



END OF TERM EVALUATION REPORT: SYNERGIZED STANDARD OPERATING PROCEDURES FOR COASTAL MULTI- HAZARDS EARLY WARNING SYSTEM



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Contents

Acknowledgments.....	2
List of acronyms.....	4
Executive summary.....	5
1. Introduction.....	14
1.1 Background	14
1.2 Evaluation purpose and objective.....	16
1.3 Evaluation scope	16
2. Evaluation methodology.....	17
2.1 Description of methodology	17
2.2 Limitations.....	17
2.3 Evaluation matrix	18
3. Findings.....	20
3.1 Evaluation against specific results framework based upon the approved work plan	20
3.1.1 Activity 1: Review and synergize existing SSOPs for coastal multi-hazards EWS in the Members of TC and PTC and develop the Manual of Synergized SSOPs for Coastal Multi-Hazards EWS.....	20
3.1.2 Activity 2: Enhance the performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through capacity building.....	23
3.2 Evaluation against specific evaluation criteria.....	25
3.2. 1 Relevance	26
3.2.2 Effectiveness	29
3.2.3 Efficiency	31
3.2.4 Sustainability.....	33
4. Lessons.....	36
5. Recommendations.....	39
Annexes.....	43
Annex I. List of people interviewed/surveyed	43
Annex II. Questionnaires for project team and stakeholders and survey	44
Annex III. Evaluation schedule	48
Annex IV. Role and contributions of consultants in SSOPs.....	49

List of acronyms

ADPC	Asian Disaster Preparedness Center
ADRC	Asian Disaster Reduction Center
AIDMI	All India Disaster Mitigation Institute
DRR	Disaster Risk Reduction
ESCAP	Economic and Social Commission for Asia and the Pacific
EWS	Early Warning System
GAATES	Global Alliance on Accessible Technologies and Environments
GIZ	Internationale Zusammenarbeit
HFA	Hyogo Framework for Action
IOC	Intergovernmental Oceanographic Commission
ISDR	International Strategy for Disaster Reduction
KRAs	Key Result Areas
MoUs	Memorandums of Understanding
NDMOs	National Disaster Management Offices
NMHSs	National Metrological and Hydrological Services
NTWCs	National Tsunami Warning Centers
OSUFFIM	Operational System for Urban Flood Forecasting and Inundation Mapping
PAGASA	Philippines Atmospheric, Geophysical and Astronomical Services Administration
BMD	Bangladesh Meteorological Department
PMD	Pakistan Meteorological Department
PTC	Panel on Tropical Cyclones
RIMES	Regional Integrated Multi-Hazard Early Warning System
RSMC	Regional Specialised Meteorological Centre
RTC	Regional Training Center
SNAP	Stocktaking for National Adaptation Planning
SOPs	Standard Operating Procedures
SSOPs	Synergized Standard Operating Procedures
TC	Typhoon Committee
ToRs	Terms of Reference
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WMO	World Meteorological Organization

Executive summary

This report is the end of term evaluation of 'Synergized Standard Operating Procedures for Coastal Multi-hazards Early Warning System' project. The report assesses the key outcomes, outputs and lessons learnt from the perspective of relevance, effectiveness, efficiency and sustainability after the completion of this 'Economic and Social Commission for Asia and the Pacific (ESCAP) Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries' funded project, which was implemented with a total budget of US\$ 457,000 from August 2012 to May 2015 (34 months) in 13 vulnerable countries (Bangladesh; Cambodia; China; India; Lao PDR; Malaysia; Maldives; Myanmar; Pakistan; Philippines; Sri Lanka; Thailand and Vietnam) in Asia Pacific region. Key activities of the project were also reviewed as per the logical framework of action. Under the consideration is that this evaluation will serve towards an important learning for Asia and the Pacific region as well as for the Typhoon Committee (TC), Panel on Tropical Cyclones(PTC), and ESCAP. The nature of this evaluation process is constructive and forward looking.

The evaluation was conducted by Mr. Mihir R. Bhatt from April to May 2015. The subject under the evaluation deals with synergizing standard of operating procedures (SOPs) for coastal multi-hazards early warning system (EWS). The project was implemented by collecting information on the performance status of coastal multi-hazards EWS from the Members of TC and PTC. Based on the analysis and synergizing of the strengths, gaps, and needs of existing SOPs for coastal multi-hazards EWS, the project developed a Manual of Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning Systems. The project mainly focused on the meteorological and hydrological services for areas that became more vulnerable to natural disasters after tsunami and other costal disasters.

The longer term goal of the project was to promote community resilience to coastal multi-hazards and to improve towards the policy and institutional arrangements at national, district, and community levels through integrated, effective, standard operating procedures for multi-hazards EWS. The project had two main outcomes to achieve: first, integrated, effective standard operating procedures for coastal multi-hazards EWS for TC and PTC Members and second, improved performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through integration, synergization, cooperation, and training.

This evaluation had two main objectives to achieve; first, assess the relevance, effectiveness, efficiency and sustainability of the project's main outcomes and; second, assess the relevance and effectiveness of training workshops and technical assistance, including project outputs to participating countries. The methodology for undertaking this evaluation included: (1) review of all project documents; (2) review and assessment of relevant country level and selected sectoral documents (3) interviews with project staff to ascertain effectiveness of the project design, planning and execution; (4) interviews with project-involved stakeholders; (5) a field mission and (6) a survey for those who could not be interviewed in person.

In terms of locations for field missions; the evaluator visited Cambodia and made a visit to ESCAP headquarters in Thailand. A limitation to this evaluation process was the limited budget and time available for field visits and limited response of stakeholders. However, the evaluator is of the view that the above mentioned limitation has not negatively affected the evaluation process as the evaluation is based on a representative set of information provided by the TC and information gathered from diverse

stakeholders met in person in Cambodia and Bangkok, and information is triangulated with at least two additional sources. The financial aspect of the project is not reviewed.

Key findings:

The findings are divided into two sections: 1) findings from review of project activities against results framework and; 2) against the criteria of relevance, effectiveness, efficiency and sustainability.

1. Findings from review of project activities against results framework

The Outcome 1 (Integrated, effective standard operating procedures for coastal multi-hazard EWS for TC and PTC Members) and outcome 2 (Improved performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through integration, synergization, cooperation, and training) were successfully achieved in most beneficiary countries. For fully achieving both outcomes in the 13 beneficiary countries and applying results of this project in other countries of TC and PTC, a SSOP Phase II would be advisable. The proposal of SSOP phase II has planned such up-scaling so that other countries in TC and PTC also benefit from the experience and gains of this project. Regarding the Outcome 2 (Improved performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through integration, synergization, cooperation, and training), it is still early to state that it was fully achieved.

1.1 Activity 1: Review and synergize existing SSOPs for coastal multi-hazards EWS in the Members of TC and PTC and develop the Manual of Synergized SSOPs for Coastal Multi-Hazards EWS.

