies need to ensure preparedness activities, awareness and exercises training applicable to different groups are completed. Exercises and drills can help to identify deficiencies in the operational SSOPs and improvements made. An SSOP can also describe or give examples on how to develop and execute an exercise or drill.

Different types of training for understanding, awareness, preparedness activities, and drills/ exercises are required for different groups.

9.1 Understanding, Awareness, and Exercise Training for Warning Centers and DMO/DRR

The focus of training for personnel most directly involved in the early warning system, warning centers and DMOs/DRRs, will most likely be for understanding and awareness of different hazards, then drills and exercises to test and evaluate the effectiveness of SSOPs.

If warning and related SSOPs are only used during emergencies, there is a high probability that they will fail when needed. Continual training and exercising is the key to ensure when the procedures are needed, the tasks will be completed correctly and efficiently. For the training, it is important to teach the "why" behind the "how" which is typically what the SSOP contains.

The EWS training will be different depending upon the roles and responsibilities of those directly involved in the warning preparation and disaster management actions.

- For the warning centers, the training will be mostly technical in the areas of forecasting and warning for different hazards, however they also will need training in the roles and responsibilities of the DMOs/DRRs so they can understand what those offices need to do their jobs. The media can provide valuable training on the preparation and content of warnings, communicating with the media and public, and the channels of communications the media uses to disseminate information. Also in addition to the traditional communication channels, the warning centers will require training on growing importance of web technology and social media communications (see Module section 12.4 and Appendix V). Finally, if possible, training by a social scientist would be extremely valuable to assist the warning centers to understand how and why people respond to warning information, what makes them take action, and communicating risk and uncertainty of the warning to the media and the public.
- The DMOs/DRRs will have their own training in the areas they are responsible for. In addition, the warning centers can provide training on understanding and awareness of different hazards. Also, similar to the warning centers, DMOs/DRRs would benefit from training provided by the media on the information they require and the communications channels they use to disseminate data and to collect data.

In this training, it is also important to organize a train the "trainer" program. This program will help during training of new staff and can act as the "continuity person" to ensure retention of knowledge on the SSOP development and management. This is needed as the SSOP go through updates in future years.

9.2 Understanding, Awareness, and Exercise Training for the Media, Decision Makers and Other Stakeholders

The focus of training for the media (an important part of the EWS as one of the main channels of communications to the general public), decision makers, and other stakeholders will be on understanding and awareness, but at a less detailed level than the agencies above. Then drills and exercises can be conducted to test and evaluate the effectiveness of SSOPs. This training will equip the media with the knowledge to improve their reporting and communicating, thus helping the public to be better informed of the impacts of different hazards when they occur. As mentioned above the media can provide valuable training to the warning centers and the DMOs. In addition, the training will assist the decision makers and other stakeholders in understanding the basics of coastal hazards and an awareness of the potential impacts. It should be noted that high level decision makers and stakeholders are often very busy individuals and emergency planning is just one of the many areas they deal with. Therefore they require efficient high level training on awareness and their functions in the EWS in a short session. If possible, they should be involved in exercises to understanding the decision they may have to make.

9.3 Awareness, Preparedness and Exercise Training for Public

The focus of training for personnel who receive the EWS information and must take actions (such as the public, farmers, fishermen, shipping companies, etc.) will be mainly on awareness and preparedness activities. If possible, exercises with large segments of the population in a high

risk coastal area would be of great benefit.

The documented public safety benefit of an early warning system is response readiness. With appropriate training in awareness and preparedness, the public will learn to take various protective measures to reduce the risk of injury and minimize damage. Thus it is very important to conduct preparedness exercises with the public so they will interpret the EWS information correctly and take the appropriate actions to save their lives or property.

9.4 Sustainability of Training

New People to the Organization
New people to the unit or organization or returning people who have not been there for a long time should receive extensive education on the agency's mission and how it fits into the overall EWS. Then they will understand their roles and responsibilities better and how critical their role is to the entire EWS. Their education and training should be focused on their operational duties and a thorough review of the SSOPs they are expected to use. Part of this training should be testing and exercising the SSOPs in different simulated situations to ensure they understand what to do and how they can do it. This initial training is critical to the success of the unit's mission, because at some point the new people are going to be responsible for issuing warnings and providing important services, and the agency will demand that it be done correctly.

Recurring Training Prior to Start of a Specific Season
People who have been in the agency for a while will also need training and exercises to maintain their proficiency. If there are distinct tropical cyclone, monsoon, and/or heavy rain seasons, then prior to these seasons, training or an exercise or both should be conducted to review the procedures and to ensure the SSOPs are current and accurate. This improves effectiveness and efficiency before an emergency or severe weather occurs. Appendix IV Example 2, contains an example of an SSOP which addresses this training and preparation.

Recurring Training on Seldom Used SSOPs
Some SSOPs, for example for a fire in a facility or similar type SSOPs, are seldom used because they are unusual, unexpected events. Therefore, an unannounced test or exercise should be conducted yearly on these SSOPs to ensure they are accurate and that the people know how to perform the assigned tasks.

If facilities are available, one way to provide these three types of training is to create short (20 - 30 minutes) training films on various subjects.

9.5 Examples of Public Service Announcements and Drills/Exercises

In the area or preparedness, Public Service Messages for different hazards can be prepared by the warning centers and DMOs/DRRs and disseminated through their channels and also through the media with their assistance. Examples of these Public Service Message from Pakistan for tropical cyclones and monsoon/flood situations are included in Appendix VI.

In the area of exercises and drills, Japan has excellent examples of disaster reduction drills and exercises for their country. These can be found in Appendix VII.

Module Ten: Local Communities

10.1 Involvement of Local Communities in EWS and SSOP Development

Local community involvement is not easy and time consuming but is required for effective EWS

Text Box 10.1 Local Community Involvement

An effective EWS at the local level must have the local community involvement and if possible, leading the development, in planning aspects and preparation of the local community for natural hazards with assistance from sub-national and national level agencies. This local contingency planning process helps the local community to have ownership of the program and respond well in an emergency. Again, SSOPs can play a very important role in this area. Before applicable SSOPs are developed and implemented, there should be an understanding of the local community's identified needs, so that when they receive EWS information they will act upon it. This greatly increases the effectiveness of the EWS and leads to saving of lives at the local level. However, it takes a lot of effort to work with the many various, different local communities who require different things. But it is necessary to do so in order to have an effective EWS which reaches down to the local communities and "last mile."

In addition, an effective EWS must include indigenous knowledge which has been passed from generation to generation. With the local communities leading the planning aspects, sub-national and national level agencies, especially the NMHSs, can include this important information into their plans and SSOPs.

There are many good references related to local communities, early warning system, and community-based early warning systems. A few of these are listed in Appendix X. The following is a brief compilation of some general ideas involving local communities.

An early warning system is absolutely necessary and recognized as such by every country. However in many cases, the early warning system does not exist, is ineffective, or does not adequate serve the local community levels. People-centered, community-based early warning systems help communities to prepare for and survive destructive natural hazards. By involving all aspects of the local communities, such as schools, hospitals, community groups, and others, in all phases of planning for SSOPs, dissemination, warning content and wording, vulnerable populations, and knowledge of appropriate actions to take can be addressed in advance and not as the emergency evolves (which is often too late). Therefore, public awareness, education, and involvement are critical.

10.2 Areas of People-Centered Early Warning System

The following core areas/processes of people-centered EWS are based upon the "People-Centered Early Warning System" Session held at the World Conference on Disaster Reduction, in January 2005, in Kobe Japan. The local communities must play a major role in each of these areas/processes.

1. Incorporation of a Combination of 'Bottom-up' and 'Top-down' Elements

As stated above, the first core area is that the most effective EWS for local communities is a "bottom-up" approach with the local communities being very involved or leading the development. Based upon their identified needs and assistance required, the national and sub-national can provide the "top-down" elements to support this.

2. Channels of Communications

During a severe weather event when televisions, mobile phones, landline phones, Internet, radio, video conferencing and facsimile and other communications systems can fail, other communications channels must be used. Two successful ones described below are low cost FM radio systems and the other used by Bangladesh

and the Philippines, is a large trained, volunteer networks. As part of the SSOP Project, a pilot mission was conducted in Bangladesh. They proudly emphasized their large community-based volunteer system.

In the Pacific, Asia, and other places, low power

3. Building Awareness into the Structure of Communities

To get people to respond and to reduce risk, local communities should develop awareness of different impacts associated with different hazards in their immediate environment as part of a Community

COMMUNITY-BASED VOLUNTEERS

Despite the good performance of many dissemination systems, warnings from the national and subnational agencies sometimes do not get the information to some communities, including fishermen and rural communities. Often, the modes of dissemination include using telephone/ fax/SMS; media (radio, TV and newspapers); website/e-mail alerts; social media (Facebook, Twitter); mobile Apps; signs; billboards; bells and drums (in indigenous communities). Even with this wide variety of systems, sometimes these are not fully efficient to the last-mile of the process.

Some countries have taken community volunteer measures with great success. In the case of Bangladesh where, in the aftermath of a cyclone that caused about half million victims in 1970, the Cyclone Preparedness Programme (http://www.cpp.gov.bd) was established in 1972 by the request of the United Nations and the help of the League of Red Cross. This programme is still considered a very successful initiative nowadays and was awarded the "Smith Tumsaroch award-1998" for its outstanding performance in disaster management. This Programme has 203 officers/staff and 49,365 volunteers, 32% of which are females.

Another way of trying to solve this gap, devised by province Cebu, Philippines, consist of training 940 community-based volunteers from the municipalities of Borbon, Sogod, Carmen, Catmon and Moalboa. This was developed in the aftermath of tropical cyclone Washi/Sendong and the 6.9 magnitude earthquake in Negros.

Text Box 10.2 Community-based Volunteers

FM radio systems were initially developed to provide warnings, especially related to tropical cyclones. However, they soon evolved to serve basic communication functions. Thus the radios are used daily and have become important to the local communities. As a result, they are well maintained and available when warnings are needed. Low power FM radios used to receive warnings are cheap, highly reliable, and excellent at ensuring the "last mile" connectivity required.
It should be noted that for fishing men and women, cargo ships, and others at sea, the Navigational Telex (NAVTEX) broadcast might be a good source of information and dissemination.

Based Disaster Risk Management process. The impacts will be different for various parts of the community such as farmers, business people, livestock owners, plantation operators, etc. The awareness can be done in many ways, however the most effective process is one developed locally with an understanding of the local culture and habits. To support this local development, sub-national and national agencies can provide needed assistance as requested in areas such as education curriculum for schools, outreach activities explaining different hazards and their possible impacts, evacuation procedures and safe areas, information on the value of voluntarism during hazards and other appropriate training.

4. Involvement of Local Communities in Data Collection

Data collection by local people using readily available technologies can provide information, which is of critical use for the early warning system. Simple technologies, such as rainfall and river gauges combined with equally simple rules of thumb can often enable communities to monitor threats and provide vital information for warnings. However, a certain amount of caution and discretion should be exercised when using these data based upon a knowledge of the training of the persons taking the observation, the calibration of the instrument used, and the appropriate positioning of the instrument.

10.3 Reasons for Taking Actions

Hazard awareness and education of the public do not lead directly to people doing the appropriate actions at the appropriate times. Researchers have found that people take action only when they:

- Know what specific actions can be taken to reduce their risks;
- Are convinced that these actions will be effective;
- Believe in their own ability to carry out the tasks;
- Receive validation from many sources (for example, friends, experts, public authorities, respected community leaders, radio, television and web sites); and
- Think others are doing it.

10.4 Case Study

The finding below are from the WMO, ESCAP and the ESCAP/WMO Typhoon Committee Post-Typhoon Haiyan (Yolanda) Expert Mission to the Philippines (Manila and Tacloban), 7 - 12 April 2014 Mission Report. These items deals mostly with local community issues and are included here because they provide excellent insight

Findings of WMO, ESCAP and Typhoon Committee Post-Typhoon Haiyan (Yolanda) Expert Mission to the Philippines, 7 - 12 April 2014.

- A combination of possible lack of appreciation and utilization of available hazard maps at the local level for exceptionally severe storm surge resulted in evacuation to unsafe shelters that were destroyed;
- Unfamiliarity of the term “storm surge”, lack of first-hand experience and recent historical knowledge of past storm surge events, combined with past experiences in which TC warnings were issued but nothing occurred, led to people being unaware or underestimating the large risk and severity of the typhoon and the resulting storm surge event;
- Inconsistency in effective leadership and coordination at the local level may have led to inadequate response;
- The non-existence of an organized body of community-based volunteers to establish the link between the local government units and fishermen and other communities, in the last mile warning dissemination, prevented the warnings from reaching the addressees in some areas affected by Haiyan;
- The heavy emphasis on using electronic means to disseminate emergency warnings left out a large number of people who do not have access to the Internet or mobile phones. There is an overwhelming need to look at low-tech solutions to reach these people;
- There is no evidence of any stakeholder in the chain of communications making special effort to reach the most vulnerable groups – women, children, people with disabilities and elderly. These groups need to be targeted through different channels of communications then radio and TV and with specialized TV messages; and
- There is no concentrated effort on behalf of the agencies issuing the signal to educate the end-users of what the warnings mean and how to react if the warning is issued.

Text Box 10.3 Case Study – Typhoon Haiyan (Yolanda)

into some of the issues in local communities. It is recommended that these be reviewed and considered for use in other countries. There are addition findings from the mission to the Philippines which are related to the preparation of warnings. These are included in Module 13.

Module Eleven: At Risk Population

In a hazardous situation, everyone is at risk but some people are more at risk than others. The Human Rights Council of the UN General Assembly in a document from their Tenth Session, Agenda Item 2 (see references) found that segments of the population who are already in vulnerable situations due to factors such as poverty, gender, age, minority status, culture, ethnicity and disability are likely to experience greater impacts than others from climate change, but it is equally applicable to hazardous events. They also identified that vulnerability and impact assessments are usually focused on impacts on economic sectors areas rather than on the vulnerabilities of these specific segments of the population. Module 10, Local Communities, suggests ways to help identify vulnerabilities of specific segments. By involving the local communities early in the SSOP and EWS development or review process, the segments of the population who are already in vulnerable situations can be identified and incorporated into the action plans.

Disabled and Elderly The Global Alliance on Accessible Technologies and Environments (GAATES) in collaboration with ADPC and ABU has produced an exceptional *"Guideline on Inclusive Disaster Risk Reduction: Disabilities and Disaster"* which can be retrieved at http://gaates.org/resources-disaster/. This document should be consulted for additional detail in this area. The following are some edited excerpts from this Guideline.

In disaster situations, people with disabilities and the elderly are more likely to die when compared to the overall population. In March 11, 2011, an earthquake off the eastern coast of Japan produced a tsunami with waves over 130 feet. In this disaster, the death rate for persons with disabilities in Japan was twice that of persons without disabilities.

Disabilities include a wide range of limitations involving mobility; vision; hearing; intellectual impairment; intellectual development; hidden

Figure 11.1 GAATES Guideline

items such as epilepsy and breathing or heart problems; and older people. These must be considered in determining communications and dissemination methods to ensure the safety of all people. Providing early warnings in a variety of formats (audio and visual) and planning for accessible shelters and accessible transportation are some of the ways to consider people with different disabilities. For more information see www.gaates.org.

Women

The document mentioned above from the 10th Session of the Human Rights Council, Agenda Item 2, found that "It is established that women, especially elderly women and girls, are affected more severely and are more at risk during all phases of weather-related events: risk preparedness; warning communication and response; social and economic impact; recovery; and reconstruction. This is because women are especially exposed to risks due to existing gender discrimination, inequality and inhibiting gender roles. They identified that the death rate of women is significantly higher than that of men during natural disasters. Some theories suggest the reasons for this include that women are: more likely to be looking after the children, wearing clothes which inhibit movement, and not being able to swim.

However the Human Rights Council stated there are studies which have documented "there are numerous examples of how measures to empower women and to address discriminatory practices have increased the capacity of communities to cope with extreme weather events."

Children

Again the Human Rights Council has found "For example, extreme weather events and increased water stress constitute the leading causes of malnutrition and infant and child mortality and morbidity."

For the reasons discussed above, the vulnerabilities produced by poverty, gender, age, minority status, culture, ethnicity and disability must be addressed in the SSOPs that implement the EWS.

For more information, see Human Rights Council, Tenth Session, Agenda Item 2, Annual Report of the United Nations High Commissioner for Human Rights and Reports of the Office of the High Commissioner and the Secretary-General: *Report of the Office of the United Nations High Commissioner for Human Rights on the relationship between climate change and human rights*, 15 January 2009

PART V : NMHSs ACTIVITIES IN EWS

Module Twelve: Role of NMHSs in EWS

Much of the following is a summary of information written by David Rogers and Vladmir Tsirkunov, Global Faciltiy for Disaster Reduction and Recovery (GFDRR) Weather and Climate Information and Decision Support Systems (WCIDS) report entitled *Implementing Hazard Early Warning Systems (2011)*, GFDRR WCIDS Report 11-03. This report was retrieved from http://www.gfdrr.org/sites/gfdrr.org/files/Implementing_Early_Warning_Systems.pdf and additional detail useful to NMHSs can be found in the report.

The role of NMHSs in an early warning system is critical since so many natural hazards, which produce floods, wind storms, storm surges, wildfires, droughts, landslides, and other hazardous conditions and the resulting social and economic losses are weather-related. Further, many NMHSs (e.g., Myanmar, Thailand) have mandates that also include other hazards such as tsunamis. The joint linkage of the NMHSs and the disaster management agencies is especially important and the NMHSs should maintain a good working relationship with these agencies.

To maintain this linkage, the NMHSs and DMO/DRR should each establish a 24 hour watch office to ensure they can communicate at any time."

The following are four areas in which NMHSs can play a critical role:

12.1 Risk Identification and Reduction

a. Risk identification: Observation and monitoring of hydro-meteorological hazards; providing high quality archived and real-time data; conducting multi-hazards and vulnerability analysis and mapping; as well as forecasts with potential impacts; and

b. Risk reduction: Provision of short-term hazard forecasts and warnings related to specific impacts (e.g., a flood or storm surge) to support emergency preparedness planning and response; and medium- and long-range forecasts (probabilistic information on hazards and their changing patterns) to support sectorial planning.

12.2 Effective Early Warning Systems

A warning system must ensure individuals, communities and businesses respond timely and appropriately to hazards in order to prevent or reduce the risk of death, injury, personal property loss and damage to public and private infrastructure. People must understand the warning messages and the warnings must stimulate those at risk to take action.