1.1.1 *Evaluation of the results of the workshop in UNCC, Bangkok, May 8-9, 2013:* The key objective of the workshop was achieved through presentations, panel discussions, and general discussions. Follow up conversations were initiated. Key information on performance of existing coastal multi-hazards EWS and key needs and gaps of current SOPs in all the 13 countries were identified and captured from local to national level.

1.1.2 *Evaluation of workshops in pilot countries and consultants missions:*

1.1.2.1 The project conducted three two-day pilot workshops on ‘Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System’ in Philippines, Bangladesh, and Pakistan during October 3 – 11 2013, through an international, multi-agency team. These workshops were found successful in identifying SOPs best practices, gaps and needs, and recommendations on next steps, including an action plan to meet the needs of beneficiary countries from national to community level.

1.1.2.2 Three two-day missions were held in Maldives, Sri Lanka and Myanmar on August 4-5, 2014, August 7-8, 2014 and August 10–11, 2014 respectively. Similar missions to Malaysia, Cambodia and Vietnam were conducted on August 28-29, 2014, September 1-2, 2014 and September 4-5, 2014 respectively. These missions achieved their pre-determined objectives of collecting and compiling scientific data, useful information, examples, and diagrams on

SSOPs best practices, gaps and needs, and recommendations for inclusion in the Manual on SSOP for Coastal Multi-Hazards Early Warning System.

1.1.3 *Evaluation of the process of designing and drafting of the SSOPs Manual and its contents:*

The evaluator has found the manual useful in improving existing SSOPs as well as creating new ones as it provides detailed guidance with relevant examples and references. The manual also includes critical guiding principles for context specific use and application and strongly recommends considering national policies and frameworks, including existing MoUs and arrangements. Such guidance makes the nature of the manual inclusive as well as flexible to adopt to different needs of users. Additional training needs emerged.

1.2 Activity 2: Enhance the performance and effectiveness of SSOPs for coastal multi-hazard EWS in Members of TC and PTC through capacity building.

1.2.1 *Evaluation of the results of the training workshop on SSOPs in Nanjing, China and hands-on training workshops on SSOPs in 3 PTC and 3 TC countries:*

1.2.1.1 A highly successful training workshop on SSOPs for coastal multi-hazards early warning system was conducted at the World Meteorological Organization (WMO) Regional Training Center (RTC) in Nanjing, China on June 9-11, 2014. The workshop provided a number of recommendations for preparation, coordination, integration, standardization, and documentation of SSOPs/MoUs prior to any event/disaster. However, most countries were represented by a lower number of participants in relation to what had been requested by the TC Secretariat. In total, the Workshop was attended by 33 participants from the beneficiary countries: Bangladesh (4); China (4); India (1); Lao PDR (1); Malaysia (1); Maldives (4); Myanmar (4); Pakistan (3); Philippines (3); Sri Lanka (2); Thailand (4); and Vietnam (2) against the target of 50.

1.2.1.2 Three-day missions were conducted to Myanmar, Maldives and Bangladesh on January 28-30, 2015, January 18-20, 2015 and January 22, 25-26, 2015, respectively and in Cambodia, Lao PDR and Philippines on January 19-21, 2015, January 23 and 26-27, and January 29-30 and February 2, 2015, respectively with the purpose of evaluating the draft SSOPs Manual by using it to provide hands-on training and technical assistance on interpretation, preparation, and improvement of SSOPs for users and issuers who found it extremely useful. The set objectives of these missions were achieved through six missions to selected targeted countries to provide assistance and expertise to develop, update, coordinate, and implement improved SSOPs for coastal multi-hazards EWS. Additional trainings need emerged.

1.2.2 *Evaluation of the working meeting on building a cooperation mechanism (October 2014 in Bangkok) and process of the developing the cooperative mechanism (February 2015 in Bangkok):*

1.2.2.1 A Working Meeting on Cooperative Mechanism for Coastal Multi-hazards Early Warning Information Sharing and Technical Transferring between PTC and the TC, was held in Bangkok on October 9-10, 2014.

1.2.2.2 The meeting successfully exchanged information on the activities in PTC and TC, to find possible gaps and challenges in coastal multi-hazards EWS. The meeting was also useful in identifying priority areas on information sharing and technical transferring between PTC and TC to address them.

1.2.2.3 Recommendations were identified for submission to the TC 47th Session which was held together with the PTC 42nd Session (3rd PTC/TC Joint Session – February 9-13, 2015). Further discussions on strengthening of cooperative mechanism were done at the 3rd PTC/TC Joint Session, Bangkok February 9-13, 2015.

2. Evaluation against specific evaluation criteria

2.1 Relevance: From the review of project proposal and documents as well key interviews of experts, it is clear that the project was relevant and was building on the past work of ESCAP, TC, PTC and ISDR. The project directly contributed to the second HFA priority for action on identifying, assessing and monitoring disaster risks and enhancing early warning as well as the third priority for action on using knowledge, innovation and education to build a culture of safety and resilience at all levels. The project strategy remains relevant even for future interventions as it takes into account all the three key components of an effective EWS i.e., issuance of warnings, interpretations of warnings and communication of warnings to the last-mile and not just accurate and timely forecasts. More work on last mile warning emerged in each country.

2.2 Effectiveness: The overall strategy of using the PC and PTC as a common communication network for improving the meteorological and hydrological services through development of SSOPs for coastal multi-hazards early warning system and capacity building for targeted countries has been successful. The strategy has made the targeted countries' approach towards accountable and performance oriented early warning systems. The structure of the project composed of a Steering Committee, Project Manager/Technical Advisor, and Task Force has also performed well. Expertise available and mission schedules did not always matched.

2.3 Efficiency:

2.3.1 Given the fact that a majority of targeted TC and PTC members are either in developing and/or less developed countries, implementation of the project by intergovernmental organizations seems appropriate. These organizations have successfully contributed to the development of SSOPs of multi-hazards early warning system, mainly concentrating on the meteorological and hydrological services.

- 2.3.2 The project has brought the National Metrological and Hydrological Services (NMHSs-institutions that issue warning information) and National Disaster Management Offices NDMOs-institutions that make decisions for preparedness and disaster risk reduction (DRR), including warning dissemination and response) closer.
- 2.3.3 The Letter of Agreement between ESCAP and TC to fund this project was signed on August 1, 2012, with the established deadline July 31, 2014. The start of the project was delayed due to the requirement of TC to approve project at its 45st Annual Session (Hong Kong, China, January 29-February February, 2013).
- 2.3.4 Due to the complexity of the project, involving 13 beneficiary countries; the great difficulties in getting agreement for the training dates; difficulties in contracting 6 consultants for two missions in 6 PTC and TC countries; and also to the great number of experts commenting and suggesting changes to the first versions of the Manual, ESCAP approved the no-cost extensions of the deadline twice, the first one until January 31, 2015 and the most recent until May 31, 2015.
- 2.3.5** On the positive note, the Project Manager/Technical Advisor was offered USD 54,000 to work for 2 years, part time, for this project. Because project manager totally believed in and supported the needs identified in the project, he stated he would work for USD 10,000 per year which was USD 20,000 for the 2 years and USD 5,000 for the extension into 2015. The rest he contributed to the success of the project.

2.4 Sustainability:

- 2.4.1 The project has successfully developed and floated the concept of an operational coastal multi-hazards warning system as a more sustainable option. This included other coastal hazards such as tropical cyclones, storm surge, floods, inundation, sediment disasters, etc. In order to promote comprehensive EWSs at the country-level, the SSOP project needed to push formalizing partnerships with key stakeholders such as media and civil society organisations. Clear roles and responsibilities needs to be defined at the country-level for sustainability of the overall effort.
- 2.4.2 The evaluator is of the opinion that there is a great potential of project outcomes and outputs being continually utilized by ADPC, ABU, GAATES, ADDRC and IOC UNESCO research and activities as well as by national authorities and institutions targeted.
- 2.4.3** Workshops and mission have helped create some sense of ownership of project outcomes. But to be fully sustainable, a next phase of action focusing on provision of financial support at the country level should be considered.

A. Key recommendations:

The recommendations are organized in a framework of ten principles common to seven good early warning systems—Bangladesh, China's Shanghai city, Cuba, France, Germany, Japan and the United

States—documented under an international effort coordinated by WMO and published in a book “Institutional Partnerships in Multi-Hazard Early Warning Systems” (Golnaraghi, M (Ed.) 2012)¹ and the recently agreed Sendai Framework for Disaster Risk Reduction (SFDRR)².

No.	Principles	Who	What	Linkages with SFDRR (2015-2030)
1	There is a strong political recognition of the benefits of EWS reflected in harmonized national to local disaster risk management policies, planning, legislation and budgeting.	TC/PTC, NMHSs, NDMOs, Media and other Stakeholders.	It is recommended that next phase of action focuses on the formalization of SSOPs and implementation arrangements in terms of signing clear ToRs and MoUs with relevant stakeholders at national and other levels.	Priority 2. Strengthening disaster risk governance to manage disaster risk
2	Effective EWS are built upon four components: (i) hazard detection, monitoring and forecasting; (ii) analysis of risks and incorporation of risk information in emergency planning and warnings; (iii) dissemination of timely and “authoritative” warnings; and (iv) community planning and preparedness.	TC/PTC, NMHSs, NDMOs.	It is recommended that next phase of action focuses on a more comprehensive set of actions to include all four components of effective EWS starting from hazard detection to community preparedness. A method such as “The Stocktaking for National Adaptation Planning (SNAP)” ³ with modification could be adopted to identify a common point of departure from standard procedures of effective EWS, which can help countries to standardize their SSOPs.	Priority 1. Understanding disaster risk
3	EWS stakeholders are identified and their roles, responsibilities, and coordination mechanisms clearly defined and documented within national to local plans, legislation, directives, MoUs, etc.	TC/PTC, NMHSs, NDMOs.	It is recommended that the TC/PTC Members engage with the highest authority at the country level to define specific roles and responsibilities of each stakeholder in the EWS as per existing national legislation and plans and make this arrangement public via CSOs and media.	Priority 4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation

¹ Golnaraghi, M (Ed.) 2012. *Institutional Partnerships in Multi-Hazard Early Warning Systems*, Springer Verlag Publishers, ISBN 978-3-642-25372-0 (2012). https://www.wmo.int/pages/prog/drr/projects/Thematic/MHEWS/MHEWS_en.html

² UNISDR 2015. Sendai Framework for Disaster Risk Reduction (2015-2030). March 2015.

http://www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf

³ GIZ 2014. The Stocktaking for National Adaptation Planning (SNAP) Tool, https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/ms/mainstreaming-tools/giz-2014_Factsheet-SNAP-EN.pdf

				and reconstruction
4	EWS capacities are supported by adequate resources (e.g., human, financial, equipment, etc.) across national to local levels and the system is designed for long-term sustainability.	Donors/ESCAP.	<p>It is recommended that adequate financial resources are mobilized for the next phase of action to both widespread and deepen the follow up actions. In its HFA progress report for the period of 2013-2015, the Philippines (Pama A. 2015)⁴, Lao PDR (Thanthathep K. 2015)⁵ and Pakistan (Siddiqui W. 2015)⁶ reported that against the core indicator 3 (Early warning systems are in place for all major hazards, with outreach to communities) of HFA Priority 2, institutional commitment has been attained, but achievements are neither comprehensive nor substantial. Countries such as Vietnam (Kirsch-Wood J. 2015)⁷, Sri Lanka (Seneviratne A. 2015)⁸ and India (Sarma G V V. 2015)⁹, while reporting progress on the same indicator for the HFA Priority 2 mentioned that substantial achievement had been attained but with recognized limitations in key aspects, such as financial resources and/ or operational capacities. In Cambodia, SSOPs are high on the agenda, but limited budget and plans are yet to be developed. Many of the 6 countries committed to continue this SSOP work after the consultants departed, but they believed</p>	Priority 3. Investing in disaster risk reduction for resilience

⁴ Pama A. 2015. Philippines: National Progress Report on Implementation of the Hyogo Framework of Action (2013-2015), March 2015. http://www.preventionweb.net/files/43379_PHL_NationalHFAprogress_2013-15.pdf

⁵ Thanhathhep K. 2015. Lao People's Democratic Republic: National progress report on the implementation of the Hyogo Framework for Action (2013-2015), http://www.preventionweb.net/files/41813_LA0_NationalHFAprogress_2013-15.pdf

⁶ Siddiqui W. 2015. Pakistan: National progress report on the implementation of the Hyogo Framework for Action (2013-2015) http://www.preventionweb.net/files/42312_PAK_NationalHFAprogress_2013-15.pdf

⁷ Kirsch-Wood J. 2015. Vietnam 2015. National progress report on the implementation of the Hyogo Framework for Action (2013-2015), http://www.preventionweb.net/files/42305_VNM_NationalHFAprogress_2013-15.pdf

⁸ Seneviratne A. 2015. Sri Lanka: National progress report on the implementation of the Hyogo Framework for Action (2013-2015) Interim. http://www.preventionweb.net/files/41730_LKA_NationalHFAprogress_2013-15.pdf