It should be noted that NMHSs-operated observation systems such as basic surface observations, upper air observations, rain gauges (manual and automatic) observations, automated weather observing systems, river gauges, satellite images, and weather radars along with numerical model data and an efficient communications system form the backbone of the NMHSs warning service and play a crucial role towards the effectiveness of the entire early warning system.

12.3 Building Partnerships and Involvement of Stakeholders

NMHSs need to build partnerships and relationships with stakeholders in both the public and private sectors to enhance cooperation and information exchange for an effective EWS. First who are the stakeholders? They include:

a. Other government agencies involved in the protection of life and property, such as other warning agencies; national, sub-national or local DMO/DRR agencies; first responders; and infrastructure (bridges, dams, canals, road network and transportation systems) managers;
b. Media;

c. Non-Governmental Organizations (NGOs);
d. Emergency relief and humanitarian organizations, such as the International Federation of Red Cross and Red Crescent Society (IFRC);
e. Colleges and schools specializing in technical areas, as well as sociology, economics, human interactions, etc.;
f. Trained volunteers (cooperative observers, storm spotters, amateur radio operators, etc.);
g. Meteorological and hydrological societies and other professional associations in risk management disciplines;
h. Private sector;
i. Utilities, telecommunications, operation-critical or weather-sensitive businesses; and
j. Public who will be the recipients of the information.

There are many benefits of partnerships with these stakeholders. They include (also see Section 5.2 Importance of Communications):

a. Agreement on warning standards, procedures and systems;
b. Ways of getting vulnerable populations to take effective action;
c. Sharing of experience, knowledge, and lessons-learned from a wide range of people;
d. Accomplishment of tasks that cannot be done by a single agency or organization;
e. Better use of financial resources through a commitment by all to a common goal;
f. Sharing costs and people for research, awareness, preparedness, safety measures, etc.;
g. Ensuring consistent warning and education information from multiple credible sources; and
h. Wider distribution of messages through multiple outlets and receiving multiple feedbacks.

The needs and decision-making processes will vary widely for each stakeholder for the same weather event because of different aspects of the national economy, cultures, vulnerabilities, economic statuses, and community capabilities. However if the NMHS understands these different needs, decision-making processes and impact on stakeholders' operations, the warning information and decision support services they provide can be tailored to the specific needs of the stakeholders.

In addition to the benefits of partnerships with stakeholders stated above, involving stakeholders in developing and enhancing the end-to-end warning system can provide excellent benefits, such as:

a. Improved presentation, structure, and wording of the warnings;
b. Increased effectiveness of communicating risks and actions;
c. Better understanding of how, and how often, stakeholders want to receive warnings;
d. Increased sense of ownership, and therefore, increased credibility and trust in the warning system; and
e. Clear insight into future needs of the warning system.

12.4 Social Media Possibilities

Worked by Ioannis Kotsiopulos (see reference in Appendix IX) stated that "…, findings show the mass media still plays an important role with respect to the extent to which ideas can diffuse to the larger public." Mass media is normally thought to include, TV, radio, and newspapers. However, social media can now play an important part in disseminating information and warnings through Facebook pages, Tweet accounts, blogging etc. In addition, social media can also play a very important role in relaying information about the occurrence, strength, events associated with the disaster; impacts on human life and extent of damage; and status of critical infrastructure.

These social data information must be used cautiously and filtered for accuracy due to the possible occurrence of misinformation, unreliable sources, misrepresentation, and information provided to disrupt EWS agencies from performing their jobs. However these social data should not be ignored because, when used with official data sources, they can provide critical information to improve the warnings for down-stream locations and to aid in rescue and recovery operations.

As done in many parts of the EWS, the planning process before a disaster should consider and address the most effective and efficient ways to incorporate social media data into the EWS, so the agencies can better perform their missions.

Social media and the use of it by NMHSs is very important, but the warning agencies must emphasize to their own personnel and to outside agencies that their primary mission is to issue accurate and timely warnings. Thus sometimes, the Facebook page updates, tweets and email responses may be delayed because of higher priorities. These limitations should be clearly stated many times, so during a hazardous situation people understand them.

Appendix V contains Selected Social Media Guidelines that countries/members may consider. Every country/member has different needs and abilities so these are suggested guidelines only.

As examples, Jonatan A. Lassa, Saut Sagala, and Adi Suryadini showed the use of social network analysis in visualizing the transmission of flood warning message for Jakarta, Indonesia. In addition, many of the weather offices in the United States place graphics such as the following on their Facebook page for reference and information dissemination.

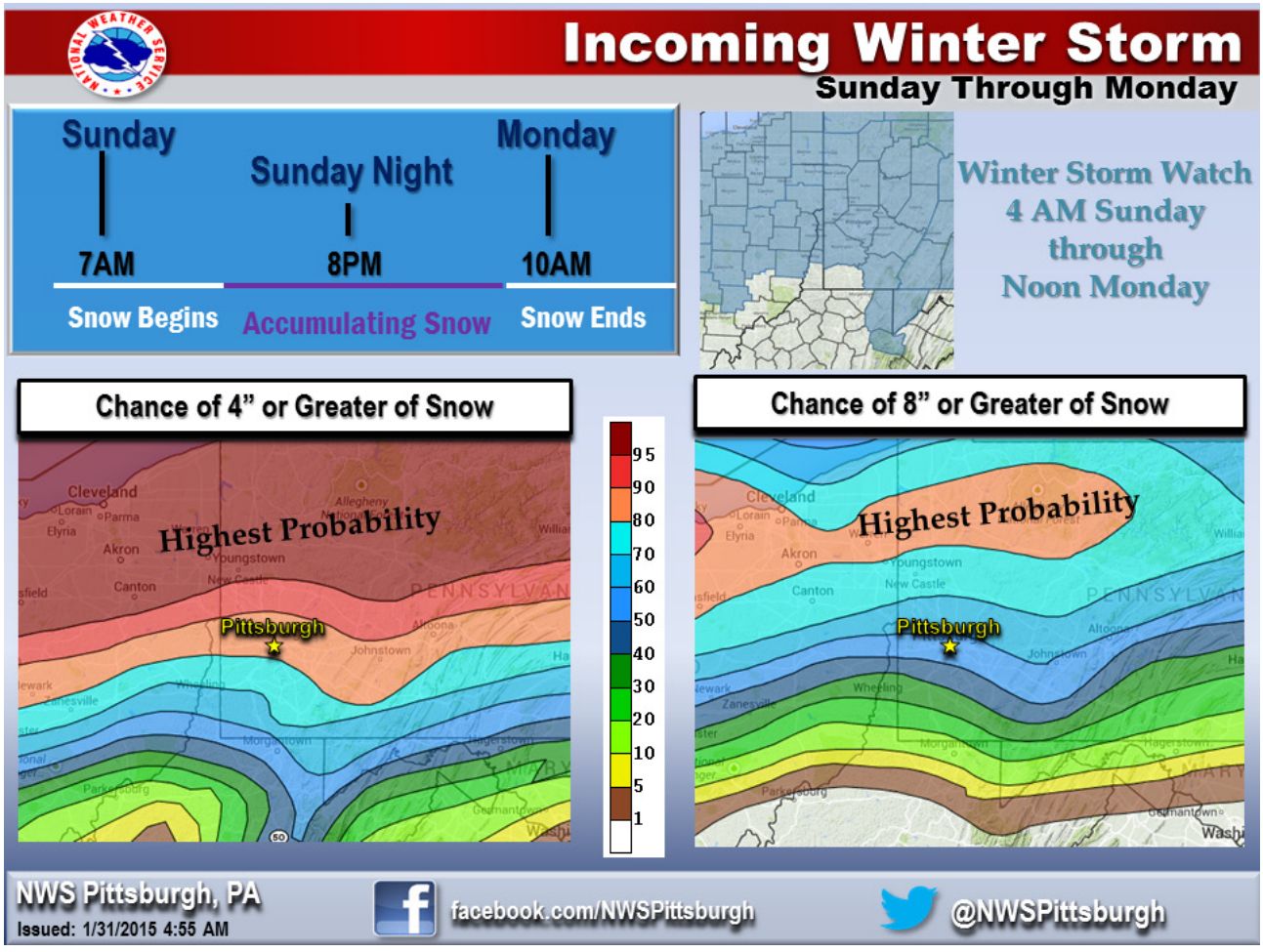


Figure 12.1 Example Facebook Graphic

Module Thirteen: Preparation of Effective Warnings

Module 12, Role of NMHSs in EWS, provides background material for this module in regards to effective early warning systems, partnerships, and identifying stakeholders' involvement in needs and decision-making assessments.

Many studies and much research have been done on how the public receives, interprets, and reacts to early warning messages. These studies, research, and Post-Typhoon Haiyan Report have documented ways to avoid confusion, panic, and inappropriate actions during a potential disaster situation. Some of these are discussed below. However, each of these need to be adapted to each country's particular needs, situations, risks, and cultures to be effective.

13.1 Case Study

The importance of preparing effective warnings which can be understood and actions taken was highly evident when Typhoon Haiyan struck the Philippines. The following findings are from the WMO, ESCAP and the ESCAP/WMO Typhoon Committee Post-Typhoon Haiyan (Yolanda) Expert Mission to the Philippines (Manila and Tacloban), 7 - 12 April 2014 Mission Report. Each of these need to be considered when preparing SSOPs on warning preparation and wording. These items deals mostly with warning preparation and are included here because they provide excellent insight into some of the issues involving warning preparation. It is recommended that these be reviewed and considered for use in other countries. There are addition findings from the mission to the Philippines which are related to the local community items. These are included in Module 10.

Findings of WMO, ESCAP, and the ESCAP/ WMO Typhoon Committee Post-Typhoon Haiyan (Yolanda) Expert Mission to the Philippines, 7 - 12 April 2014.

- Lack of scientific and technological capacity to translate hazard information into impact forecasts meant that the impacts were underestimated.
- Warnings were not communicated in layman's language and in such a way as to trigger life-saving actions, for example quantifying the height of the storm surge with tangible reference points such as the height of known landmarks or buildings, the speed of the surge and the extent of the inundation.
- The information on the storm surge is vital for the safety of the people in the coastal area. It should be more easily understandable information specifying potential affected areas, expected inundation heights or storm tides, and the occurrence time. The graphical information is preferable for people to understand disaster crisis by storm surges clearly.
- Lack of understanding the warnings by the public due to the use of scientific jargon, vague language failing to communicate the severity and urgency in the warnings may have led to inadequate response by the public. In addition, cultural habits and beliefs may have contributed to non-action on the part of the recipients.
- The warnings should be stated in a manner that is adapted to the audience as the warnings are intended to urge people at risk to take necessary actions. The nationwide information may be used to raise the attention of the entire nation but might be short of this objective. That means that the messages wording has to take into consideration local languages and local habits of receiving messages as well as cultural awareness of the impact of the coming disaster.

Text Box 13.1 Case Study Typhoon Haiyan (Yolanda)

To ensure a continuous improvement process, the warning content, format and dissemination processes should be reviewed following each event and corrective actions taken as necessary to improve the process. As discussed in Modules 8 and 9, the warning procedures and dissemination process should be reviewed often through regular exercises to ensure the EWS process is working and people understand and take appropriate actions. In addition, training should be conducted to instruct that people about the various hazards, risks, and threats; that they understand the seriousness of these threats; and that they understand the importance of understanding warning messages.

13.2 Effective Communications

For the preparation of effective warnings, vertical and horizontal communications and coordination among those involved in the early warning process is essential. For successful communication to take place, there are at least three groups involved. They are:

a. Warning Agencies:
Responsible for creating the contents of the warning message (typically a technical service such as meteorology, hydrology or tsunami centers). The most effective warning messages come from one official source and is not interpreted by any receiving agency.

b. Communications Agencies:
Receives and distributes warning messages to the at-risk recipients. Sometimes the format of the warnings might be slightly altered to meet the needs of an agency to distribute the information, but the original information of the warning must be preserved.

c. Recipients:
To be effective, warnings must be clear, understandable and relevant to the recipients, the people at risk. This makes the role of the warning agencies extremely important. The warnings must convey an urgency for proper actions. As stated in other sections of this module, warnings must address the recipient's perceptions, their past reactions to warnings, and general public beliefs and attitudes regarding disasters. The communications agencies, e.g., DMO/DRR, other government agencies, media, trained volunteers, social media, and spiritual or other leaders/persons who act as communicators, must ensure the warning gets to the people at risk in a timely manner.

Media plays a critical role in disseminating warnings. They are becoming increasingly the most influential factor in the lives of people at all social groups at all levels, national, regional and community. There is no other channel that can reach such a wide audiences on so many platforms from traditional FM radio, to smart phones and to other increasingly high-tech devises. It is noted that not many countries in the Asia Pacific region have integrated media in their disaster warning and disaster preparedness efforts. As a result, not many broadcasters have solid internal standard operational procedures in the form of Emergency Broadcast Plans. Very few examples of SSOPs for interactions between media and the other stakeholders exist. However because of the important role of the media to reach almost every person in danger, they must be integrated in the EWS and NMHSs must form partnerships with them.

13.3 Warning Content

A good early warning message must contain the following six elements:

1. Timing: When is the hazard due to strike?
2. Location: Which areas are going to be affected?
3. Scale: What is the magnitude of the hazard? (e.g., level of water, wind speed, likely area of inundation, etc.)
4. Impact: What will be the impacts of the hazard on the communities and environment?
5. Probability: What are the chances of this happening?
6. Response: What should at-risk populations do to protect themselves?

However, care should be exercised to ensure the warning is not too long or complicated.

13.4 Warning Tone

Some research has shown that in addition to the facts associated with a warning, people might respond to an appeal of consequences or an appeal to fear. These warnings which include a strong appeal to consequences or fear ("emotional appeal") may in some contexts be more successful in both reaching and convincing the people in danger to take action. Emotional appeal in addition to the warning facts, may cause some people to pay close attention to what is being said.

13.5 Warning Standardization

It is very important to try to standardize the format of warnings for different hazards in accordance with the warning content stated above. Warning templates can be prepared before a hazard strikes, so the person issuing the warnings can use these templates as the basic format of the warning. However, the templates and the standardized warning format/content must allow for modifications based upon the specific nature of each hazard.

The warnings should use words that can be understood by the community receiving the warnings, so special attention should be given to language, tone, and choice of words. To accomplish this, the local communities must be involved in all EWS planning or have the local communities lead the process affecting them as stated in Module 10.

Messages in plain language are more likely to be understood by older people and people with little education. Plain language messages are also appreciated by many persons with disabilities, particularly those with developmental disabilities and learning disabilities. Messages should be transmitted in a variety of formats to ensure that they reach people who are deaf (text format), people who are blind (audio format), and through other methods to reach vulnerable populations. Warnings on television should include captioning and sign language interpretation (see Module 11 for more information).

13.6 Color Coded and Graphical Warnings

Many countries use color codes for different warning and response actions levels. Although countries may use different color codes or levels which best meets the needs and past experiences of their country, some of the basic principles would apply.

1. The Shanghai Meteorological Bureau (SMB) of the China Meteorological Administration (CMA) uses the following system.

Warning Level and Corresponding Response Actions Level

Warning level	Response Action Levels
Blue	Municipal emergency headquarters arranges the whole resources for emergency to deal with the event under the lead and command of municipal government, and takes charge of information reporting.
Yellow	Municipal emergency headquarters takes responsibility to manage the emergency response, and asks for support of the municipal government if it necessary.
Orange	The related agencies take charge of disposal for hazard event. They need to take action to prevent and control the extension and ask for supports from municipal emergency headquarters if needed.
Red	The Basic Grid Units (BGU) takes charge of the emergency disposal of light hazard; the public takes suitable defensive action based on the actual need, and ask for help from related agencies according to the BGU mechanism.

Taking blue warning signal of typhoon as an example, when the meteorological conditions reach the specific standards, the blue warning signal of typhoon will be issued by the Meteorological Service. The standards are as follows: If the tropical cyclone may affect within 24 hours or has already affected, the coastal or land surface wind speed is between 10.8m/s and 13.8m/s or gust speed between 17.2m/s and 20.7m/s, and it is likely to last for some time. As soon as the Shanghai Water Affairs Office receives the blue warning signal of typhoon provided by SMB, the blue warning signal of flood and typhoon prevention will be issued by Shanghai Water Affairs Office immediately.

Text Box 13.2: Example of Color Coded Warnings – Shanghai, China

2. The United States National Hurricane Center (RSMC Miami) has introduced an experimental warning, the Potential Storm Surge Flooding Map, which clearly and concisely depicts the risk associated with the storm surge hazard from a tropical cyclone. It is an example of both a color coded and a graphical warning. It was developed over the course of several years in consultation with social scientists, emergency managers, broadcast meteorologists, and others, this map shows:

    - Geographical areas where inundation from storm surge could occur;
    - How high above ground the water could reach in those areas; and
    - Areas of possible storm surge flooding for a given storm are represented in different colors on the map based on water level.

    An example of this products follows.