⁹ Sarma G V V. 2015. India: National progress report on the implementation of the Hyogo Framework for Action (2013-2015) http://www.preventionweb.net/files/40210_IND_NationalHFAprogress_2013-15.pdf

			additional assistance—technical, training, and financial—would be very beneficial. This may be in terms of staff in place as well as expertise available on call. Involvement of international actor such as DFID, ADB, The World Bank, IFRC OXFAM and others can jointly fund some activities of the next phase.	
5	Hazard, exposure and vulnerability information are used to carry-out risk assessments at different levels, as critical input into emergency planning and development of warning messages.	WMO, TC/PTC.	It is recommended that next phase of the project include preparatory activities such as scoping of multi-hazards EWS awareness among authorities and governments. Moving from integration to synergization will take time and resources, including technical inputs. While climate change is gaining momentum globally, EWSs should be linked to climate risk more so that comprehensive assessment of risk can be made and resources from climate change adaptation initiatives could be better leveraged.	Priority 1. Understanding disaster risk
6	Warning messages are: (i) clear, consistent and include risk information; (ii) designed with consideration for linking threat levels to emergency preparedness and response actions (e.g., using colour, flags) and understood by authorities and the population; and (iii) issued from a single (or unified), recognized and “authoritative” source.	TC/PTC, NMHSs, NDMOs, Media and other Stakeholders.	It is recommended that more capacity building activities along with small city level pilots and performance rating of SSOPs in a real or mock situation be carried out. It is also recommended that communication and cooperation between TC and PTC countries is facilitated through a secure website (with password access) where MoUs and SSOPs can be deposited and shared. This has to be approved and agreed upon by Members as procedures for sharing critical information has to go through a long bureaucratic process.	Priority 4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction
7	Warning dissemination mechanisms are able to reach the	WMO, Donors/ESCAP TC/PTC	It is recommended that the next phase of action should be longer than three years, for five years so	Priority 2. Strengthening disaster risk

	authorities, other EWS stake-holders and the population at risk in a timely and reliable fashion.		that enough time is available for finalization of SSOPs as well as testing and performance measurement during emergencies in beneficiary countries.	governance to manage disaster risk
8	Emergency response plans are developed with consideration for hazard/risk levels, characteristics of the exposed communities.	NMHSs, NDMOs, Media and other Stakeholders.	It is recommended that gains of the current project are consolidated and SSOPs are integrated in national policy frameworks and at sub-regional levels, especially at city-levels, integrating risk from both natural disasters as well as climate extremes.	Priority 1. Understanding disaster risk
9	Training on hazard/risk/emergency preparedness awareness integrated in various formal and informal educational programmes with regular drills to ensure operational readiness.	Intergovernmental organizations	It is recommended that the SSOPs Manual and Quick Reference Guide are used as a solid basis for training and education by creating a SSOP trainer group in the region through a ToT. There is a need to share outcomes more widely as well as deepen the outcomes in targeted countries with the existing partners. South-South knowledge exchange, research and networking activities around the theme of SSOPs are highly recommended to conserve and build on what is already gained.	Priority 3. Investing in disaster risk reduction for resilience Priority 4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction
10	Effective feedback and improvement mechanisms are in place at all levels of EWS to provide systematic evaluation and ensure system improvement over time.	WMO, TC/PTC	It is recommended that EWSs are made to be seen as risk governance issues, tied up with performance monitoring and evaluation mechanism so that impact could be measured.	Priority 2. Strengthening disaster risk governance to manage disaster risk

To turn the recommendations into road map, a suitable task forces or working group be set up with regional bodies such as ADPC, ADRC, SAARC, and others.

1. Introduction

This report is the end of term evaluation of ‘Synergized Standard Operating Procedures for Coastal Multi-hazards Early Warning System’ project. The report assesses the key outcomes, outputs and lessons learnt from the perspectives of relevance, effectiveness, efficiency and sustainability after the completion of this ‘ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries’ funded project, which was implemented with a total budget of US\$ 457,000 from August 2012 to May 2015 (34 months) in 13 vulnerable countries (Bangladesh; Cambodia; China; India; Lao PDR; Malaysia; Maldives; Myanmar; Pakistan; Philippines; Sri Lanka; Thailand and Vietnam). Key activities of the project are also reviewed as per the logical framework of action. Under the consideration that this evaluation will serve as an important learning tool for Asia and the Pacific region as well as for the TC and ESCAP, the nature of this evaluation process is constructive and forward-looking.

This evaluation report meets the requirement of the original proposal, which required the TC Secretariat to commission an independent end of term evaluation. The evaluation was conducted by Mr. Mihir R. Bhatt from April to May 2015. This chapter describes the background of the evaluation, and the evaluation purpose, objectives, outputs and scope, as outlined in the terms of reference (ToRs) of this evaluation and suitably modified to meet the emerging needs.

1.1 Background

The subject under the evaluation deals with standardization of operating procedures for coastal multi-hazard early warning systems. Countries of South Asia and South-east Asia are extremely vulnerable to the threats of natural disasters such as tsunami and tropical cyclones which may increase in intensity due to climate change. The forty-sixth session of the ESCAP/WMO TC held at Bangkok, from the February 10 to 13, 2014 noted that despite the availability of fairly reliable forecasts and warnings, both in terms of cyclone motion and storm surge threat, the casualty figures were still in the thousands, a stark reminder of the need for more efforts in ensuring effective responses (ESCAP 2014)¹⁰. Economic losses, linked to extreme hydro-meteorological events identified by WMO, have increased nearly 50 times over the past five decades but millions of lives have been saved by advancements in effective EWS (WMO 2012)¹¹.

In response to the 2004 India Ocean Tsunami many countries in South and South-east Asia developed SOPs for tsunami early warning systems. However, given the low frequency of tsunami events, sustainability and continual use of such system was a question. Thus it was important to include other hazard warnings, especially coastal into such systems to ensure appropriate use of such mechanism. However, most of these systems had limited experience in handling the combination of tsunami and other coastal hazard EWSs.

ESCAP/WMO TC and WMO/ESCAP PTC in cooperation with Asian Disaster Preparedness Center (ADPC), Asian Disaster Reduction Center (ADRC) and Intergovernmental Oceanographic Commission (IOC) of

¹⁰ Economic and Social Commission for Asia and the Pacific (ESCAP). 2014. Seventieth session, Bangkok, 4-8 August 2014 (Phase II), Item 3(f) of the provisional agenda, Review of issues pertinent to the subsidiary structure of the Commission, including the work of the regional institutions: disaster risk reduction. 1 April 2014. Bangkok: ESCAP. Accessed on 6 April 2015.

¹¹ WMO 2012. A WMO Factsheet: Early Warning Systems Saves Millions of Lives.

https://www.wmo.int/pages/prog/drr/events/GPDRR-IV/Documents/FactSheets/FS_nhews.pdf

UNESCO recognized this issue and felt that there was a strong need to create synergies among different types of early warnings for coastal hazards by reviewing relevant existing SSOPs, for tsunami this includes storm surge, high tide, high wave, strong wind, flood and sediment disasters SOPs. These partners realized that these synergies could be achieved through identifying specific strengths, gaps, and needs to enable existing EWSs to be fully operational in multi-hazards contexts.

In response, these partners submitted a successful proposal titled 'Synergized Standard Operating Procedures for Coastal Multi-hazard Early Warning System' for addressing the above mentioned issue to the ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries. The project was implemented by collecting information on the performance status of multi-hazards coastal EWS from the Members of TC and PTC. Based on the analysis and synergy of strengths, gaps, and needs of existing SOPs for multi-hazards coastal EWS, the project developed a Manual of Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System and a Quick Reference Guide on SSOP for Coastal Multi-Hazards Early Warning System

The project mainly focused on the meteorological and hydrological services for areas that became more vulnerable to natural disasters after tsunami and other costal disasters. In terms of key activities, the project conducted workshops and training courses for strengthening the capacity of the performance of coastal multi-hazard early warning system SSOPs and developed coordination and cooperative mechanism between TC and PTC. The project also provided expert inputs to the countries in need to provide assistance in the development and review of multi-hazard SSOPs. This project also emphasized South-South cooperation. Overall, the project was jointly sponsored by the TC and also PTC. Thus, it was a combined effort.

The longer term goal of the project was to promote community resilience to coastal multi-hazards and to improve the policy and institutional arrangements at national, district, and community levels through integrated, effective standard operating procedures for multi-hazards EWS. The project had two main outcomes to achieve; first, integrated, effective standard operating procedures for multi-hazards coastal EWS for TC and PTC Members and two, improved performance and effectiveness of SSOPs for multi-hazards coastal EWS in Members of TC and PTC through integration, synergization, cooperation, and training.

The two main outputs of the project include; a) Manual on Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System, mainly focusing on the hydro-meteorological service, including SSOPs related to warning providers, disaster managers, media, and fishermen and; b) regular communication and cooperation mechanism between TC and PTC on the coastal multi-hazards early warning system, particularly southern countries in the region. The project was also expected to address regional cooperation and genders issue in EWSs.

The project was implemented with a total budget of US\$ 457,000 from August 2012 to May 2015 (34 months in 13 countries (Bangladesh; Cambodia; China; India; Lao PDR; Malaysia; Maldives; Myanmar; Pakistan; Philippines; Sri Lanka; Thailand and Vietnam) targeting NMHSs/National Tsunami Warning Centers (NTWCs), NDMOs and Government Sectorial agencies.

The ESCAP/WMO Typhoon Committee is an inter-governmental body organized under the joint auspices of the ESCAP and the WMO in 1968 in order to promote and coordinate the planning and implementation of measures required for minimizing the loss of life and material damage caused by typhoons in Asia and the Pacific. The Typhoon Committee develops activities under three substantive

components: meteorology, hydrology, and disaster risk reduction (DRR), as well as in training and research. The mission of the Typhoon Committee is to reduce the loss of lives and minimize social, economic and environmental impacts caused by typhoon related disasters through integrated and enhanced regional collaboration. Since 1968, the Typhoon Committee has been repeatedly recognized as an outstanding regional body who has integrated the actions and plans of the meteorological, hydrological, and DRR components to produce meaningful results.

1.2 Evaluation purpose and objective

The rationale behind the evaluation of the ‘Synergized Standard Operating Procedures for Coastal Multi-hazard Early Warning System’ project, implemented since August 2012 in 13 vulnerable countries (Bangladesh, Cambodia, China, India, Lao PDR, Malaysia, Maldives, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam) is to meet the requirements of the project and capture learning for future interventions. Thus, the evaluation dually aims to measure the impact of what has already been achieved as well as to provide inputs on the next phase of activities.

This evaluation had two main objectives to achieve; first, assess the relevance, effectiveness, efficiency and sustainability of the project’s main outcomes; and second, assess the relevance and effectiveness of training workshops and technical assistance, including project outputs to participating countries. The main focus of the resulting recommendations was on strengthening multi-hazards EWS at regional, national and local levels. To achieve this, the evaluation took a participatory approach and ensured that the evaluation outputs are usable and forward looking.

1.3 Evaluation scope

The evaluation took into account project interventions from the beginning of the project and assessed its performance against the criteria of relevance, effectiveness, efficiency and sustainability. This included mapping of key aspects of project planning and execution (outputs and outcomes and activities implemented to achieve them) to determine what went well and which areas require improvement for TC and PTC to design future activities in the region. The evaluation reviewed project activities in all 13 target countries.

Key stakeholders of the evaluation included, the ESCAP/WMO TC, WMO/ESCAP PTC, ADPC, ADRC and IOC of UNESCO, including participating NMHSs/NTWs, NDMOs and government sectorial agencies, including non-governmental agencies.

2. Evaluation methodology

This chapter describes the implemented evaluation methodology and limitations of the evaluation.

2.1 Description of methodology

The methodology for undertaking this evaluation included: (1) review of all project documents; (2) review and assessment of relevant country level and international subject matter documents; (3) interviews with project team to ascertain effectiveness of the project design, planning and execution; (4) interviews with project-involved stakeholders and (5) field missions. The methodology required development of specific questionnaires for the project team and stakeholders involved. Two separate questionnaires for project team and stakeholders involved were designed piloted, and are enclosed as Annexure II along with survey form, which was sent to stakeholders who could not be interviewed in person. List of people interviewed/surveyed is enclosed as Annexure I.

In terms of locations for field missions, the evaluator visited Cambodia and made a visit to ESCAP headquarters in Thailand. The evaluation plan is enclosed as Annexure III. Information and data gathering was done as shown in the table below.

2.2 Limitations

A limitation to this evaluation process was the limited budget and time available for field visits. However, the evaluator is of the view that the abovementioned limitation has not negatively affected the evaluation process as the evaluation is based on a representative set of information provided by the TC and information gathered from diverse stakeholders who met in person in Cambodia, and Bangkok. The financial aspect of the project is not reviewed.

2.3 Evaluation matrix

The evaluation was guided by the following evaluation matrix. The table below (evaluation matrix) presents evaluation criteria, key questions, sub-questions, indicators of variable to be considered, sources of information and data collection methods and tools.

Criteria & key questions	Sub questions	Indicators or variables to be considered	Sources of Information	Data collection methods/tools
Relevance: How appropriate was the project design?	<ol style="list-style-type: none"> 1. Was the design of project interventions the most appropriate way to achieve intended outcomes and outputs? 2. Are the objectives and design still relevant for potential future phases of the project? 	<ul style="list-style-type: none"> • Connectedness of project activities with local needs and national priorities • Evidence of use/application of project activities/outputs • Evidence of unmet needs that remain in spite of the project activities 	<ul style="list-style-type: none"> • Project team • Involved stakeholders • Progress reports 	<ul style="list-style-type: none"> • Review of literature • Project documents • National plans and policies • SSOPs • Interviews • Meetings
Effectiveness: How well were the project activities were planned and implemented?	<ol style="list-style-type: none"> 1. Are there any defined quality standards are procedures or protocols in place, and are they followed in the implementation? 2. Did the project achieve its intended outcomes? 3. Did the project contribute to the advancement of early warning knowledge and practices? 	<ul style="list-style-type: none"> • Signs of strengthened early warning systems • Level of satisfaction among stakeholders • Resource leveraging • Evidence of significant contribution of the project 	<ul style="list-style-type: none"> • Project documents • Targeted institutions • Project team 	<ul style="list-style-type: none"> • Team interviews • Meeting with key institutions/stakeholders • Review of project documents
Efficiency: How efficiently did TC manage the project?	<ol style="list-style-type: none"> 1. Was the implementation arrangement suitable for this type of project? 2. Were there any important unintended outcomes, either 	<ul style="list-style-type: none"> • Cost-effective • Value for money • Level of support mobilized at national levels 	<ul style="list-style-type: none"> • Project reports • Project team • Key stakeholders 	<ul style="list-style-type: none"> • Project documents • Interviews • Meetings