    Up to 3 feet above ground
    Greater than 3 feet above ground
    Greater than 6 feet above ground
    Greater than 9 feet above ground

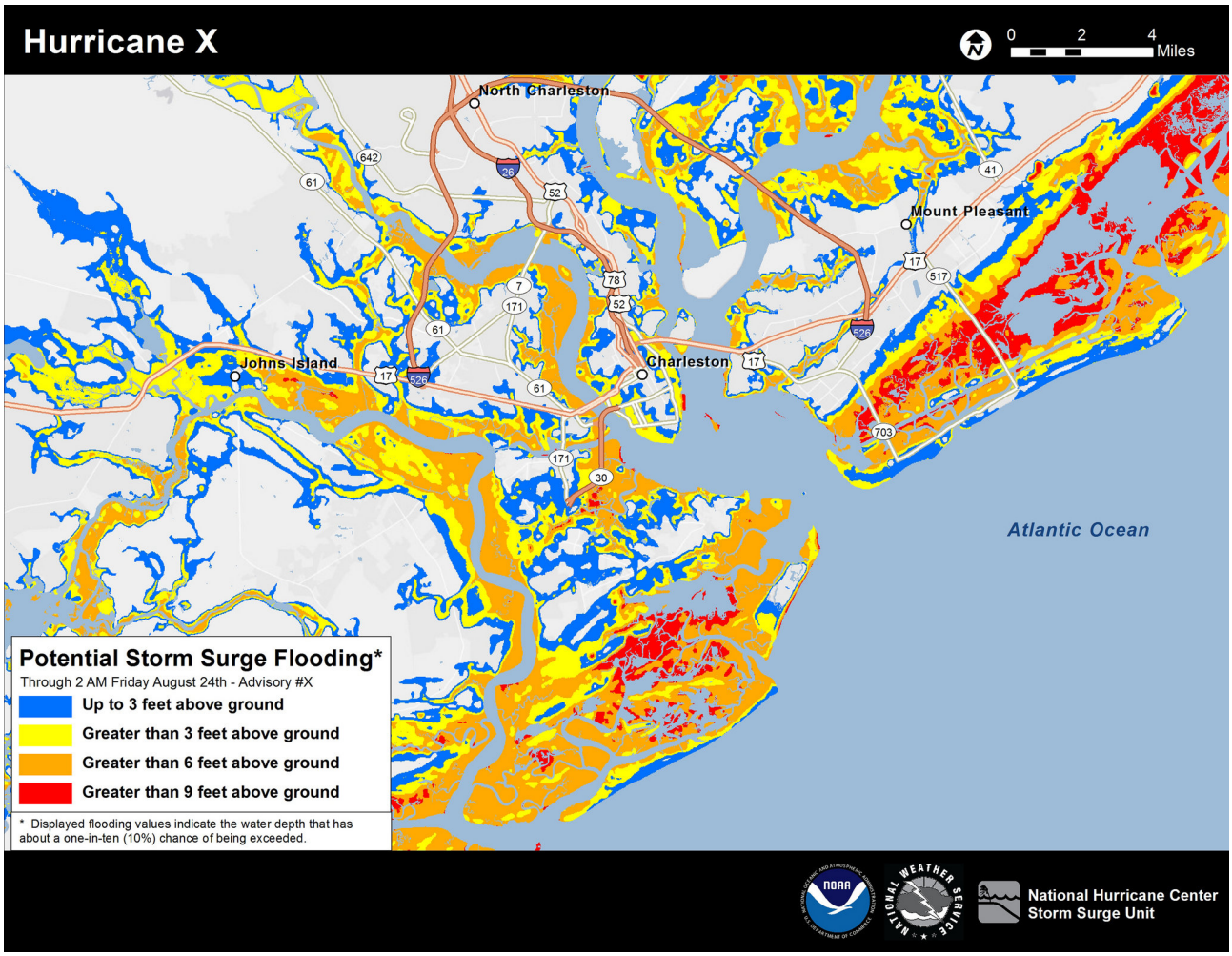


Figure 13.1 Example of Color Coded and Graphical Warning - USA

PART VI : SSOPS' SYNERGY AND CONTINUITY OPPORTUNITES

Module Fourteen: Operational SSOPs

Operational SSOPs are the most important SSOPs for NMHSs because they are the ones which provides the "who", "what", "when", "where", "why", and especially the "how" tasks or activities to provide timely, accurate, and useful services and products to all users (fishermen, shipping, aviation, public safety, etc.). SSOPs list the steps required to analyze the situation; determine if a warning is needed; prepare and format warnings; issue warnings; communicate and disseminate warnings; and dictate follow-up actions. These actions can be similar to other countries' actions and other countries' definitions and thresholds can be similar/common for such things as tropical cyclone classification and open sea wind speed warnings. Because of these possible commonalities, synergized SSOPs may be produced from other countries' NMHSs existing SSOPs. In addition, there are opportunities to create synergized multi-hazards SSOPs because of similar tasks associated with different hazards identified in other TC and PTC countries existing SSOPs.

14.1 Areas for Possible Synergy with Other Countries' Existing SSOPs

Defined Criteria

Different Stages and Levels

Frequency of Warnings/Updates

Warnings Numbering and Time Issued

Information/Data for Hazard Monitoring, Analysis, and Warning Generation

Broadcast Media Interactions

Social Media Use

Information or Decisions on Sources of Reliable Information

Dissemination and Backup Methods

Updating Information

Community Participation

SSOP Reviews and Revisions

Lessons Learned

14.2 Hazards for Possible multi-hazards synergy with Other Countries' Existing SSOPs

Heavy Rain

High Winds and associated high waves

Swells

Thunderstorms (high Winds, Hail, heavy Rain, waterspouts, tornado)

Tropical Cyclones (Heavy Rain, strong winds, and storm surge)

Tsunami (Local and Distance)[1]

Flash floods/river flooding near coast

14.3 Example for Possible Synergy for Tropical Cyclones

All of the various items listed may not always be in the "Strong Possibilities for Synergy" category or the "Some Synergy Possibilities in Certain Areas" category. Some of these could be in both categories, but they have been listed in the category that most often would apply. The items within the "Some Synergy Possibilities in Certain

[1] In some countries, warnings for tsunami and some ocean hazards are the responsibilities of other agencies and not the NMHSs'. Thus some of the above may not apply to all countries

Areas" category indicate some synergy may be possible, but some items may be very specific to the country.

Strong Possibilities for Synergy:

Preparation

1. Pre-cyclone exercise ideas
2. Telecommunications tests
3. Publicity and awareness of warnings
4. Public education and education events
5. Observational data and organization/staffing review
6. Review of products and services
7. Results of drills and exercises

Tropical Cyclone Identification and Monitoring

1. Terminology used in the region
2. Classification of cyclonic disturbances and tropical cyclones
3. Tropical cyclone characteristics
4. Terms related to the warning and warning system
5. Meaning of terms used for international exchanges
6. Units used in international exchanges
7. Units used in national bulletins
8. Identification of tropical cyclones
9. Satellite and radar analysis
10. Synoptic analysis
11. Dvorak Fix
12. Structure of the tropical cyclone (Eye, eye wall, rain/spiral bands, outer storm area, and vertical structure
13. Life cycle of a tropical cyclone (Formation, developing, maximum stage, decaying)
14. Hazards due to tropical cyclones (Winds, storm surge, high waves, heavy rain)
15. Historical Cyclones and their Impact
16. Climatology of Tropical Cyclones
17. Frequency of Disturbances
18. Location of Genesis
19. Intensification

Regional Specialized Meteorological Centers – Tropical Cyclones Products and Services

1. Bulletins issued by RSMC
2. Tropical weather outlook
3. Special Tropical weather outlook
4. Tropical cyclone advisories
5. Tropical cyclone warnings for the high seas
6. Warnings and advisories for aviation
7. Tropical cyclone warnings for national purposes
8. Storm surge guidance
9. Graphical presentation of track and intensity

Communications and Dissemination

1. Telecommunication headings for the exchange of radar observations
2. Telecommunication headings for the exchange of other messages
3. Telecommunication headings for the exchange of tropical cyclone advisories and warnings for aviation
4. Existing GTS circuits

Prediction

1. Forecast development and movement
2. Intensity Forecasting
3. Use of Model Data
4. Cone of uncertainty
5. Rainfall
6. Storm Surge
7. Coastal inundation
8. Maximum sustained wind

Post Cyclone Action

1. Preliminary and Final Reports
2. Press Bulletin
3. Final Report Scrutiny of Action Taken
4. Visit of Officer to Cyclone Affected Areas
5. Assessment of Damage
6. Evaluation of Products and services
7. Annual Cyclone Review Meeting
8. Back-plotting and Re-analysis

Some Synergy Possibilities in Certain Areas

Early Warning System

1. Tropical Warning system
2. Staffing
3. Data and Products
4. Decision making
5. Communication and dissemination
6. Procedures to be followed
7. Tropical cyclone warning headings
8. List of important telephone numbers and addresses connected with tropical cyclone

9. Coordination and coordination mechanism among EWS agencies at all levels

Monitoring

1. Surface (Land, Ocean) Based Observations
2. Land (conventional, cooperative network, upper air, radar)
3. Ocean (ship, buoys)
4. Air (Aircraft)
5. Satellite (Geostationary, polar orbiter, different wave lengths)
6. Request for specials or extra
7. Observations from outside region
8. Data monitoring and quality control
9. Archive of data for event

Prediction

1. Port and sea warnings
2. Forecasts for coastal areas, fisherman, navy
3. Content and wording of warning
4. Tropical cyclone warnings for national purposes
5. Aviation warnings and alerts

Module Fifteen: Agency Continuity Plans

Unexpected events can easily make a disastrous situation much worse. Therefore it is important that each office has an "Agency Continuity Plan" (backup plan) for these events such as fires, power loss, communications loss and other events that hinder normal operations. The "Agency Continuity Plan" should contain backup procedures and identify a backup office to maintain operational capability in these situations.

SSOPs contained in the "Agency Continuity Plan" for unexpected events can be as important as those for warning SSOPs. If adequate plans and procedures are not in place for these events, the warning process and early warning system could fail.

Thus to prepare for events, SSOPs can provide procedures to continue operations (although they may be somewhat degraded) and to issue and disseminate warnings.

15.1 Backup Roles and Responsibilities Considerations

There are two types of backup roles and responsibilities.

1. When an office or location is impaired and cannot perform their mission, then that office must contact their backup office and request them to assume the impaired office's mission responsibilities. SSOPs would be needed for the impaired office on whom and how to contact their backup office.

2. A backup office must be prepared to perform all of the necessary tasks for an impaired office if requested. The backup office would need SSOPs on how to provide all of the products and services of the impaired office.

This can be a very complex process to develop

backup SSOPs, but necessary to ensure continuity of an office's roles and responsibilities in the EWS. If an office cannot perform their mission in a critical hazard situation, a disaster of enormous magnitude may occur.

15.2 Office Requesting Backup

One of the most important items for the office requesting backup is to ensure the office has multiple ways to request the backup. Because this will be an unusual situation and circumstances, normal communications methods may not work and alternates may be needed. These should be researched and tested before any emergency and then documented in SSOPs. Also the office requesting backup should have a way to keep the backup office informed of their situation, how long the outage may last, and possible arrangements for people to go to the backup office to assist during long backup periods.

15.3 Office Assuming Backup Role

Performing a backup role takes a lot of additional work and places additional stress on the office performing the backup. To ensure this backup role can be performed, the office should develop specific SSOPs and test these to evaluate whether they can perform the backup mission. There are many things to consider in backing up another office and to incorporate into the necessary SSOPs. Some of the most important ones are:

1. Ensure access to the data and information required to perform the backup role. Since the backup area will be different from your normal area of coverage, some of the observations, satellite data, radar data, etc. may not normally be available to the backup office. Thus, special planning and actions will be needed to ensure these data are available when needed;
2. Ensure access to the communications and dissemination systems required to perform the backup role. Again in normal operations, the backup office may not normally have access to the communications and dissemination systems that the other office uses to perform their mission. If a perfect warning cannot be communicated or disseminated then it is useless; and
3. Ensure access to the phone numbers or contact systems for those people in the early warning system that the backup office will need to coordinate with. In any warning situations, the warning issuers, disaster management agencies, media, government officials, and decision makers will need to coordinate. Since the backup office will be performing the primary mission, they must have a way and the means to coordinate with these people.

15.4 Fire in the Facility – Some Possible Things to Consider

1. A fire evacuation map should be developed for each facility and then posted by the entry doors and by all fire extinguishers within the facility. The map should be a floor plan of the facility with the location of exit doors and fire extinguishers identified. Arrows should be drawn on the map through the corridors indicating the quickest exit route.

2. The staff should be trained as to the quickest exit from the building based on their room assignments.

3. The SSOP in the event of a fire should cover such things as:
   a. The first to detect a fire should activate the fire alarms or if fire alarms are not available start to notify everyone;
   b. Ensure the facility manager is notified;
   c. It is the facility manager's responsibility to ensure that all personnel in the area have evacuated the building by either personally or assigning people to search all parts of the building;
   d. The facility manager should be aware of any specific needs of the people within the building to ensure they receive proper assistance to exit the building;

e. If someone has been trained on the use of a fire extinguisher and the fire is small, the facility manager can decide to have one or two people stay to help suppress the fire while all others are evacuated;
f. A rally point should be designated outside the building where the staff will meet. This area should be at least 100 feet from the building;
g. A person(s) should be designated to wait for the firemen in an appropriate position outside the building to direct them to the fire; and
h. No one should re-enter the building until an official of the fire department has granted permission. People should be positioned near entrances to ensure someone who is not aware of the fire doesn't inadvertently enter the building.

15.5 Loss of Power Considerations

A step-by-step SSOP should be developed for personnel to follow in the event of loss of power. Each country and each office has different power sources and different backup systems, so the SSOPs will vary. But some general considerations can be included in the SSOP.

SSOP Considerations:

1. The backup power source should be clearly identified. The SSOP should specify whether the backup power will automatically start or office personnel must take specific actions to start the backup power.
2. If certain equipment may be affected by power surges when the backup power begins or when commercial power is restored, these should be identified and procedures should be developed to either power down this equipment or actions to take to minimize possible damage.
3. The SSOP should address the situation when the backup power fails. This is often unlikely, but it does occur. If backup power fails during an emergency and procedures have not been developed before the event, the impact could be devastating.
4. If commercial power fails or backup power fails, procedures should be identified to call the appropriate technicians (along with the correct phone numbers) to repair it. Operational personnel should never attempt to investigate or repair the power failure unless they have been trained and it is absolutely safe.
5. Any other impacts from a power failure should be considered in advance, and proper procedures developed to resolve or limit these impacts.

15.6 Loss of Communications Considerations

Most countries and offices have multiple, redundant communications systems to disseminate warning information. However some communications systems only serve specific users while others serve different users. It is recommended that each communication system be evaluated to determine any impacts of outages on each specific user and then SSOPs developed to provide instructions and procedures to disseminate the information in different ways.

This is extremely important because all agencies or personnel may not have access to the redundant systems and may not receive the correct information. This is especially true for people at the "last mile" in rural, remote locations and to vulnerable, disadvantaged, disabled populations who depend on specific methods to receive warning information.

During tests and exercises, some communications systems should be disabled and the appropriate SSOP used to test it's effectiveness. As it has been said many times, a perfect warning is no good if the right people do not receive it at the right time.

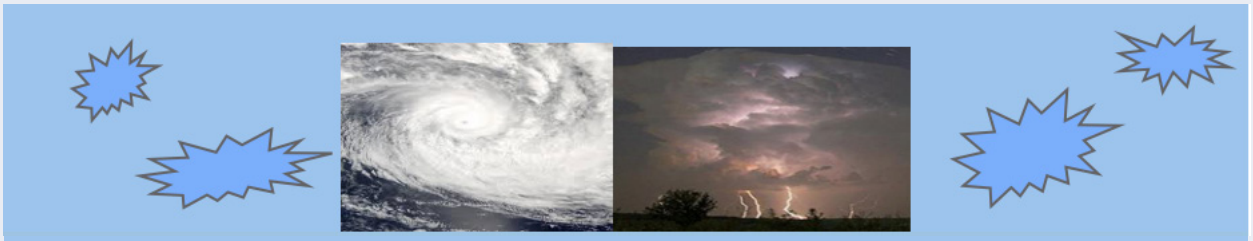
APPENDIX I: BASIC SSOP TEMPLATE AND EXAMPLE

(See section 6.9 SSOP Development and General SSOP Format for additional guidance)
(Based on an example provided by Abdul Majid)

1. Header

SSOP TCF-001 (High Wind Warning) 30 March 2015

2. Emblem and Organization



National Meteorological and Hydrological Service of Rainland

3. SOP for coastal flooding due to heavy rains caused by the tropical cyclone (Title)

4. SSOP Number: TCF-001

5. Prepared By: Flood Team (Abdul Majid, Leader; with Olavo Rasquinho; Jinping Liu; Denise Lau and Lisa Kou)

6. Approved By: _____ SIGNATURE _____ Date: _____
James Weyman

7. Implementation Date: _____

8. Distribution List: See Attachment 1

9. Partner Agencies:
Rainland Disaster Management Office
Daily News of Thunder
Rainland National Tsunami Warning Center

10. Acknowledgements:
Thank you to the Flood Team, under the direction of Abdul Majid, for their hard work in developing this SSOP, the coordination and collaboration of the partner organizations, and to the NMHS Rainland Administration Section for formatting and publishing this document.

11. Revision History

Number	Prepared by	Approved By	Implementation Date
____	_____	_____	_____
____	_____	_____	_____

Table of Contents

1. Background

A general description of the hazard, impacts, areas most affected, time of year the hazard occurs, how often has the hazard occurred in the past, and other related information can be included to explain the importance of the hazard and why the SSOP needs to be done correctly.

2. Purpose

The SOP has been written to provide a generalized example of a flood SOP for tropical countries which experience tropical cyclones and associated heavy rain. It is also meant to provide an example of synergy in SSOP development.

3. Scope

This SSOP addresses the tasks related to the issuance of a flood alert, the coordination required, and monitoring of the situation.

4. Applicability

This SOP applies to those countries which are subject to tropical cyclones which produce heavy rain and floods along the coastal belt.

5. Task

The DFF must continually monitor a tropical cyclone's strength and movement through coordination with the DMF. Based upon the expected rainfall and storm surge, the DFF must run the flood models, coordinate with the NMHS Director or Deputy Director and DMO, and issue alerts, watches, and warning for different water levels as needed.

6. Summary

Floods associated with a tropical cyclone occurrence can be devastating to many people who live and/or work along the rivers. Thus they need accurate and timely flood information to take actions to save lives or protect their property.

7. Definitions, Flood Levels Color Coding, and Acronyms

Danger Level:

Danger level is the level at which the river is bankfull (the level that is as high as the river can be without flooding).

Low Flood:

Flood level is between the danger level and 50 centimeters above the danger level.

Medium Level Flood:

Flood levels ranging between the upper limit of the low flood and 50 centimeters above this limit (total of 100 centimeters above danger level).

High Flood:

Flood levels ranging between the upper limit of medium flood and 50 centimeters above this limit (total of 150 centimeters above the danger level).

Very High Flood:

Flood levels above the upper limit of the high flood.

Flood Levels Color Coding:

Flood level:	Color Code
Low Flood:	Blue
Medium Flood:	Yellow
High Flood:	Indigo
Very High Flood:	Red

Flood Products Issued:

Alert:	Flood conditions expected within 36 hours
Watch:	Flood Conditions expected within 24 hours
Warning:	Flood Conditions expected within 12 hours

Acronyms:

AOI:	Area of interest
DFF:	Duty Flood Forecaster
DMF:	Duty Meteorological Forecaster
DMO:	Disaster Management Office
TC:	Tropical Cyclone

8. Cautions

River flooding in a coastal area during a tropical cyclone event is caused by two factors. One is heavy rain falling in the river basin and flowing into the river. The second is associated with storm surge. A strong storm surge can push water up a river raising the river height and also block the water trying to drain out of the river. So each of these must be considered.