	positive or negative?			
Sustainability: How sustainable is the project model	<p>1. What exit strategies/sustainability plans were incorporated in the project design and to what extent did they contribute to sustainability?</p> <p>2. Do the targeted agencies have the capacity and resources to continue activities?</p>	<ul style="list-style-type: none"> • Reported changes as a result of the project • Ownership of project interventions • Request/demand for additional support 	<ul style="list-style-type: none"> • Project team • Stakeholders • National agencies 	<ul style="list-style-type: none"> • Team interviews • Meeting with key institutions/stakeholders • Review of project documents

3. Findings

This chapter contains findings that emerged from extensive review of project documents as well as the interviews of key project staff and stakeholders, including the survey. This chapter is divided into two sets of findings: one, emerging from evaluation of the project against a specific results framework based upon the approved work plan and two, against the criteria of relevance, effectiveness, efficiency, and a sustainability.

3.1 Evaluation against specific results framework based upon the approved work plan

Overall, the project has achieved the following outputs and outcomes. The project has successfully achieved its two outputs; one, on preparing a Manual on the Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System, mainly focusing on the hydro-meteorological services, including SSOPs related to warning providers, disaster managers, media, and fishermen and; two, on establishing regular communication and cooperation mechanism between TC and PTC on coastal multi-hazards early warning system, particularly southern countries in the region. For the second output, it was mentioned that only a limited number of capacity building activities were performed in the targeted countries. The trainer team could have been broadened with more regional experts working internationally to provide trainings on the SSOP guidance with state of art experiences.

Similarly, the project has integrated, effective standard operating procedures for coastal multi-hazard EWS for TC and PTC Members. In order to achieve this outcome the project reviewed and synergized existing SSOPs for coastal multi-hazard EWS in the Members of TC and PTC and developed the Manual of Synergized SSOPs for Coastal Multi-Hazards EWS. Workshops and missions to select pilot counties were conducted for identifying existing systems, gaps and opportunities to develop the Manual of Synergized SSOPs for Coastal Multi-Hazards EWS. It has also enhanced the performance and effectiveness of SSOPs for coastal multi-hazard EWS in Members of TC and PTC through integration, synergization, cooperation, and training.

In order to achieve this outcome the project has conducted training of users and issuers in the interpretation and preparation of EWS products for decision making, media, and communications, including a working meeting to build a cooperation mechanism between TC and PTC for coastal multi-hazards EW information sharing and technical transfer. The above mentioned outputs and outcomes are achieved through the following activities.

3.1.1 Activity 1: Review and synergize existing SSOPs for coastal multi-hazards EWS in the Members of TC and PTC and develop the Manual of Synergized SSOPs for Coastal Multi-Hazards EWS.

3.1.1.1 Evaluation of the results of the workshop in UNCC, Bangkok, May 8-9, 2013

A workshop on 'Standard Operating Procedures under the Project Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System' was conducted during May 8-9, 2013 at Bangkok, Thailand. The key objective of the workshop was to collect and exchange information on the performance status of coastal multi-hazard EWS in the 13 beneficiary countries of this project who are Members of TC and PTC. The associated outcome indicator for the workshop was the identification of needs and unmet gaps of current SSOPs for EWS in the 13 beneficiary countries. With the exception of Cambodia (the Cambodia representative presentation was

delivered to the participants), all the other beneficiary countries were able to attend and present the multi-hazards risks and early warning systems in their countries during the workshop.

In relation to the Manual of Synergized Standard Operating Procedures (SSOPs), the workshop suggested flexibility in approach and the consideration of national policy frameworks, including greater engagement with the NDMOs and NTWCs to increase probability of success at the national levels and so that early warning systems can work in a comprehensive manner. Training and human resource development was identified as a common need and gap for SSOPs (ESCAP et.al. 2013)¹². Issues of infrastructure improvement for better storm models, better observation tools, and better numerical forecasting tools were also discussed but were mostly beyond the scope of this project.

During the workshop, the key objective of the workshop was achieved through presentations, panel discussions, and general discussions. Key information on performance of existing coastal multi-hazards EWS and key needs and gaps of current SSOPs in all the 13 countries of this project were identified and captured in the workshop report. The workshop also recommended 3 pilot countries (Philippines, Bangladesh, and Pakistan) to prepare a draft *Manual of Synergized SSOPs for Coastal Multi-Hazards EWS*.

3.1.1.2 Evaluation of workshops in pilot countries and consultants missions

As planned, the project conducted three two-day pilot workshops on ‘Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System’ in the Philippines, Bangladesh, and Pakistan during October 3-11, 2013 through an international multi-agency team. These workshops aimed to identify the best practices, gaps and needs, as well as recommendations for next steps on the SSOPs, including an action plan to meet the needs of these three and ten other beneficiary countries of the project.

At country-level these workshops received vital assistance and support from the Philippines Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Bangladesh Meteorological Department (BMD), and Pakistan Meteorological Department (PMD). Facilitation teams for these workshops were mobilized from important institutions such as the Asian Disaster Preparedness Center, Asia-Pacific Broadcasting Union, Typhoon Committee Secretariat, and the Panel on Tropical Cyclones Secretariat.

These workshops were useful in identifying recurring themes for an effective early warning system such as (Weyman. J. C. 2013)¹³: a) support and commitment of governments at the highest levels as a key for success; b) use of legal and policy framework as a foundation at country-levels; c) collaborations and cooperation at national, regional, and local levels; d) media involvement as an important stakeholder; e) importance of a multi-hazards approach; and f) the need to address issues of a comprehensive people-centered early warning system at the country-level.

The workshops found that the strengths, gaps, and needs differ from one country to another as well as within countries between agencies and stakeholders. These workshops were helpful in identifying

¹² Economic and Social Commission of Asia and Pacific (ESCAP), ESCAP/World Meteorological Organization (WMO) Typhoon Committee (TC), WMO/ESCAP Panel on Tropical Cyclones (PTC) and Thai Meteorological Department. 2013. Report for the Workshop on Standard Operating Procedures under the Project Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System, UN Conference Center (UNCC), Bangkok, Thailand, May 8 – 9, 2013.