9. Procedures

Example:

In accordance with SOPs TC-001, TC-002, and TC-003, the DMF will use all available meteorological means/technologies to track an approaching TC; notify the NMHS Director and Deputy Director when the TC is forecasted to be in the AOI within 3 days; coordinate with DMO; issuance and disseminate the appropriate TC alert, watch, or warning (SSOP DIS-001); and notify the DFF providing the location, intensity, and future movement of the TC.

a. Based upon the forecast of the tropical cyclone track, the amount of rain, and the height of the storm surge, and the current river flow information, the DFF will run the flood models (see attached checklist) to estimate the possibility to flood, height of expected flood, and the time the flood is expected to occur.

b. When alert conditions are met (flooding expected within 36 hours), in coordination with the Director or Deputy Director, issue the flood alert, the expected time of occurrence, and the forecasted highest flood level expected with associated color scale.

c. Disseminate the flood alert to all concerned in accordance with flood dissemination SSOP DIS-001.

d. When disseminating an alert, watch, or warning, ensure the media has received it and set up methods for providing updated information to the media.

e. DFF will coordinate with DMF to continuously monitor the movement and intensity of the TC, expected rainfall, expected storm surge, and timing. When significantly changes occur or are forecasted, DFF will run the flood models (see attached worksheet) with the updated information to determine whether to upgrade, down grade, or keep current status of the product type and expected levels of flooding.

f. The DFF will also continue to coordinate with

the DMO throughout the event to keep them aware of the situation and what is expected.

g. If watch conditions (flooding expected in 24 hours) are met, and in coordination with the Director or Deputy Director, issue the flood watch and expected levels and associated color codes, and then dissemination according to SSOP DIS-001.

h. Once the watch is issued, the DFF will collect the river flow, rainfall data, and storm surge expected from all of the available rain gages and river stations and run the flood forecast models (see checklist) every 6 hours to update the forecasted level and timing for the rivers. Based upon these data, evaluate upgrading, down grading, or continuing the watch and updating the expected levels and the associated color codes.

i. If flooding warning conditions (flood expected in 12 hours) are met and in consultations with: authorities for the river reaches; Director or Deputy Director; and DMO, issue the warning, the expected time and forecasted level with associated color coded information.

j. Disseminate warning in accordance with SOP DIS-001.

k. In a warning situation, continuously monitor the situation and run the flood forecast models every 3 hours with updated rain, river data, and storm surge values and evaluate whether to up/down grade or continue warning and flood levels.

l. When flooding has ended or is no longer expected, in coordination with the Director or Deputy Director and DMO, issue an advisory terminating the flood warnings.

m. Collect all relative information regarding the flood event and save for post-event analysis to evaluate for performance and any improvement areas.

References:

SSOP DIS-001	Synergized Dissemination Procedures
SOP TC-001	Detection of a Tropical Cyclone
SOP TC-002	Tropical Cyclone Enters AOI
SSOP TC-003	Coordination with Partner Agencies

APPENDIX II: SSOP CHECKLIST

Checklist for Effective SSOPs for EWS

SSOP Development

- ☐ Are new SSOPs written when new equipment or processes create new work situations?
- ☐ Are such factors as the age, education, knowledge, skills, experience and training of the person(s) considered? Is the work place environment within which the individuals work considered in the SSOPs?
- ☐ Did the development process consider how people learn and accomplish tasks (visual, hearing, physical limitations, memory problems, language proficiency)?
- ☐ Were new SSOPs reviewed and tested before implementation?
- ☐ Were appropriate different styles of SSOPs (simple step, hierarchical step, linear graphic flow chart, annotated pictures, and/or branching flowchart) used?
- ☐ Were appropriate QC procedures and QC material prepared to successfully demonstrate performance of the method?

SSOP Content and Use

- ☐ Are SSOPs in compliance with agency and government regulations?
- ☐ Are safety, health and environment concerns incorporated into the traditional how-to-operate or how-to-do steps?
- ☐ Are there SSOPs for different levels of activities?
- ☐ Are SSOPs that involve a long list of steps broken into separate logical sections of about 10 steps per section?
- ☐ Are SSOPs written in short and imperative sentences (usually begin with an action verb in the form of a command); are not too wordy or vague (vagueness often increases the likelihood of errors or inconsistency); and use acronyms and abbreviations sparingly?
- ☐ Are SSOPs clear and brief and emphasize critical steps and warns about safety issues?
- ☐ Are all personnel knowledgeable on SSOPs for their area of work?
- ☐ Do the SSOPs include in advance, things to know about upcoming steps that require caution, precision, timing, assistance and personal protective equipment?
- ☐ Does each SSOP have:
  - A title that clearly identifies the activity or procedure and uses descriptive action words?
  - An SSOP identification number, date of issue and/or revision, the name of the applicable agency, division, and/or bureau to which the SSOP applies?
  - Name of Organization or project for which the SSOP was prepared?
  - Names of people who prepared the SSOP?
  - Signatures and dates of the individuals who approved the SSOP?
  - Implementation Date?
  - Acknowledgements?
  - Revision history log?
- ☐ Is the SSOP Table of Contents a quick reference guide?
- ☐ Is the Purpose, Scope and Applicability identified?
- ☐ Is an overall task described which includes the number of people required for the task, their skill levels, the equipment and supplies required, any personal protective or safety equipment required, and a description of how the finished product or result should look?

- Are there:
  - A summary of method?
  - A summary of the procedure?
  - Acronyms, abbreviations and specialized terms defined?
  - Health and Safety Warnings included?
  - Cautions listed for possible equipment damage, possible invalidation of results, etc. in beginning and at critical steps in the procedure?
  - Interferences listed which may interfere with the final results?
  - Personnel qualifications, if applicable, (the minimal experience that the SSOP follower should have to complete the task satisfactorily and citing any applicable requirements, like certification or training) provided?
  - A list Equipment and Supplies included?

- For the Procedures:
  - Are all pertinent steps identified in sufficient detail?
  - Is the specific order, timing sequence and times allowed, and materials needed to accomplish the procedure and how they are to be used if appropriate included?
  - Is active voice and present verb tense used?
  - Is the "you" avoided?
  - If another SSOP is referenced, is it identified and where it can be found?
  - Are terms and concepts defined when needed?
  - Are health and safety warnings placed prominently in the SSOP?
  - Are procedures with more than 10 steps broken into logical sub-tasks?
  - Are checklists used? Are they appropriately referenced and/or attached?

- Are QC activities designed to allow self-verification of the quality and consistency of the work?

- Are documents or procedures that interface with the SSOP fully referenced (including version), such as related SSOPs and published literature or methods manuals?

SSOP Documentation

- Is an historical record kept of all SSOPs when modifications are made to that process and when an SSOP must be revised?

- Are computer accessible files and at least one notebook as backup of all approved SSOPs available?

SSOP Monitoring, Review and Training

- Are employees trained on new SSOPs?

- Are SSOPs 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 through step-by-step instructions to ensure that nothing is missed?

- Is an annual evaluation and review system established to be certain that over time all the steps of SSOP are still correct and appropriate for the production system?

- Do workers routinely evaluate existing SSOPs, work practice guidelines, and other documents for possible revisions to SSOPs?

- Are procedures in place to ensure that SSOPs are followed consistently over time?

- Are references to performing SSOP tasks included in conducting performance evaluations?

- Are SSOPs used to regularly evaluate work activity and possible improvements?

APPENDIX III : STANDARD EMERGENCY WARNING SIGNAL AND ITS USE IN QUEENSLAND

Can be retrieved at

http://www.disaster.qld.gov.au/Disaster-Resources/PGF.html , “Operational Guidelines.” In addition, there are similar resources at this website which may be of interest to some readers.

APPENDIX IV: SSOP EXAMPLES

SSOP Example #1 – "Philippines Tropical Cyclone Early Warning System"

This is a working draft of a SOP and therefore not all of the information, sections, diagrams and examples are completed. Additional information, changes, or ideas required are indicated in red.

Working Draft

Standard Operating Procedure

for

Philippines Tropical Cyclone Early Warning System

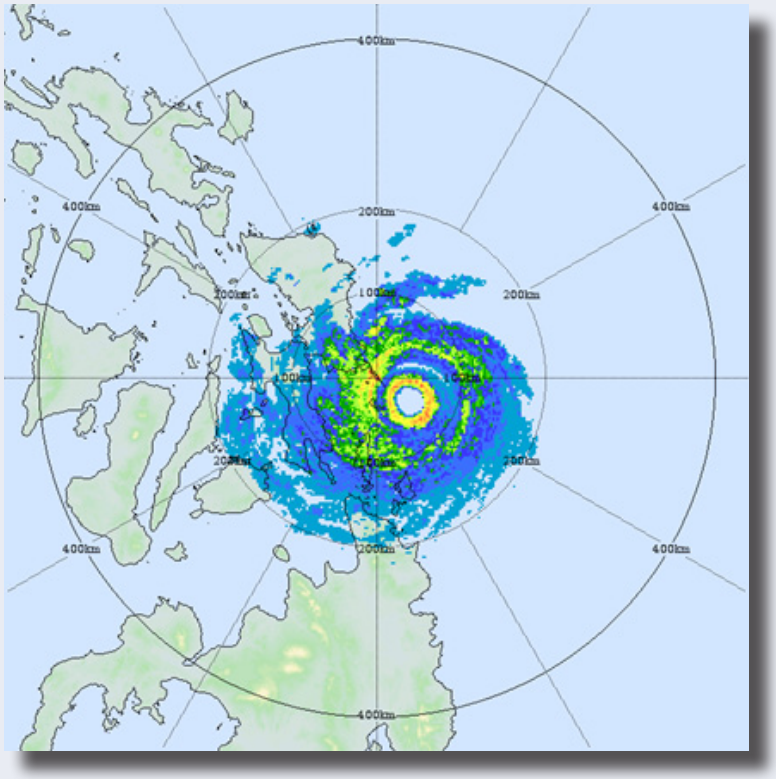
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

Department of the Interior and Local Government

(DILG)

Office of Civil Defense

(OCD)



1. **Prepared by** PAGASA
DILG
OCD

2. **Approved by** VICENTE B. MALANO, Ph.D. Date: _____
Acting Administrator, PAGASA
Implementation Date: _____

3. **Document Control** PAGASA
Distribution: NDRRMC

4. **Revisions** 1. Approved by: _____ Date: _____
2. Approved by: _____ Date: _____
3. Approved by: _____ Date: _____

5. **Identification of partners** OCD
DILG
Media: Panahon TV

Table of Contents

6. Background

The Philippines is vulnerable to a range of natural disaster especially tropical cyclone. Effective Early Warning Systems SOPs are important in managing emergencies and can assist in the protecting lives and properties. Due to its geographical setting in the Western North Pacific basin, the Philippines is considered as one of the countries in the world most prone to extreme weather and other climate-related hazards events. On the average about twenty (20) tropical cyclones (TC) enter the Philippine Area of Responsibility (PAR) annually as shown in Figure 1. About eight of these TC cross land areas or coastal communities, inflicting enormous damage to public and private properties as well as causing the loss of lives. Among the associated meteorological hazards brought by TCs are strong winds, storm surges and excessive rainfall that can cause flooding and mass movements like landslides.

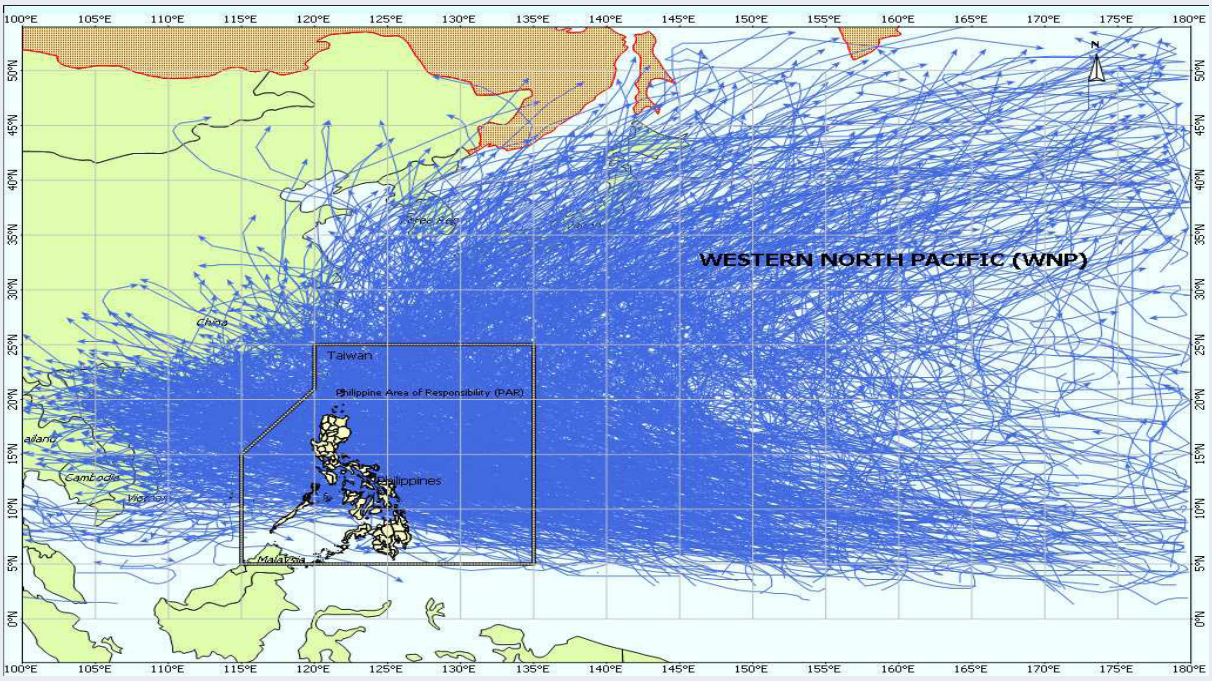


Figure 1: Western North Pacific Tropical Cyclone Frequency and PAR

From 1970-2014, the National Disaster Risk Reduction and Management Council (NDRRMC) tallied 707 tropical cyclones that entered PAR, 322 of these were destructive. In the past 20 years alone, tropical cyclones claimed 17,119 lives and injured 51,068. Tropical cyclone have affected 24.8 million families (122.1 million persons) and brought a total of PhP 354.7B damages to agriculture, infrastructure and private properties. [1]

7. Aim

To establish how Philippines will manage and operate its end to end Tropical Cyclone EWS.

Objectives:

1. To establish systematic procedure and processes on the preparation of accurate TC warning

2. To ensure proper, effective and timely delivery and transmission of TC warnings and related information to all stakeholders
3. To enable all stakeholders to prepare and to act appropriately in sufficient time.

8. Scope

This will cover tropical cyclone and its associated hazards such as strong winds, storm surges and heavy rainfall leading to floods and landslides.

9. Applicability

This is applicable to internal and external procedures and processes related to tropical cyclone EWS at the national level up to the local communities.

10. Summary of Method: Early warning systems have received significant international attention over the past ten years. First International Early Warning Conference (EWC-I) (1998) stressed the critical value of early warning systems as an essential element of disaster risk reduction strategies, while the Second International Early Warning Conference (EWC-II) (2003) defined four components of early warning systems as shown in Figure 2. The four components are discussed below. EWC-II also discussed the need for an International Early Warning Programme (IEWP) that would strengthen national early warning capacities.

Figure 2: Components of EWS

11. Task

The joint undertakings and agency responsibilities will be addressed under the following four (4) components of EWS.

a. Risk Analysis/knowledge
Risks arise from the combination of hazards and vulnerabilities at a particular location. Assessments of risk require systematic collection and analysis of data and should consider the dynamic nature of hazards and vulnerabilities that arise from processes such as urbanization, rural land-use change, environmental degradation and climate change. Risk assessments and maps help to motivate people, prioritise early warning system needs and guide preparations for disaster prevention and responses.

b. Monitoring and Warning Service
Warning services lie at the core of the system. There must be a sound scientific basis for predicting and forecasting hazards and a reliable forecasting and warning system that operate 24 hours a day. Continuous monitoring of hazard parameters and precursors is essential to generate accurate warnings in a timely manner. Warning services for different hazards should be coordinated where possible; to gain benefit of shared institutional, procedural and communication networks.

c. Dissemination and Communication
Warnings must reach those at risk. Clear messages containing simple and useful information are critical to enable proper response to help safeguard lives and livelihoods. Regional, national and community level communication systems must be pre-identified and appropriate authoritative voices established. The use of multiple communication channels is necessary to ensure as many people as possible are warned, to avoid failure of any one channel and to reinforce the warning message.

d. Response Capability
It is essential that communities understand their risks, respect the warning service and know how to react. Education and preparedness programmes play a key role. The community should be well informed on options for safe behavior, available escape routes, and how best to avoid damage and loss to property. It is also essential that disaster management plans are in place, well-practiced and tested.

12. Joint Undertakings and Agency Responsibilities

1. Risk Analysis/Knowledge

The Risk Analysis project is led by the government agencies under the Collective Strengthening of Community Awareness on Natural Disasters (CSCAND) Group chaired by the Office of Civil Defense (OCD) and composed of the scientific agencies in promoting disaster risk reduction and management which composed of Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Philippine Institute of Volcanology and Seismology (PHIVOLCS), the Mines and Geoscience Bureau (MGB) and the National Mapping and Resource Information Authority (NAMRIA). PAGASA is responsible in hydro-meteorological hazards and risk assessment. Other partner agencies include Metro Manila Development Authority (MMDA), Department of Interior and Local Government (DILG), Housing and Land use Regulatory Board (HLURB), National Statistical Office (NSO), Dept. of Health (DOH), Dept. Public Works and Highway (DPWH), Dept. of Social Welfare and Development (DSWD), National Economic Development Authority (NEDA) University of the Philippines, Institute of Civil Engineering (UPD-

ICE) and other related agencies.

Risk assessment is the methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend [1] as shown in Figure 3.

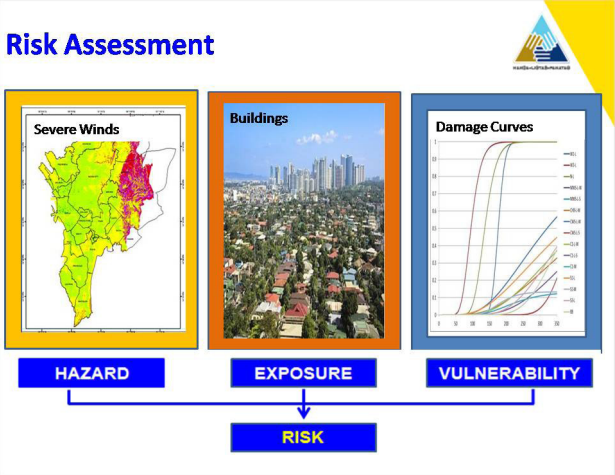


Figure 3: Components of Risk Assessment

Following is the inventory of available maps and related information in coming up with the risk assessment such as hazard, vulnerability and exposure. The inventory will give the format and accessibility of this information.

A. Hazard

HAZARD	MAPS	COVERAGE	SOURCE	FORMAT	ACCESS
Tropical Cyclone	Climatological frequency (e.g., See Annex A)	Whole country	PAGASA	Jpeg	Public
Severe wind	Probability (Ex. See Annex B)	Whole country	PAGASA	Shapefiles jpeg	Public
Heavy rains	Extreme rainfall frequency and intensity trend	Whole country	PAGASA (Technical report)	Jpeg	
Flood	Susceptibility	Whole country	MGB PAGASA Project NOAH	Jpeg Shapefile	Public (geoportal)/ ocd/ pagasa/ project noah
Landslide	Susceptibility	Whole country	MGB	Jpeg Shapefile	Public (geoportal)
Storm surge	Susceptibility of different height based on historical events	Whole country	PAGASA Project NOAH	Jpeg Shapefile	Public (geoportal)/ ocd/ pagasa/ project noah
Climate Change Projection	Tropical cyclone Projection in terms of frequency and intensity	Southeast Asia Region	CMIP 5 report (Technical Report)	Jpeg and Table	Public

B. Vulnerability

VULNERABILITY	CURVE/CHART	APPLICABILTY/ COVERAGE	SOURCE	FORMAT	ACCESS
B.1. PHYSICAL VULNERABILITY					
Severe Winds	Vulnerability curves for different building types	Whole country	PAGASA UPD-ICE	Table and curves	Available upon request
Floods	Vulnerability curves for different building types	Whole country	PAGASA UPD-ICE	Table and curves	Available upon
		request			
Landslides	---	---	---	---	---
Storm Surge	---	---	---	---	---
Evacuation Centers	Multi-hazards resilient evacuation center				
B.2. SOCIAL VULNERABILITY					
Contingency Plan					
IEC	Multi-hazards IEC				
Conduct of Drills	Annual conduct of flood and storm surge drills				
Demographic	Locations of vulnerable communities (informal settler, coastal / riverine)				

C. Exposure

EXPOSURE	MAPS	COVERAGE	SOURCE	FORMAT	ACCESS
Population	Population Density	Philippines available up to barangay level	NSO	Table	Public
				(Map)JPEG	Available upon request
Buildings	Building typology	GMMA	PHIVOLCS, CSCAND agencies	Tables, JPEG and Shapefile	Available upon request
CBMS	Population Building	Selected Cities/ Municipalities	DILG/ DLSU	Tables and Map sketch GIS format	Available upon request
REDAS	Critical Facilities Population Buildings	Selected Cities/ Municipalities	PHIVOLCS	Tables and Shapefiles	Available upon request

The sample of flood risk maps is shown in Figure 4 while severe wind risk maps are shown in Figure 5. {Additional description of the maps c/o mam charmie}

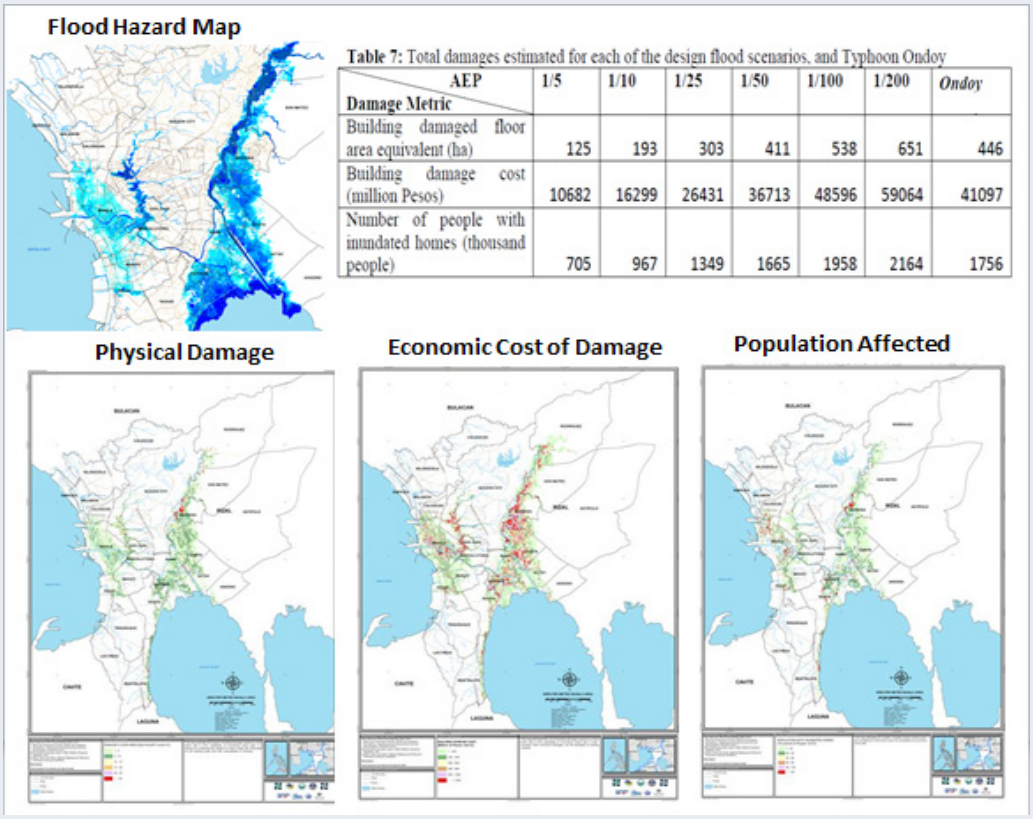


Table 7: Total damages estimated for each of the design flood scenarios, and Typhoon Ondoy

AEP / Damage Metric	1/5	1/10	1/25	1/50	1/100	1/200	*Ondoy*
Building damaged floor area equivalent (ha)	125	193	303	411	538	651	446
Building damage cost (million Pesos)	10682	16299	26431	36713	48596	59064	41097
Number of people with inundated homes (thousand people)	705	967	1349	1665	1958	2164	1756

Figure 4: Sample Flood Risk Maps

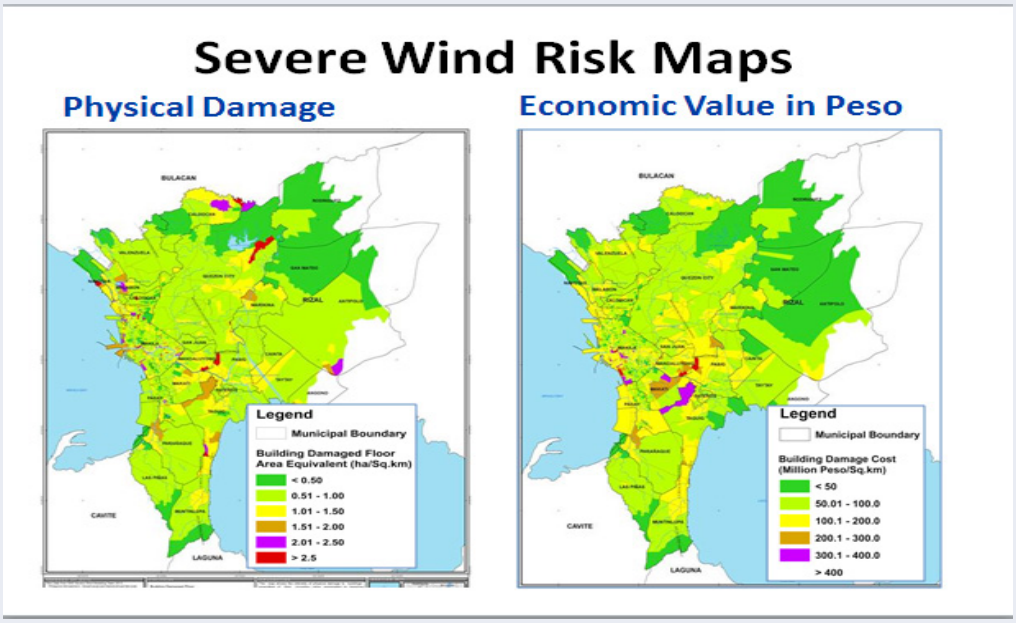


Figure 5: Sample Severe Wind Risk Maps

2. Monitoring and warning service

Before the typhoon season, PAGASA conducts IEC about Philippine's weather and climate to various NGAs, LGUs, NGOs, schools and other requesting organization and refresher course for forecasters. Also, PAGASA conducts inspection, repair and rehabilitation of the existing facilities of synoptic station nationwide. Further, PAGASA continues to coordinate with the local and international partners for the continuous advancement in the field of meteorology.

During TC events, the procedures shown in Figure 6 undertaken by PAGASA in Tropical Cyclone monitoring and warning are as follows:

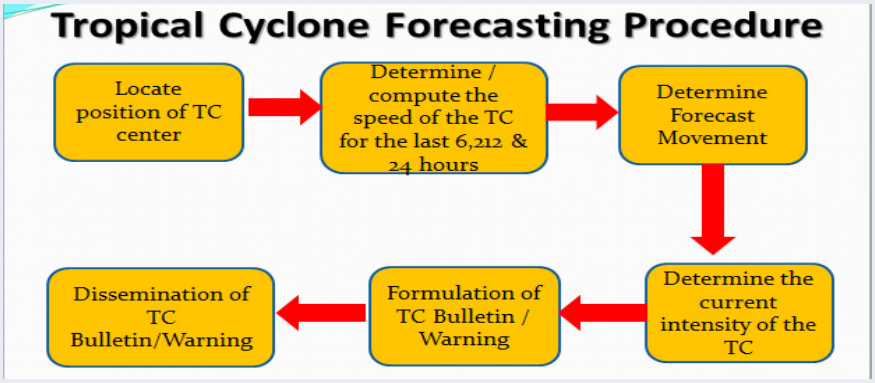


Figure 6: PAGASA Tropical Cyclone Forecasting Procedure flowchart

In the presence of TC within PAR and with the issuance of SWB Alert, two (2) personnel ((one (1) Weather Specialist or higher and one (1) sub-professional level)) are required to provide support to the Weather Forecasting Section under CODE BLUE. Meanwhile, on a CODE RED, 2 Weather Specialists or higher and 2 sub-professional level are required to provide the same support to the Weather Forecasting Section, Weather Division. {include definition of CODE BLUE and CODE RED}

The PAGASA Storm Chaser Team is tasked to undertake ground truth investigation of land falling tropical cyclone, conduct damage survey and render briefing services to NDRRMC OpCen. {when to activate, deployment procedure, on site monitoring, verification of warning issued}

The following products will be issued by the Weather Division, HMD and PRSD:

A. Weather Advisory for Tropical Cyclone (TC) {sample product in the annex}
   The duty forecasters shall issue the advisory when a TC outside the Philippine Area of Responsibility (PAR) is expected to enter PAR within the next three (3) days. This is to inform the general public and the concerned DRRMOs about the presence of a weather disturbance that may affect the country.

B. Severe Weather Bulletin (existence of TC or *bagyo* inside the Philippine Area of Responsibility (PAR)) {sample product in the annex}

   The duty forecasters shall issue the SWB when a TC or *bagyo* has entered or developed inside the designated PAR. Amendments to SWB shall be issued as deemed necessary.

1. Severe Weather Bulletin (SWB) Alert
   The duty forecasters shall issue the SWB Alert when the TC is not expected to affect the country in the next thirty six (36) hours. The SWB Alert shall be issued twice a day, at 11:00 AM and 11:00 PM; however, the initial SWB shall be issued at any time once the TC develops or enters the PAR. The final SWB shall be issued once the TC exits the PAR, dissipates or weakens into a Low Pressure Area (LPA).

2. Severe Weather Bulletin (SWB) Warning

a. The duty forecasters shall upgrade the SWB Alert to SWB Warning when the TC is expected to affect the country within 36 hour, such that raising PSWS is necessary. PSWS has 4 levels {see Annex}.

b. In cases when the formation of the tropical cyclone is near landmass which poses a threat and warrants the issuance of Public Storm Warning Signal (PSWS)*, the SWB Warning status shall be issued instead of the Alert status.

c. The SWB Warning shall be issued four times a day at 5:00 AM, 11:00AM, 5:00 PM and 11:00 PM.

C. TC Warning for Shipping

The duty marine forecasters shall issue the TC Warning for Shipping when a TC or *bagyo* has entered or developed inside the designated PAR. This cyclone information commonly called as International Warning for Shipping is intended to all the shipping vessels en route inside the Philippine Area of Responsibility. The TC Warning shall be issued four times a day at 5:00 AM, 11:00AM, 5:00 PM and 11:00 PM, with initial and final TC Warning for Shipping in conjunction with the initial and final issuance of the SWB. {sample product in the annex}

D. TC Warning for Aviation {sample product in the annex}

The duty aeromet forecasters shall issue SIGMET for Tropical Cyclone when a TC or bagyo of Tropical Storm intensity or higher has entered or developed inside the designated Flight Information Region (FIR) {put definition of FIR}.

E. Rainfall Warning ({sample product in the annex}

The duty forecasters at PAGASA Regional Services Division (PRSD) to be affected by the TC shall issue the appropriate Rainfall Warning corresponding to the following advisories:

1. Yellow Rainfall Advisory: when rainfall of 7.5 to 15 mm per hour has fallen or expected to fall and most likely to continue for the next 3 hours;

2. Orange Rainfall Advisory: when rainfall of more than 15mm up to 30mm within 1 hour has fallen or expected to fall or if continuous rainfall for the past 3 hours is more than 45mm to 65mm and most likely to continue for the next 3 hours; and

3. Red Rainfall Warning: when rainfall of more than 30mm within 1 hour has fallen or

expected to fall or if continuous rainfall for the past 3 hours is more than 65mm and most likely to continue for the next 3 hours. {c/o Daizy Baran}

F. Flood Warning

1. General Flood Advisory (GFA) {sample product in the annex}

The duty hydrologists shall issue GFA for a specific administrative region in ungauged river basins during the presence of TC and based on past 24-hour rainfall. This information shall be issued once a day at 9:00AM.

In established river centers, the duty hydrologists shall issue Flood Advisory during the presence of TC once a day for community awareness and based on the past 24-hour mean basin rainfall. Hereinafter, river centers shall refer to Cagayan River Center, Pampanga River Center, Agno River Center, and Bicol River Center {insert pictures/maps of different telemetered river basin}.

2. Flood Bulletin (FB) {sample product in the annex}

The duty hydrologists shall issue FB for telemetered river basins during the presence of TC twice a day if it reach the water level assessment. The water level assessments are based on 40%, 60%, 80% of the river capacity for each water level station which corresponds to Alert, Alarm, and Critical Status. Refer to Appendix _ for the description of water level assessments.

Post typhoon activities:

After the passage of TC, post analysis and damage assessment shall be simultaneously conducted by the lead forecaster and the PAGASA Storm Chaser Team respectively. These reports shall be consolidated to evaluate the performance of the forecast and warnings issued. Recommendations should be made to further enhance the forecasting capabilities of PAGASA. {include forecast track error, statement on the post analysis by WFS, damage statement of PAGASA storm chaser team PDNA}

The HMD and the river centers are conducting a post flood survey whenever a devastating flood event has been occurred. The main objective of the flood survey is to obtain the flood depth as well as the location of the inundated areas.

The Numerical Modeling Section of the Research and Development and Training Division of PAGASA conducts verification of the operational forecast model of PAGASA after the passage of the TC. Validation includes model value of pressure and rainfall at all lead time together with the synoptic station and Automatic Weather Station once TC enters PAR up to the last SWB issued. The rationale of this validation is to have an immediate quantitative evaluation of the performance of the forecast model.

3. Dissemination and communication

{add: when to conduct press conference and media briefing}

The identified dissemination and communication platforms are SMS, Media (Tri Media), Internet (Social media, Email, Website), Radio, Directives, Personal, Letters and Press

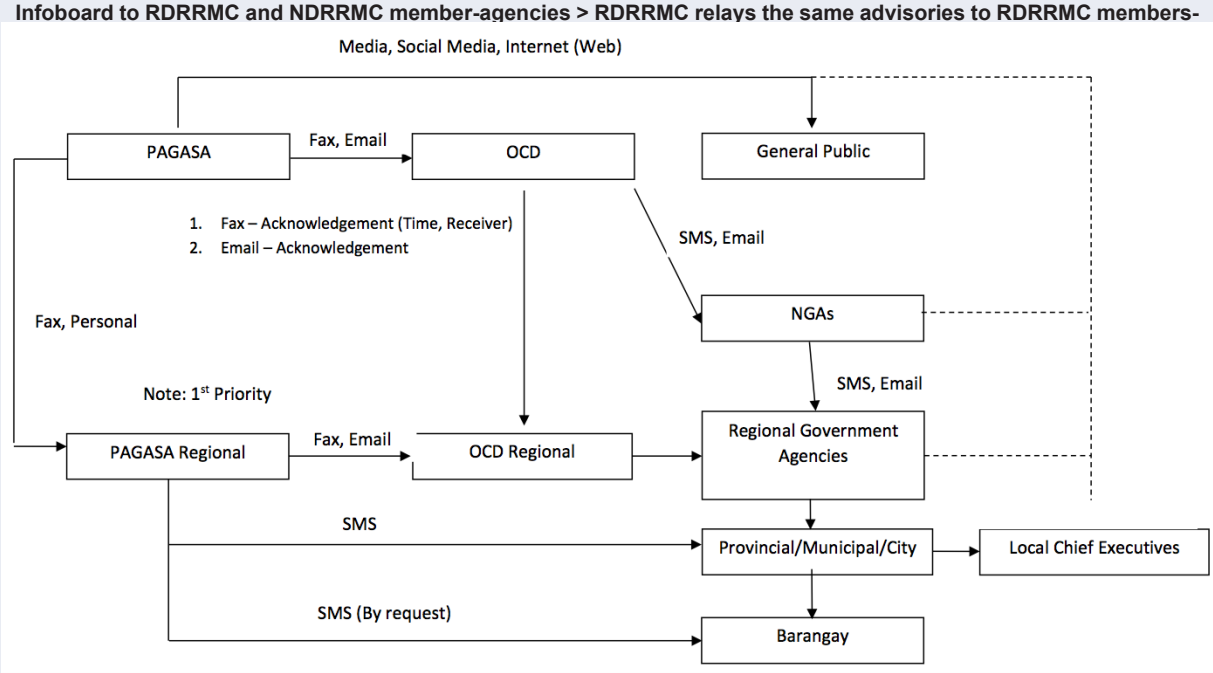
Conference and the identified end-users are LCEs, LGUs, Local DRRMOs and General Public as shown in the diagram below.

PAGASA sends advisories to NDRRMC OpCen thru fax and email > NDRRMC OpCen relays the advisories thru SMART Infoboard to RDRRMC and NDRRMC member-agencies > RDRRMC relays the same advisories to RDRRMC members-agencies, local DRRMCs and LCEs.