¹³ Weyman. J. C., Project Manager, Technical Advisor. 2013. Draft Summary Report on Three Pilot Workshops for Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System (Philippines, Bangladesh and Pakistan). November 18, 2013.

strengths at the country level such as (Weyman. J. C. 2013)¹⁴: a) availability of a favorable policy environment and framework for creating and maintaining SSOPs; b) good examples of existing SSOPs; c) existing systems of threat detection, monitoring, forecasting, and warning dissemination, including communication with key stakeholders; e) existing systems of emergency response and preparedness and f) existing formal and informal MoUs between key stakeholders at the country-level.

These workshops also identified the needs and gaps most commonly felt. This included (Weyman. J. C. 2013)¹⁵: a) SSOP development for specific need and for specific areas; b) integration in key institutions and sectors; c) testing and maintenance related needs; d) awareness creation and; e) formalization through MoUs. Both in terms of context and content, these workshop deliberations included many important suggestions for the SSOPs Manual development so that countries could easily use and adopt standardization processes. Thus, these workshops successfully achieved their intended purposes . These workshops provided much needed guidance and insights into developing the next phase for action, which included developing the SSOPs Manual as well as engage all the beneficiary countries and key stakeholders in review and trainings.

Three expert consultants, one on meteorology, one on hydrology, and one on Disaster Risk Reduction, conducted two-day missions in Maldives, Sri Lanka and Myanmar on August 4-5, 2014, August 7-8, 2014, and August 10–11, 2014 respectively. Similar missions to Malaysia, Cambodia, and Vietnam were conducted on August 28-29, 2014, September 1-2, 2014, and September 4-5, 2014 respectively. The purpose of these missions was to collect and compile data, information, examples, and diagrams on the best practices, gaps and needs, and recommendations for SSOPs to be included in the Manual on Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System which will meet the needs of the 13 beneficiary countries involved in the Project. In line with the set objectives of the missions, all three countries successfully identified best practices, gaps and needs, as well as recommendations for inclusion in the Manual on SSOP. These missions reviewed in detail the EWS and SSOP aspects from the points of view of meteorology, hydrology and DRR. These findings were captured in the forum of county-level mission reports, which will be further utilized in developing SSOPs Manual for all the beneficiary countries participating in the project.

3.1.1.3 Evaluation of the process of designing and drafting of the SSOPs Manual and its contents

The Manual on SSOPs was prepared with the purpose of promoting community resilience to coastal multi-hazards. The aim was to improve policy and institutional arrangements at national, district, and community levels through integrated, effective standard operating procedures for multi-hazards EWS. The evaluator finds the manual extremely useful in improving existing SSOPs and in creating new ones as it provides detailed guidance with relevant examples and references. The Manual consists of 15 Modules divided into six Parts to highlight the linkage between ongoing efforts with existing SSOPs and the need to improve them into SSOPs for a multi-hazards early warning system of coastal areas. The five parts are: Technical Background; Strategic Framework of SSOPs; Formalization of SSOPs; Towards an Effective and Sustainable Process of Improvement; National Meteorological and Hydrological Services (NMHSs) Activities in EWS; and Operationalizing Duty SSOPs. The

¹⁴ Weyman. J. C., Project Manager, Technical Advisor. 2013. Draft Summary Report on Three Pilot Workshops for Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System (Philippines, Bangladesh and Pakistan). November 18, 2013.

¹⁵ Weyman. J. C., Project Manager, Technical Advisor. 2013. Draft Summary Report on Three Pilot Workshops for Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System (Philippines, Bangladesh and Pakistan). November 18, 2013.

templates for creating SSOPs and checklists are found useful for creating new SSOPs as well as evaluating existing ones. The manual also includes critical guiding principles for contextual use and application, and strongly recommends the consideration of national policies and frameworks, including existing MoUs and arrangements. Such guidance makes the nature of the manual inclusive as well as flexible to adopt the different needs of users. The Manual on SSOPs was tested (still in draft version) in the hands of training missions of consultants to 3 PTC (Bangladesh, Maldives, Myanmar) and 3 TC countries (Cambodia, Lao PDR and the Philippines). Reports of these missions assisted the project manager in making adjustments to the Manual.

Based upon the findings during the missions in 6 countries, a “Quick Reference Guide” was developed as a separate document so that the SSOPs Manual could be tested in hands –on situations. It was developed to enable a quick and easy start for countries towards SSOPs and their continued development. A number of experts participating in the development and review process of the Manual are of the opinion that it contains valuable information and guidance for professionals working in the area of EWS. Since templates could be used as a ready reference, countries with proper technical inputs are likely to complete their SSOPs in a comprehensive manner.

Creating a password-protected web site could host a wide range of SSOPs (and MoUs) from around the region. The benefits of this mechanism could be substantial, but this would depend on a willingness to share critical information, pointed out one expert. The Manual contains much valuable information, but it was too long for the operational people to rapidly review and develop SSOPs. Therefore, a Quick Reference Guide was developed to meet these needs. Based on comments from other experts, more examples were provided and a specific template was provided. It was mentioned to the evaluator that the Manual on SSOPs is well formulated and compatible with WMO technical regulations for WMO Members.

3.1.2 Activity 2: Enhance the performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through capacity building.

3.1.2.1 Evaluation of the results of the training workshop on SSOPs in Nanjing, China and hands-on training workshops on SSOPs in 3 PTC and 3 TC countries

A highly successful training workshop on SSOP for coastal multi-hazards early warning system was conducted at the WMO Regional Training Center (RTC) in Nanjing, China on 9-11 June 2014. The training consisted of lectures, presentations and training scenarios followed by active discussions among participants, representatives of the beneficiary countries, and lecturers/trainers. The Workshop was attended by 33 participants from the beneficiary countries: Bangladesh (4); China (4); India (1); Lao PDR (1); Malaysia (1); Maldives (4); Myanmar (4); Pakistan (3); Philippines (3); Sri Lanka (2); Thailand (4); and Vietnam (2). Cambodia was the only SSOP project beneficiary country that did not send any representatives due to a lack of available human resources. The TC Secretariat had requested the countries to select one expert from the following four areas: decision-makers, disaster managers, media professionals, and warning issuers. Most countries were represented by a lower number of participants in relation to what had been requested by the TC Secretariat. Many also had multiple experts from one requested area, while none from others.

The workshop concluded that even though SSOPs for the EWS are considered important at the country level, the concept is yet to be fully adopted. Neither the format recommended by the publication “*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 is fully adhered nor have all beneficiary countries entered into MoUs between warning issuers and media organizations, between warning issuers and DRR, and

between DRR, and the media (ESCAP et.al. 2014)¹⁶. It also noted that recent disasters such as the severe Tropical Depression Washi/Sendong and Typhoon Haiyan/Yolanda lacked well-structured SSOPs. This inhibited effective response, which resulted in a large number of victims (ESCAP et.al. 2014)¹⁷. The workshop provided a number of recommendations for the preparation, coordination, integration, standardization, and documentation of SSOPs/MoUs prior to any event/disaster.