{take note to identify all communication during disaster}

Communication Flow

PAGASA sends advisories to NDRRMC OpCen thru fax and email > NDRRMC OpCen relays the advisories thru SMART Infoboard to RDRRMC and NDRRMC member-agencies > RDRRMC relays the same advisories to RDRRMC members-



agencies, local DRRMCs and LCEs.

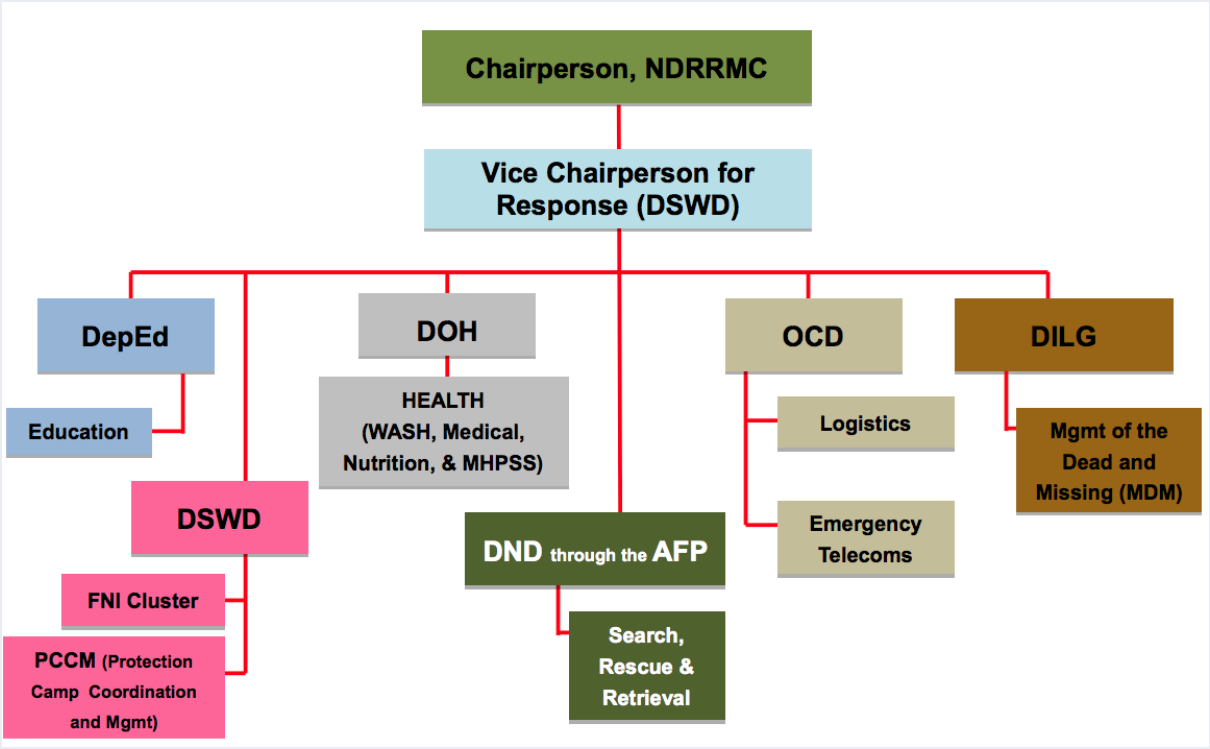
4. Response capability

The responses of OCD, NGAs, LGUs and LCEs during TC events based on the PSWS issued by PAGASA are as follows:

Agencies	Signal #1	Signal #2	Signal #3	Signal #4	Remarks
	Classes at the pre-school level, in the affected area, shall be automatically cancelled or suspended.	Classes at the pre-school, elementary and secondary levels, in the affected area, shall be automatically cancelled or suspended.	Classes at pre-school, elementary, secondary, and tertiary levels, in the affected area, including graduate school, as well as work in all government offices, shall be automatically cancelled or suspended.	Classes at pre-school, elementary, secondary, and tertiary levels, in the affected area, including graduate school, as well as work in all government offices, shall be automatically cancelled or suspended.	By virtue of EO No. 66 s. 2012 the suspension of classes are based on the PSWS issued by PAGASA. (see Annex)
OCD	Dissemination of weather advisories and bulletins through SMS, telephone, tri-media, website and others.	Dissemination of weather advisories and bulletins through SMS, telephone, tri-media, website and others.	Dissemination of weather advisories and bulletins through SMS, telephone, tri-media, website and others.	Dissemination of weather advisories and bulletins through SMS, telephone, tri-media, website and others.	
OCD	Blue Alert – In preparation for a slow onset disaster - Limited activation of the NDRRMOC when only the primary or lead personnel from the OCD and complemented by selected NDRRMC member agencies Blue Alert • Alert teams of NDRRMOC and selected member agencies shall render duty on a 24/7 basis • Gather reports from OCDROs and NDRRMC member agencies including initiatives on pre-emptive evacuation, and prepositioning of resources, etc. • Prepare Memo for C, NDRRMC on the preparedness measures of the NDRRMC member agencies and RDRRMOCs based on the following timelines: □ 6:00 AM and 6:00 PM □ NDRRMOC shall capture the previous report submitted by the RDRRMOCs prior to the latest report as indicated in the reporting time. Provide RDRRMOCs with NDRRMC's draft SitRep for further validation and confirmation within an hour	Red - In anticipation of an imminent emergency situation - Requires full multi-agency staffing at the NDRRMOC and immediate inter-agency coordination Red Alert • NDRRMC member agencies shall render duty at NDRRMOC on a 24/7 basis and perform the following: □ Coordinate with their respective offices □ Provide reports and other related requirements as stated in the DDO guidelines and SOP □ Attend and/or answer queries during meetings □ Monitor actions taken by their respective field units □ Activate cluster approach • NDRRMOC shall analyze and consolidate information from RDRRMOC and validate/cross check vague information/data through Detailed Duty Officer/s (DDO/s) • Facilitate effective public information and accurate alerts and warnings to the public • Provide the President, and C, NDRRMC and member agencies with regular reports on the prevailing situation: • 6 AM and 6PM or as deemed necessary • Provide RDRRMOCs with NDRRMC's draft SitRep for further validation and confirmation Prepare updates/executive summary for press release and briefings on current situation • Maintain maps and other visuals • The duty personnel shall upload Situational Reports to NDRRMC website and linked to social media for the information of general public Upon the approval of the ED, NDRRMC			

OCD	• Prepare updates/ executive summary for press release and briefings on current situation • Maintain maps and other visuals • The duty personnel shall upload Situational Reports to NDRRMC website and linked to social media for the information of general public Upon the approval of the ED, NDRRMC	• Prepare a complete documentation of the major disasters managed (effects, HA/DR, assistance per cluster) • Chairperson, NDRRMC shall conduct regular briefings on the situation among DDOs • Deploy organized Multi-Agency RDNA team from the National agencies when necessary / if situation warrants	
	Process bulletins/warnings/advisories/information issued by surveillance agencies for dissemination to all stakeholders; • Ensure that the Situation Report in the form of Memorandum for the Chairperson, NDRRMC shall be translated into an NDRRMC Update, uploaded at the NDRRMC website and linked to social media; • Prepare situational reports and damage assessments for the President, NDRRMC Chairperson and member-agencies; • Coordinate with implementing agencies to maximize mobilization of resources to the disaster-stricken areas; • Monitor the member agencies' relief and recovery efforts and document various activities of DRRMCs concerned and the active participation of local agencies in the emergency operations; • Recommend the declaration of National State of Calamity if needed; • Facilitate a meeting among NDRRMC member-agencies to effectively address the requirements in the affected regions; • Ensure that the requirements of affected regions in terms of Search and Rescue/ Retrieval (SAR) resources, logistics, relief supplies, and other basic services are immediately referred to appropriate agencies on duty at NDRRMOC; In coordination with OCDROs, ensure that the status of on-going disaster operations and the evolving situations in the affected areas are properly monitored and reflected in the progressive situation report: □ Affected Population - DSWD (including IDPs served inside and outside the Evacuation Centers) □ Casualties - DOH □ Damages to Infrastructure - DPWH □ Damages to Agriculture - DA (such as crops, fisheries, livestocks, and other agricultural equipment) □ Damaged Houses – DSWD □ Cost of Assistance Extended– DSWD, DOH, NGOs, LGUs etc.		
	NDRRM OpCen Manual (restricted)		
NGAs	"Response Clusters" that are presented in this plan are the National Response Clusters created and approved by the NDRRMC as provided in the NDRP and are directly under the Vice-Chairperson for Response (DSWD) (see Fig 2.3). These "Response Clusters" will either augment or assume the response operations given the different trigger points for each disaster phase. The eight Response Clusters each have their own Lead Agency that will primarily supervise, coordinate and report all activities of their cluster members during disaster. http://ndrrmc.gov.ph/attachments/article/1334/NDRP_Hydro_Meteorological_Hazards_as_of_2014.pdf		

LCEs	LGUs to GET ORGANIZED: • Convened LDRRMC within 24 hours upon receiving a severe weather bulletin • Reviewed LDRRM/Contingency Plans and Hazard Risk Maps • Estimated number of evacuees • Readied pre-emptive/forced Evacuation Plans • Organized Administrative/Logistical Support Team • Organized Search, Rescue and Retrieval Teams • Organized Security Teams • Organized Medical Teams in ECs • Organized Clearing Operations Team • Organized Monitoring and Reporting Team • Activated 24/7 Emergency Operations Center • Activated Incident Command System • Conducted inventory of supplies, equipment and stockpile of goods • Assessed Evacuation Centers • Conducted clearing operations and assessed structures • Placed adequate guide markers at strategic locations for evacuees and operations teams ALERT COMMUNITIES: • Informed Punong Barangays of weather advisory • Disseminated public warnings thru established warning systems and weather bulletins, especially families in identified danger zones • (For coastal and island barangays) Warned fisherfolks to take precautionary measures when going out to sea • "(For coastal and island barangays) • Issued prohibitions for sea voyage and fishing (include rivers) and prevented people to cross in any body of water" • Advised households to prepare survival kits/ secure roof, wall, power lines • Issued suspension of classes for appropriate levels and suspension of work for private and government offices • Sounded pre-emptive/forced evacuation alarm EXECUTE PLANS: • Prepared Evacuation Centers • Conducted mass feeding • Cancelled travel authorities for SAR and frontline personnel • Repacked and prepositioned food packs and non-food items for evacuees • Dispatched and prepositioned SAR/SRR, Medical, Security and Clearing Operations teams • Advised Security Teams to maintain peace and order • Secured communication, power and water supply lines • Deployed brgy health workers/volunteers to provide medical, psycho-social, and spiritual counselling to the evacuees • Coordinated with PNP and BFP for reporting of casualties (dead, missing, injured) and damage to structures, if any • C/MHO coordinated with PNP and funeral parlors to manage dead, if any Oplan LISTO (restricted)	
PCG	Cancellations of travel of all sea vessels.	



13. Definitions

Risk	The combination of the probability of an event and its negative consequences [1]
Risk assessment	methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend. [1]
Hazard	also referred as Hydrometeorological Hazard that is defined as natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage related to hydrometeorological phenomena.
Vulnerability	The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.
Exposure	People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses.
Capacity	The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals.

14. Acronyms

OCD	Office of Civil Defense
DILG	Department of the Interior and Local Government
REDAS	Rapid Earthquake Damages Assessment Software

CBMS	Community Bases Monitoring System
GMMA	Greater Metro Manila Area
IEC	Information and Education Campaign

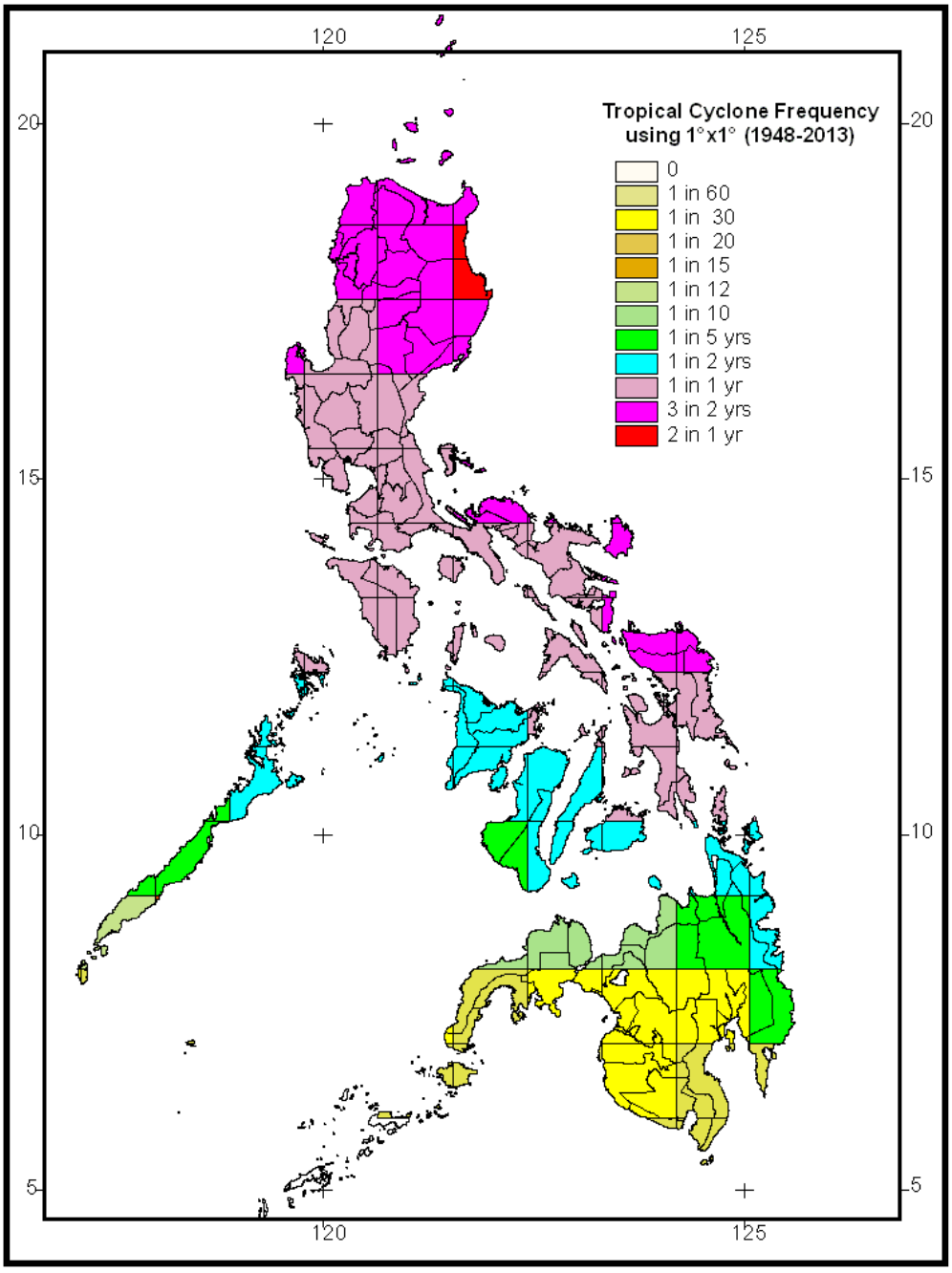
15. Acknowledgement

ESCAP, WMO Typhoon Committee and PAGASA

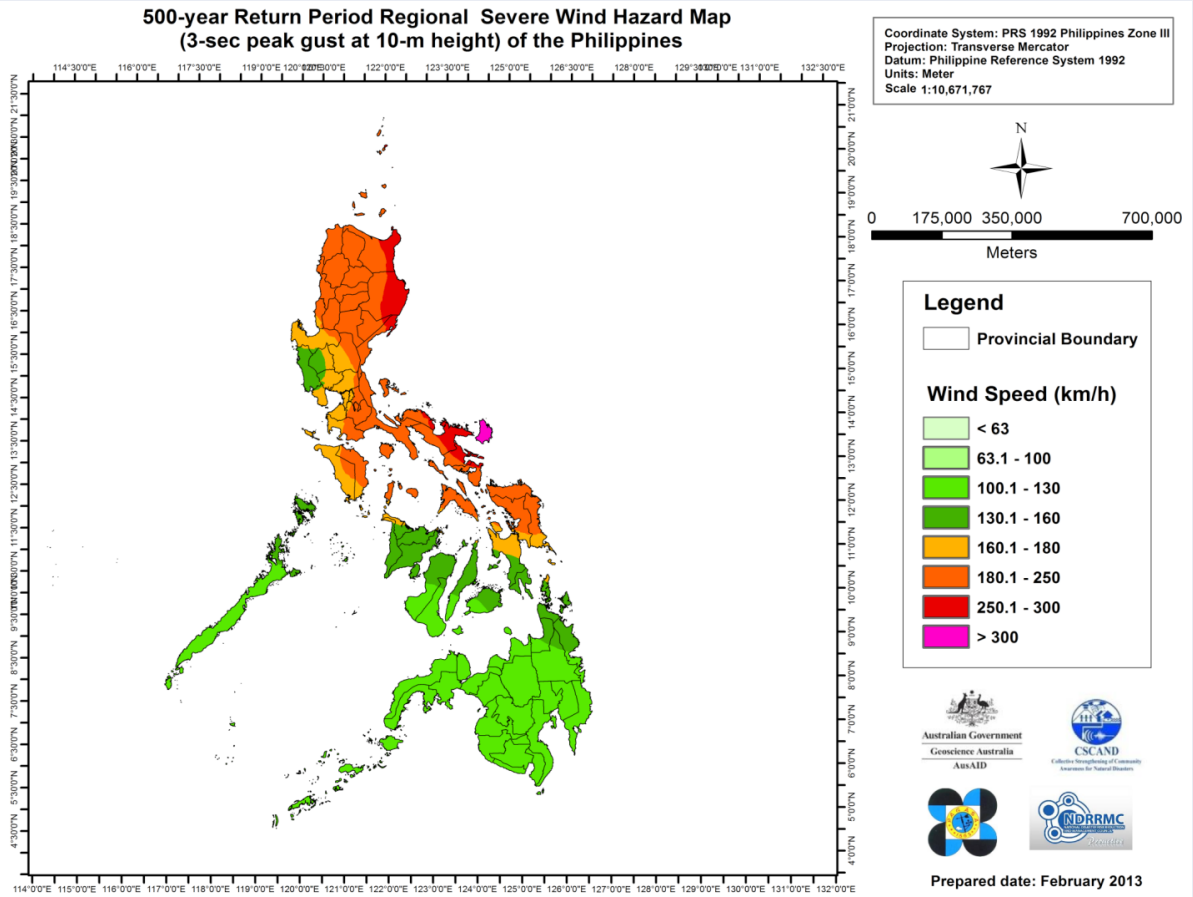
16. References

[1] NDRRMC OpCen 2014
[1] http://www.unisdr.org/we/inform/terminology
[2] http://phdataprep.pbworks.com/f/REDAS_Writeup.pdf
[3] http://pagasa.dost.gov.ph/images/climate/long_term_abstract.pdf
[4] Monteverde, MC, Cinco TA and et.al: Enhancing Risk Analysis Capacities for Flood. Tropical Cyclone Severe Wind and Earthquake for the Greater Metro Manila Area Component 4: Tropical Cyclone Severe Wind Risk Analysis
[5] http://mgbxi.org/wp-content/uploads/2012/05/Geohaz2011_Talaingod3.jpg

ANNEX A
Tropical Cyclone Climatological Frequency Map
Using 1°x1° (1948-2013)



ANNEX B
Severe Wind Probability Map



SSOP Example #2 - Action to be taken before the Start of Hurricane Season

SSOP TC-001 (Before Season) **26 September 2014**

Central Pacific Hurricane Center, Pacific Region, USA National Weather Service
Standard Operating Procedure

1. Title: Actions to be taken before the Hurricane Season

2. SSOP Number: Tropical Cyclone (TC) – 001

3. Prepared by: _____

4. Approved by: _____ Date: _____
   Implementation Date: _____

5. Revisions: 1. Approved by: _____ Date: _____
   2. Approved by: _____ Date: _____
   3. Approved by: _____ Date: _____

6. Purpose, Scope and Applicability. In accordance with NWS Directive 10-601 and to ensure effective, timely products and services during a hurricane situation, the office must prepare for these situations before the hurricane season begins. These activities must include training, testing of communications, coordination with other agencies, and exercising procedures in a test mode. This preparation is critical to ensure the office takes the correct actions to protect lives and property. This SSOP applies to all forecasters and management staff in the Central Pacific Hurricane Center.

7. Acronyms:

AM/MIC	Area Manager/Meteorologist in Charge
ATCF	Automated Tropical Cyclone Forecast system
DCO	Data Collection Office
DO	Director of Operations
ESA	Electronic Systems Analyst
LMS	Learning Management System
NHOP	National Hurricane Operations Plan
NWS	National Weather Service
OIC	Officials in Charge
PL	Program Leader
SOO	Scientific and Operations Officer
WCM	Warning Coordination Meteorologist

8. Procedures:

The following actions will be accomplished no later than May 31 each year:

1. Review and critique latest issuances and drafts of NWS Directive 10-60. (AM/MIC, DO, WCM, SOO, Hurricane PL).
2. Contact critical weather observers and review instructions (WCM).
3. Check tropical cyclone related supplies (ESA).
4. Prepare, revise, and/or update forms for forecast/advisories, public advisories, and local statements. Establish sufficient supplies of necessary forms in district desk and overflow file (DO, WCM, and/or Hurricane PL).
5. Contact Emergency Management officials and review and coordinate warning procedures (AM/MIC or WCM).
6. Conduct statewide hurricane drill as applicable in cooperation with federal, state, county, and local agencies (WCM and Hurricane PL).
7. Review NWS Directive 10-601, the NHOP, and the hurricane station duty manual (all forecasters)
8. Review and Update ATCF and provide written notification to all forecasters of any changes (SOO).
9. Conduct at least one training workshop providing the latest information, including operational techniques/methods, available for tropical cyclone forecasting. The training will emphasize tropical cyclones impacting the Hawaiian Islands directly or indirectly (SOO, WCM, Hurricane PL)
10. Complete the LMS module "Introduction to Tropical Meteorology, Chapter 10: Tropical Cyclones". (Mandatory for new forecasters who have not previously participated in the office's hurricane program and highly suggested for all forecasters.
11. Test communications procedures to ensure adequate capabilities (WCM and Hurricane PL).
12. Provide written statement of operational capabilities of equipment statewide per NWS Directive 10-601 (ESA).
13. Issue a memorandum to the OICs at DCOs Hilo and Lihue with written exercises (SOO, WCM)
14. Conduct a written drill in which they prepare advisories, local statements, aviation products, and marine products for a simulated tropical cyclone (WCM, SOO, Hurricane PL, all forecasters)
    a. Lead forecasters will produce the following products in a test mode:

WTPA2x	Forecast Advisor
WTPA3x	Public Advisory
WTPA4x	Tropical Cyclone Discussion
WTHW80	Hurricane Local Statement

    b. Lead forecasters and all remaining forecasters will produce the following products in a test mode:

WTHW80	Local Statement
FAHW31	Aviation Area Forecast
WAHW31	AIRMETs for Hawaii
WCPA3x	SIGMET for a tropical cyclone
FTPA31	Terminal Aerodrome Forecast (TAF)
FZHW50/FZHW51	Coastal marine bulletins (Marine Zones / HI1)
FZHW60	Offshore marine bulletin

c. Drill messages must have the phrase " …THIS IS A DRILL AND NOT FOR REBROADCAST...THIS IS A DRILL..." at the beginning, middle, and end of each message.

d. A log will be kept by the forecasters of any problems encountered or any procedures/SSOPs that need revised, created, or deleted and provided to the AM/MIC, DO, SOO, and WCM when all forecasters have completed their review and training

e. A report on the results of the drill will be submitted to the AM/MIC through the DO as soon after the drill as possible.

f. A critique of all written exercises and drill material will be completed and returned to the participants.

g. A memorandum will be sent to the Regional Director, Pacific Region Headquarters that the annual drill has been completed in accordance with NWS Directive 10-601.

9. References

a. NWS Directive 10-601
b. Appropriate Learning Management System modules
c. SSOPs for ATCF operations and hurricane products preparation

SSOP Example #3 – Aviation Support (From Bangladesh)

Can be retrieved at http://www.caab.gov.bd/circul/ac2a.pdf

SSOP Example #4 - Joint SSOP Indian National Centre for Ocean Information Service and Indian Meteorological Division/RSMC

Can be retrieved at http://www.imd.gov.in/section/nhac/dynamic/cyclone.htm. or Contact Dr. S R Ramanan at srramanan56@gmail.com

APPENDIX V: SOCIAL MEDIA GUIDELINES

Selected Social Media Guidelines[1]

Social media is a powerful knowledge-sharing and engagement tool that the public and media rely on. To be effective, certain rules or procedures should be followed. However, remember providing warnings is the most important thing and has the highest priority. Therefore, social media cannot interfere with the warning process. The following are possible social media guidelines that a country/agency can use. This is not a complete list and a country/agency may want to add others as needed.

General guidelines

- First and most importantly, be sure to keep all information on social media sites updated. This is very important because old information can be misleading and may conflict with current data. Review your social media sites to ensure accurate and timely information and to make sure people are not spreading rumors or posting misinformation.
- Use plain language, check spelling and grammar, and test links before you go public.
- Be as clear as possible in your tweets and posts. Answer the basics of *Who?, What?, Where?, When?, Why?* and *How?* in plain language. Don't use abbreviations that others don't understand.
- Think before you post or reply. Be respectful, professional, clear, and accurate. Once something is posted it is hard to remove and others may copy it. Also, people who receive your posts may be victims of the disaster.
- Do not get into an argument with users or tell them that they are wrong. Instead, hide, delete, or block users' comments.
- The value of social media is to interact with others by commenting, replying, giving feedback and letting your voice be heard. Thank your followers for their feedback and interest in your content.
- Answer as many questions you can in a timely manner, without sacrificing accuracy.
- Correct and acknowledge mistakes as quickly as possible, and announce your correction to your followers so that they trust the information you are providing.
- If you want to post that your organization did an outstanding job and you want to thank people after an event, before posting think of the victims affected by the disaster and show respect.
- Inform people of event-critical mobile/smartphone friendly websites on your social media channels. People might not have electricity to use their computers but are checking their mobile phones for breaking news.

Official Areas

- All agency social media accounts should be approved by a higher level authority before they are created. Also, request approval for any changes made to the account.
- Know and follow any government or agency rules for social media.
- Ensure all agencies involve in the EWS process speak with one voice and do not contradict each other.

1 Some sections based upon USA Department of Commerce, NOAA "Social Media Handbook: A User Guide for Communicators", Updated June 2014.

- Only use official information that has been approved or already disseminated through official channels

- Do not follow, link to or promote websites or pages hosted by political associations; questionable "news" sources; biased websites; websites selling products/services; or personal accounts.

Twitter Tweets

- Use a short, easy-to-follow hashtag for your tweets such as: #Haiyan (typhoon); #Higos (typhoon); #StateofClimate; #TsunamiChat; #TYPiChat (Typhoon tweetchat); and #DoYouknowNMHS.

- Do not retweet rumors or unconfirmed reports by non-official sources, especially during an active hazard. Often, these reports cannot be confirmed or are altogether false.

- Do not retweet or comment on tweets by non-partner groups or on issues that don't directly relate to the agency's mission.

- Repetition can help. Don't assume everyone saw that tweet you sent 2 hours ago. For critical and late-breaking information and instructions, RESEND, and then resend again.

- Do not send unnecessary or non-useful tweets or posts.

Facebook

- Beware of people tiring of your posts. Try to use different graphics to keep interest and prevent people from ignoring your graphics.

- For social media pages, set "Comment Guidelines" that inform users what type of comments are and are not allowed.

- Hide or block comments on your social media based upon on the situation, the comments and frequency of the violation.

Photos, Images, Video

- Ensure every image you post answers the question: "What am I looking at?"

- Use official government or other public domain images, which don't carry copyright restrictions. Provide full caption and credit information, as well as any links to more information about the photo.

- If the photo is not agency-owned or in public domain, be sure to include information about the source. For example, "Courtesy of XXXX".

Media inquiries and news distribution

- If you receive any inquiries from reporters or media outlets through your social media channels, politely refer them to the official media spokesperson.

- Only official spokespeople are authorized to speak for agency regarding agency policy and budget issues.

- Non-warning official news releases should be sent by high level agency personnel. Do not use social media to send these type of releases.

Remember

- Do not provide any type of endorsement of a product or company. Refer questions to upper agency personnel.

- Don't forget your primary mission is to monitor and provide warnings. Be sure that online social media activities do not interfere with

your job commitments. Your manager has the right to limit the use of social media at work at any time.

Reference Websites

- Mashable
http://mashable.com/category/social-media

- Neiman Journalism Lab (Harvard)
http://www.niemanlab.org/tag/social-media

- Poynter Institute Social Media
http://www.poynter.org/tag/social-media/

- Social Media Today
http://socialmediatoday.com

APPENDIX VI : PAKISTAN EXAMPLE OF PUBLIC SERVICE MESSAGES

Example #1

DRR RELATED PUBLIC SERVICE MESSAGES FOR CYCLONE SAFETY TIPS

Before the Cyclone Season

- Keep watch on weather situation, weather forecast and listen to Radio /TV. Remain alert about the community warning systems – loudspeakers, bells, drums or any traditional warning system besides announcements made through loud speakers from mosques etc.
  - Get to know the nearest cyclone shelter / safe places and the safest route to reach shelters/safe places.
  - Also designate a safe area within and around your home.
  - Prepare an emergency kit containing:
    - A portable radio, torch and spare batteries;
    - Fresh drinking water , dried/canned nonperishable food stuff
    - Matches, fuel lamp, portable stove, cooking utensils, waterproof bags
    - A first aid kit
    - Small saw, axe and plastic rope
    - Any other item you think necessary
- Check the walls, pillars, doors and windows to see if they are secure. If not, repair those at the earliest. In case of tin roofs, check the condition of the tin and repair the loose points. Cover the mud walls with polythene or mats or straw mats on a bamboo frame if possible. Bind each corner of the roof with a plastic rope in case of thatched roof.
- Trim dry tree branches, cut off the dead trees and clear the place/courtyard of all debris.
- Clear your property of loose materials that could blow about and cause injury or damage during extreme winds.
- Removal of advertisement hoarding or making arrangements to secure the same.
- If your area is prone to storm surge, locate safe high ground for shelter.
- Keep important documents including the Holy Quran or religious books, passbook, etc. in a tight plastic bag and take it along with your emergency kits if you are evacuating.
- Identify in advance the spot where you can dig holes to store food grains, seeds, etc. in polythene bags.
- Keep a list of emergency addresses and phone numbers on display. Know the contact telephone number of the government offices /agencies, who are responsible for search, rescue and relief operations in your area.
- Fishermen be advised not to venture in open sea. The ones who are already in open sea be advised to return to coastal areas.
- People be advised to refrain from swimming in the sea.
- Warning and forecasts be issued to people, fishermen and ship captains, ports etc.

Upon a Cyclone Warning

- Store loose items inside. Put extra agricultural products/ stock like paddy in plastic bags and store it by digging up a hole in the ground, preferably at a higher elevation and then cover it properly if covered storage is not available. Fill bins and plastic jars with drinking water.
- Keep clothing for protection, handy.
- Prepare a list of assets and belongings of your house and give information to volunteers and other authorities about your near and dear ones.
- Fill fuel in your car/motorcycle and park it under a solid cover. Tie bullock carts, boats securely to strong posts in an area, which has

a strong cover and away from trees. Fallen trees can smash boats and other assets.

- Close shutters or nail all windows. Secure doors. Stay indoors, with pets.
- Pack warm clothing, essential medications, valuables, papers, water, dry food and other valuables in waterproof bags, to be taken along with your emergency kit.
- Listen to your local Radio / TV, Local Community Warning System for further information, forecast, warnings etc.
- In case of warning of serious storm, move with your family to a strong pucca building. In case of warning of cyclones of severe intensity, evacuate the area with your family, precious items and documents and emergency kit. Take special care for children, elders, sick, pregnant women and lactating mothers in your family. Do not forget your emergency food stock, water and other emergency items. GO TO THE NEAREST SAFE PLACES.
- Do not venture into the sea for fishing.

On Warning of Local Evacuation

Based on predicted wind speeds and storm surge heights, evacuation may be necessary. Official advice may be given on local radio / TV or other means of communication regarding safe routes and when to move/ move out.

- Wear strong shoes and clothing for protection.
- Lock your home, switch off power, gas, water connections/points, and take your emergency kit.
- If evacuating to a distant place take valuable belongings, domestic animals, livestock and leave early to avoid heavy traffic, flooding and wind hazards.
- If evacuating to a local shelter or higher grounds carry the emergency kit and minimum essential materials.

When the Cyclone Strikes

- Disconnect all electrical appliances and turn off gas.
- If the building starts crumbling, protect yourself with mattresses, rugs or blankets under a strong table or bench or hold on to a solid fixture (e.g. a water pipe)
- Listen to your transistor radio for updates and advice.
- Beware of the calm `Eye'. If the wind suddenly drops, don't assume the cyclone is over; violent winds will soon resume from the opposite direction. Wait for the official "All clear".
- If driving, stop – but well away from the sea and clear of trees, power lines and watercourses. Stay in the vehicle.

After the Cyclone

- Do not go outside until officially advised that it is safe.
- Check for gas leaks. Do not use electric appliances, if wet.
- Listen to local radio for official warnings and advice.
- If you have to evacuate, or did so earlier, do not return until advised. Use a recommended route for returning and do not rush.
- Be careful of snake bites and carry a stick or bamboo
- Beware of fallen power lines, damaged bridges, buildings and trees, and do not enter the floodwaters.
- Heed all warnings and do not go sightseeing.

Example #2

DRR RELATED PUBLIC SERVICE MESSAGES DURING MONSOON SEASON/ FLOODS

Flood is a natural disaster but by taking few precautionary measures life and property can be saved.

1. Measures to Be Taken Before Monsoon / Flood Like Situation

- Keep yourself updated on latest weather conditions through radio, TV and internet before and during monsoon season.
- Follow the instructions of government regarding precautionary measures to save life and property in case of any emergency.
- Keep ready emergency kits including bandages, first aid kit, an extra charged battery of mobile phones, match box, torch, candles, mosquito nets and essential medicines, drinking water and dry food etc.
- Keep stock of dry food ration for example roasted grams, pulses, flour, sugar, rice and drinking water bottles.
- Keep important documents and precious belongings (National Identity Certificate, educational certificates, property documents, domicile, passport, cash (if any) etc) on a higher place in a plastic bag.
- Keep in touch with local government representative or disaster management committees (if any) in your area for timely information on early warnings.
- Keep your friends and relatives informed about important flood related information.
- Construct safety walls around houses.
- Get your livestock vaccinated before onset of monsoon.

2. Precautionary Measures to Be Taken During Floods

- Keep yourself updated and keep your friends and relatives informed about emergency routes, high protection areas etc., in case of evacuation.
- Evacuate immediately on receiving information about approaching floods and shift to safe place as per emergency plan.
- Related school teachers, Imam of mosques, community leaders should lead the preparedness and protection activities.
- Priority should be given to evacuate/shift People with Disabilities (PWDs), elderly, children and women to safer areas. Seek help/ assistance of emergency response teams for evacuation.
- Immediately shift to safe /high grounds at the outset of heavy rains in case you are living in low lying areas.
- While leaving home keep important documents and precious belongings (such as, National Identity Certificate, educational certificates, property documents, domicile, passport etc.) along with you covered in a plastic bag. Do not forget to carry cash with you, if any.
- Wash your hands before eating anything.
- Do not eat moisten food as it can be infected and cause illness (diarrhea etc.).
- Do not walk in flood water, if necessary walk with the help of a stick as there may be pieces of broken glasses, snakes and deep ditches. If possible use shopping bag (alternate of socks) to protect direct contact of your body with flood water.
- Do not use electric appliances while standing on wet floors.

- Do not sit near shabby or mud walls as they might collapse.
- Do not drive through flood waters as you may get washed away.
- Do not tie your livestock with electric poles.

3. Precautionary Measures to be taken After Flooding

- Use boiled water to prevent from water borne diseases.
- Boil potable water before use if your community well has been flooded.
- Avoid walking in stagnant flood water as it can cause skin infections.
- Do not go near fallen electric polls or wires to avoid electric current.
- Avoid keeping your livestock assembled on wet ground, where house flies are abundant.
- Promptly report any sign of disease to concerned official of veterinary department.
- Parents should not allow children to play in the submerged areas to ensure their health and safety.
- Do not return to your homes/areas unless declared safe by the government/concern departments.
- Check walls before entering a house, as flood water may have weakened it, to avoid any mishap.

APPENDIX VII: DISASTER REDUCTION DRILLS AND EXERCISES IN JAPAN

Overall

Disaster reduction drills and exercises are good opportunities to review the effectiveness of disaster management systems to ensure quick and appropriate emergency operations, and to enhance public awareness through wide-ranging stakeholders' participation. The Disaster Countermeasures Basic Act stipulates the obligation to conduct disaster reduction drills. In order to promote various drills and exercises nation-wide, the Central Disaster Management Council sets forth an annual Disaster Reduction Drills Plan which stipulates the basic principles for executing the drills and outlines the comprehensive disaster reduction drills carried out by the national and local governments and relevant organizations.

On September 1st, Disaster Reduction Day (This is the day of Great Kanto Earthquake in Tokyo and Yokohama, September 1st, 1923), wide area, large-scale disaster reduction drills are conducted in every region across the country in collaboration with disaster related organizations. Additionally, drills based on the experiences of the past disasters are conducted in every region throughout the year. In recent years, practical disaster reduction drill methods such as mapped put role-playing systems have been introduced, in which participants are not given any information beforehand and are required to make decisions and respond to the situation based upon the information provided after the drill starts.

Flood-Fighting Drills

To avoid flooding from happening and to alleviate damage, personnel must be deployed as quickly as possible for levee protection before/during periods of overflow situations and appropriate measures should be taken for maximum results. Such activities are dangerous because they are usually conducted during torrential downpours, and sometimes flood fighters are required to engage in tasks at the risk of their own lives. So flood-fighting drills are held throughout the country every year before the flooding season (before July) begins in order for flood fighters, residents and local government staff members in the community to learn, exercise, and improve levee protection techniques as well as to raise awareness about levee protection. In addition, a large-scale flood-fighting drill is carried out in the every regional bureau of the Ministry of Land, Infrastructure and Transport of Japan in cooperation with the riparian prefectures/cities.

APPENDIX VIII: FEEDBACK CHECKLIST FOR EARLY WARNING MESSAGES

Checklists at provincial, district level, and village levels provide Lao PDR Department of Meteorology and Hydrology (DMH) feedback from various end users of their services. With these checklists, Lao PDR DMH can collect useful information on the dissemination, content, and usefulness of warnings and requests feedback on ways to improve.

(Provincial, District, Village) Level	**Agency** _____			
Did you receive the warning?	Yes	☐	No	☐
Did you receive the warning on TIME?	Yes	☐	No	☐
Did you understand the content of EW?	Yes	☐	No	☐
How did you receive the warning?	Mobile	☐	Fax	☐
	Email	☐	Radio	☐
	Others	☐		☐

Did the warning help in decision making or preparedness?
If Yes, how, please explain. If No, why not?

.....
.....
.....

How would you like the content or format of the warning be changed to be more effective?
Provide your suggestions.

.....
.....
.....

APPENDIX IX: LIST OF REFERENCES USED TO PREPARE THE SSOP MANUAL AND ADDITIONAL REFERENCES

The manual is based extensively upon the information and wording compiled from the following documents:

1. Asian Disaster Preparedness Center (ADPC): Two types of Checklists and Questionnaires developed for the Early Warning Gaps Assessment (National and Community) and Household Survey (household level for Pilot Sites) under the ESCAP project. A document prepared under the project name: Technical assistance for *Enhancing the Capacity of End-to-end Multi-Hazards Early Warning Systems (EWS)* for Coastal hazards in Myanmar, Sri Lanka & Philippines.

2. Developing Effective Standard Operating Procedures, David Grusenmeyer, Sr. Extension Associate, PRO-DAIRY, Cornell University.

3. Global Facility for Disaster Reduction and Recovery (GFDRR), 2011: Implementing Hazard Early Warning Systems, David Rogers and Vladimir Tsirkunov.

4. Guidance for Preparing Standard Operating Procedures, (SSOPs), United States Environmental Protection Agency, Office of Environmental Information, Washington, DC, EPA QA/G-6, April 2007

5. Guidance for Preparing a Standard Operating Procedure, Montana Department of Environmental Quality, Water Quality Planning Bureau, WQPBDMS-001, March 22, 2004.

6. Guidance for the Preparation of Standard Operating Procedures For Quality-Related Document, Illinois Environmental Protection Agency, Bureau of Water, Document Control No. 065, September 2008

7. Guide to Writing Standard Operating Procedures (SSOPs), Department of Environment and Conservation, Government of Australia, 10 December 2009.

8. Guide to Writing Standard Operating Procedures, Office of Engineering Safety, Texas A&M University

9. Guidelines for Creating a Memorandum of Understanding and a Standard Operating Procedure between a National Meteorological or Hydro-meteorological Service and a Partner Agency WMO-No. 1099 PWS-26, 2012

10. International Federation of Red Cross and Red Crescent Societies (IFRC), 2012: Community Early Warning Systems: Guiding Principles

11. International Strategy for Disaster Reduction, 2006: Developing Early Warning Systems: A Check-List. The Third International Conference on Early Warning (EWC-III) from Concept to Action, 27-29 March 2006, Bonn, Germany, ISDR, 13pp.

12. Report of Multi-Hazards Early Warning and Decision Support Systems Workshop, Shanghai Meteorological Service, Shanghai, China, March 21 -23, 2012

13. Standard Operating Procedures (SSOPs) – A Quick Guide, Kelly Gleason, Research, Clinfield Limited, Cambridge, Great Britain, March 10, 2013.

14. Standard Operating Procedures: A Writing Guide, Richard Stup, senior extension associate, Human Resources, Penn State Dairy Alliance, Penn State College of Agricultural Research and Cooperative Extension

15. World Meteorological Organization (2010) Guidelines on Early Warning Systems and Application of Nowcasting and Warning Operations, Lead Authors: Elliot Jacks, Jim Davidson, H.G. Wai with Contributions by: Charles Dupuy, Vlasta Tutis and Kevin Scharfenberg. WMO-No. 1559 PWS-21

16. Disaster Risk Reduction Programme, Multi-hazardsEarly Warning Systems, World Meteorological Organization. http://www.wmo.int/pages/prog/drr/projects/Thematic/MHEWS/MHEWS_en.html

17. Human Rights Council, Tenth Session, Agenda Item 2, Annual Report of the United Nations High Commissioner for Human Rights and Reports of the Office of the High Commissioner and the Secretary-General: *Report of the Office of the United Nations High Commissioner for Human Rights on the relationship between climate change and human rights*, 15 January 2009

18. WMO, ESCAP, and ESCAP/WMO Typhoon Committee Post-Typhoon Haiyan (Yolanda) Expert Missions Report to the Philippines (Manila and Tacloban), 7 – 12 April 2014

19. Lassa, Jonatan A.;, Sagala, Saut; Suryadini, Adi (2013). Conceptualizing an Established Network of a Community Based Flood Early Warning System: Case of Cawang, East Jakarta, Jakarta, Indonesia. Working Paper No. 3, Institute of Resource Governance and Social Change. Retrieved from http://www.irgsc.org/pubs/wp.html

20. Kotsiopulos, Ioannis (2014). Social Media in Crisis Management: Role, Potential and Risk as part of the Contribution of Social Media in Crisis Management (COSMIC) project. Retrieved from http://www.cosmic-project.eu/sites/default/files/custom_cosmic/ Social%20Media%20in%20Crisis%20Management.pdf

21. Report of the Office of the United Nations High Commissioner for Human Rights on the relationship between climate change and human rights, 15 January 2009

Additional References (Also see Appendix V, Social Media Guidelines)

1. Symposium on Multi-Hazards Early Warning Systems for Integrated Disaster Risk Management, Session V: Integration of Risk Information and Early Warnings in Emergency, Preparedness, Planning and Response, Horst Letz. Geneva, 23-24 May 2006, World Meteorological Organisation and International Federation of the Red Cross and Red Crescent Societies.

2. WMO, Disaster Risk Reduction Programme Multi-Hazards Early Warning Systems (MHEWS) website: http://www.wmo.int/pages/prog/drr/projects/Thematic/MHEWS/MHEWS_en.html

3. “Institutional Partnerships in Multi-Hazards Early Warning Systems: A compilation of Seven National Good Practices and Guiding Principles,” Springer Verlag, Golnaraghi, M. (Ed.) (2012)

4. Public Awareness and Public Education for Disaster Risk Reduction: A Guide International Federation of Red Cross and Red Crescent Societies, Geneva, 2011.

5. *Four Elements of People-Centered Early Warning Systems, UN-ISDR/Platform for the Promotion of Early Warning Systems – A Public Entity Risk Institute Symposium*, Public Entity Risk Institute (PERI), April 2005.

APPENDIX X: APPLICABLE WEBSITES

Member	Website
Cambodia	http://www.cambodiameteo.com
China	http://www.cma.gov.cn/en/
Democratic People's Republic of Korea	http://www.korea-dpr.com/
Hong Kong, China	http://www.weather.gov.hk/
Japan	http://www.jma.go.jp/jma/indexe.html
Lao People's Democratic Republic	http://dmhlao.etllao.com/
Macao, China	http://www.smg.gov.mo/www/e_index.php
Malaysia	http://www.met.gov.my/
Philippines	http://www.pagasa.dost.gov.ph/
Republic of Korea	http://web.kma.go.kr/eng/index.jsp
Singapore	http://www.weather.gov.sg/wip/web/ASMC/home
Thailand	http://www.tmd.go.th/
United States of America	http://www.weather.gov/
Viet Nam	http://www.nchmf.gov.vn/Web/en-US/43/Default.aspx

Member	Website
Bangladesh	http://www.bmd.gov.bd/
India	http://www.imd.gov.in/
Maldives	http://www.meteorology.gov.mv/
Myanmar	http://www.dmh.gov.mm/
Oman	http://met.gov.om/opencms/export/sites/default/dgman/en/home/index.html
Pakistan	http://www.pmd.gov.pk/
Sri Lanka	http://www.meteo.gov.lk/
Thailand	http://www.tmd.go.th/

Name	Website
RSMC New Delhi-Tropical Cyclone Centre	http://www.rsmcnewdelhi.imd.gov.in/index.php?lang=en
RSMC Tokyo-Typhoon Center	http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/RSMC_HP.htm
RSMC Miami-Hurricane Center	http://www.nhc.noaa.gov/
RSMC Honolulu-Hurricane Center	http://www.prh.noaa.gov/hnl/cphc/
Severe Weather Information Centre	http://severe.worldweather.wmo.int/

Selected References for SSOPs (There are many more which can be found through a Google Search)	
Cornell University, Developing Effective Standard Operating Procedures	http://www.ansci.cornell.edu/pdfs/sopsdir.pdf
Government of Australia, Department of Environment and Conservation, Guide to Writing Standard Operating Procedures	http://www.dpaw.wa.gov.au/.../conservation... conservation/.../sop/sop_guide_ 20090812_revised.doc

Texas A&M, Office of Engineering Safety, Guide to Writing Standard Operating Procedures	http://www.oes.tamu.edu/new/templates/class%20web%20site/SOPs_How_to_Write.pdf
Montana, Department of Environmental Quality , Water Quality Planning Bureau, Guidance for Preparing a Standard Operating Procedure	http://www.deq.mt.gov/wqinfo/qaprogram/PDF/SOPs/WQPBDMS-001_GuidanceforSOPs.pdf
Illinois, Environmental Protection Agency, Bureau of Water, Guidance for the Preparation of Standard Operating Procedures For Quality-Related Document	http://www.epa.state.il.us/water/water-quality/methodology/sop-guidance.pdf
WMO-No. 1099 PWS-26, Guidelines for Creating a Memorandum of Understanding and a Standard Operating Procedure between a National Meteorological or Hydro-meteorological Service and a Partner Agency	https://www.wmo.int/pages/prog/amp/pwsp/documents/1099_PWS_26_MOUNMSPA_en.pdf
China, Shanghai Meteorological Service, Report of Multi-Hazard Early Warning and Decision Support Systems Workshop	http://www.gfdrr.org/sites/gfdrr.org/files/Multi-Hazard_Early_Warning_and_Decision_Support_Systems_Workshop_12-04-13.pdf
Great Britain, Clinfield Limited, Cambridge, Standard Operating Procedures (SOPs) – A Quick Guide	http://www.clinfield.com/2013/03/standard-operating-procedures-sops/
Penn State University, College of Agricultural Research and Cooperative Extension, Penn State Dairy Alliance, Standard Operating Procedures: A Writing Guide	http://www.extension.psu.edu/animals/dairy/hr/tools-for-dairy-employee-supervisors/ud011

Selected References for EWS (There are many more which can be found through a Google Search)	
Asian Disaster Preparedness Center (ADPC): Two types of Checklists and Questionnaires developed for the Early Warning Gaps Assessment (National and Community) and Household Survey (household level for Pilot Sites) under the UNESCAP project; Project: Technical assistance for Enhancing the Capacity of End-to-end Multi-hazard Early Warning Systems (EWS) for Coastal hazards in Myanmar, Sri Lanka & Philippines	http://www.adpc.net/igo/category/id103/doc/2013-f30mdq-adpc-rcc_mdrd_tool_kit.pdf
Global Facility for Disaster Reduction and Recovery, Implementing Hazard Early Warning Systems	http://www.gfdrr.org/sites/gfdrr.org/files/Implementing_Early_Warning_Systems.pdf

International Federation of Red Cross and Red Crescent Societies: Community Early Warning Systems: Guiding Principles	https://www.ifrc.org/PageFiles/103323/1227800-IFRC-CEWS-Guiding-Principles-EN.pdf
International Strategy for Disaster Reduction: Developing Early Warning Systems: A Check-List	http://www.unisdr.org/files/608_10340.pdf
World Meteorological Organization (WMO): Guidelines on Early Warning Systems and Application of Nowcasting and Warning Operations	https://www.wmo.int/pages/prog/amp/pwsp/documents/PWS-21.pdf
World Meteorological Organization: Disaster Risk Reduction Programme, Multi-Hazard Early Warning Systems,	http://www.wmo.int/pages/prog/drr/projects/Thematic/MHEWS/MHEWS_en.html

APPENDIX XI: ACRONYMS

AAR	After-Action Reviews
ABU	Asia-Pacific Broadcasting Union
ADPC	Asian Disaster Preparedness Center
AFP	Armed Forces of the Philippines
AM/MIC	Area Manager/Meteorologist in Charge
AOI	Area of Interest
ATCF	Automated Tropical Cyclone Forecast System
BGU	Basic Grid Units
CBMS	Community Bases Monitoring System
CMA	China Meteorological Administration
CONOPS	Concept of Operations
CSCAND	Collective Strengthening of Community Awareness on Natural Disasters
DCO	Data Collection Office
DDO	Detailed Duty Officer
DFF	Duty Flood Forecaster
DG(CI)	Director General (Communication and Information)
DILG	Department of the Interior and Local Government
DLSU	De La Salle University
DMA	Disaster Management Authority
DMF	Duty Meteorological Forecaster
DMH	Department of Meteorology and Hydrology
DMO	Disaster Management Office
DND	Department of National Defense
DO	Director of Operations
DOC	Disaster Operation Commander
DOH	Department of Health
DPWH	Department of Public Works and Highway
DRR	Disaster Risk Reduction
DRRMOs	Disaster Risk Reduction and Management Offices
DSWD	Department of Social Welfare and Development
EC	Education Campaign
ED	Executive Director
ESA	Electronic Systems Analyst
EWC	International Early Warning Conference
EWS	Early Warning System
FB	Flood Bulletin
FIR	Flight Information Region
FNI	Food and Non-food Items
GAATES	Global Alliance on Accessible Technologies and Environments
GFA	General Flood Advisory
GFDRR	Global Facility for Disaster Reduction and Recovery
GMMA	Greater Metro Manila Area

GTS	Growing Through Sharing
HA/DR	High Availability/Disaster Recovery
HLURB	Housing and Land Use Regulatory Board
HMD	Hydrometeorology Division
IDP	Internally Displaced Person
IEC	Information and Education Campaign
IEWP	International Early Warning Programme
IFRC	International Federation of Red Cross and Red Crescent Societies
IOC	Intergovernmental Oceanographic Commission
IRIDeS	International Research Institute of Disaster Science
ISDR	International Strategy for Disaster Reduction
LCEs	Local Chief Executives
LDRRMC	Local Disaster Risk Management Councils
LGUs	Local Government Units
LMS	Learning Management System
LPA	Low Pressure Area
MGB	Mines and Geoscience Bureau
MHEWS	Multi-Hazards Early Warning Systems
MMC	Media Management Center
MMDA	Metro Manila Development Authority
MOUs	Memorandums of Understanding
NAMRIA	National Mapping and Resource Information Authority
NAVTEX	Navigational Telex
NDRRMC	National Disaster Risk Reduction and Management Council
NDRRMOC	National Disaster Risk Reduction and Management Operations Center
NEDA	National Economic Development Authority
NGAs	National Government Agencies
NGO	Non-Governmental Organization
NHOP	National Hurricane Operations Plan
NMHSs	National Meteorological and Hydrological Services
NOAH	Nationwide Operational Assessment of Hazards
NSO	National Statistical Office
NWS	National Weather Service
OCD	Office of Civil Defense
OCDRO	Office of Civil Defense Regional Office
OIC	Officials in Charge
OpCen	Operation Center
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAR	Philippine Area of Responsibility
PDNA	Post Disaster Needs Assessment
PHIVOLCS	Philippine Institute of Volcanology and Seismology

PL	Program Leader
PRSD	PAGASA Regional Services Division
PSWS	Public Storm Warning Signal
PTC	Panel on Tropical Cyclones
PTCS	Panel on Tropical Cyclones Secretariat
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
RDNA	Rapid Damage and Needs Assessment
RDRRMC	Regional Disaster Risk Reduction and Management Council
RDRRMOC	Regional Disaster Risk Reduction and Management Operations Center
REDAS	Rapid Earthquake Damages Assessment
RIMES	Regional Integrated Multi-Hazards Early Warning System for Africa and Asia
RSMC	Regional Specialized Meteorological Center
RTC	Regional Training Centre
SAR	Search and Rescue/Retrieval
SEWS	Standard Emergency Warning Signal
SIGMET	Significant Meteorological Information
SMB	Shanghai Meteorological Bureau
SOO	Scientific and Operations Officer
SOPs	Standard Operating Procedures
SRR	Search and Rescue Region
SSOPs	Synergized Standard Operating Procedures for Coastal Multi-Hazards Early Warning System
SWB	Severe Weather Bulletin
TAF	Terminal Aerodrome Forecast
TC	Typhoon Committee
TC	Tropical Cyclone
TCS	Typhoon Committee Secretariat
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPD-ICE	University of the Philippines, Institute of Civil Engineering
WCIDS	Weather and Climate Information and Decision Support Systems
WCM	Warning Coordination Meteorologist
WFS	Weather Forecasting Section
WMO	World Meteorological Organization

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