Three expert consultants, one on meteorology, one on hydrology, and one on Disaster Risk Reduction, conducted three-day missions to Myanmar, Maldives, and Bangladesh on January 28-30, 2015, January 18-20, 2015, and January 22, 25-26, 2015 respectively. Similar missions were conducted on January 19-21, 2015, January 23 and 26-27, and January 29-30 and February 2, 2015 for Cambodia, Lao PDR, and Philippines respectively. The main purpose of these missions was to evaluate the draft SSOPs Manual by using it to provide hands-on training and technical assistance on interpretation, preparation, and improvement of SSOPs for users and issuers. This feedback was used to inform and revise the SSOPs Manual. Thus, the set objectives of these missions were achieved through six missions to targeted countries to provide assistance as well as expertise to develop, update, coordinate, and implement improved SSOPs for coastal multi-hazards EWS.

3.1.2.2 Evaluation of the working meeting on building a cooperation mechanism (October 2014 in Bangkok) and process of the developing the cooperative mechanism (February 2015, Bangkok)

A Working Meeting on Cooperative Mechanism for Coastal Multi-hazards Early Warning Information Sharing and Technical Transferring between PTC and the TC was held in Bangkok on October 9-10, 2014. The main objectives of the workshop were to exchange information on the activities in PTC and TC, to find possible gaps and challenges in Coastal Multi-Hazards Early Warning System, and to identify priority areas on information sharing and technical transferring between PTC and TC to help fill identified gaps and to meet current and future challenges. The meeting was also useful in identifying priority areas on information sharing and technical transferring between PTC and TC to address them. Recommendations were identified for submission to the TC 47th Session which was held together with the PTC 42nd Session (3rd PTC/TC Joint Session – February 9-13, 2015).

Further discussions on strengthening of cooperative mechanism were done at the 3rd PTC/TC Joint Session, Bangkok 9-13 February 2015. For regular communication a cooperative mechanism was developed at a meeting of TC and PTC representatives. The Session was attended by 107 participants. They were represented from 12 of 14 Members of the Typhoon Committee, namely: Cambodia; China; Hong Kong, China; Japan; Lao PDR; Macao, China; Malaysia; Philippines; Republic of Korea; Thailand; the United States of America (USA); and the Socialist Republic of Vietnam; and 5 of 8 Members of Panel on Tropical Cyclone, namely: Maldives, Oman, Pakistan, Sri Lanka, and Thailand. The Joint Session also took note of the major progress and issues in meteorology, hydrology and DRR aspects under the Key Result Areas (KRAs) of TC as well as PTC Members in 2014.

¹⁶ Economic and Social Commission of Asia and Pacific (ESCAP), ESCAP/World Meteorological Organization (WMO) Typhoon Committee (TC) and WMO/ESCAP Panel on Tropical Cyclones (PTC). 2014. Summary Report on the Training Workshop on Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System WMO RTC Nanjing, China 9-11 June 2014.

¹⁷ Economic and Social Commission of Asia and Pacific (ESCAP), ESCAP/World Meteorological Organization (WMO) Typhoon Committee (TC) and WMO/ESCAP Panel on Tropical Cyclones (PTC). 2014. Summary Report on the Training Workshop on Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System WMO RTC Nanjing, China 9-11 June 2014.

The Joint Session noted the report of the Working Meeting on PTC/TC Cooperative Mechanism for Coastal Multi-Hazards Early Warning System Information Sharing and Technical Transferring between PTC and TC and decided to pursue the following joint activities (ESCAP/WMO 2015)¹⁸:

- a. To develop a mechanism for holding Joint PTC/TC Sessions more frequently and regularly.
- b. To develop a proposal for SSOP Phase II, based on the successful completion of the SSOP project, and to submit to ESCAP for funding consideration.
- c. To request ESCAP and WMO to provide funding and expertise support for extending the TC on-going project of real-time Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) to PTC Members. This is to commence with a joint workshop on implementing OSUFFIM for selected pilot cities in TC and PTC Members in 2015.
- d. To facilitate PTC and TC Members to participate in each other's annual sessions and workshops/seminars, and to encourage PTC Members to seek funding through ESCAP or WMO for attendance to training courses and workshops offered by TC Members .
- e. To coordinate and undertake joint expert mission in assessing the damage caused by tropical cyclones and related disasters with ESCAP support.
- f. To invite two to three tropical cyclone forecasters from PTC Members to the RSMC Tokyo attachment training every year with the support of ESCAP, and to request ESCAP to make financial and logistic arrangements for the PTC participants in cooperation with RSMC Tokyo.
- g. To invite one or two tropical cyclone forecasters or researchers from PTC Members to the TRCG Research Fellowship Scheme of KMA every year if possible with the support of WMO/ESCAP or other donors. To request WMO/ESCAP to make financial and logistic arrangements for the PTC participants in cooperation with KMA.
- h. To invite TC members to join the initiatives of RSMC New Delhi on Forecast Demonstration Project on landfalling cyclones over Bay of Bengal, Severe Weather Forecast Demonstration Project and coastal inundation modelling with the involvement of PTC member Countries.
- i. To invite TC members to participate in the annual bi-weekly training and short term weekly/bi-weekly training programmes on specific themes such as Satellite Meteorology, Radar Meteorology, and NWP currently conducted by RSMC New Delhi/IMD for the benefit of PTC countries. While RSMC New Delhi provides only training support, it requests extra-budgetary resources to support air fare and DSA for the participants of PTC and TC member Countries.
- j. To strengthen data sharing between TC and PTC Members including satellites data, noting that by the end of 2016 EUMETSAT will terminate the operations of Meteosat-7.

3.2 Evaluation against specific evaluation criteria

The project targeted 13 countries, 6 from the TC region and 6 from the PTC region and Thailand which belongs to both. 10 of the 13 countries were part of the Pilot mission and/or two consultants missions. India, China, and Thailand (the other 3) provided excellent input during meetings and in response to requests to review the SSOPs Manual. Actually, most of TC Members were involved in the implementation of SSOP project in term of providing information, participation of workshops, advice from AWG members and WGs, etc. The activities mandated by the project in meeting the long term goal for the project are found suitable and timely. The project activities have successfully contributed to the longer term goal of the project which is to promote community resilience to coastal multi-hazards and to improve the policy and institutional arrangements at national, district, and community levels through integrated, effective standard operating procedures for multi-hazards EWS. The following section presents the findings of the project against specific evaluation criteria of relevance, effectiveness, efficiency and sustainability.

¹⁸ ESCAP/WMO 2015. Report of the 3rd Joint Session of Panel on Tropical Cyclone/Typhoon Committee (42nd Session of PTC and 47th Session of TC), Bangkok, Thailand, 09 – 13 February 2015

3.2. 1 Relevance

The assessment against the relevance criterion refers to the consistency of the project's intended objectives with ESCAP's priorities, governments' development strategies, and priorities and requirements of the target groups.

Project stakeholders have found the project interventions relevant to their needs as most Members experience natural disasters in one form or the other. The importance of project interventions to improve coordination and cooperation mechanism between various agencies at the national level can be realized by quoting two recent examples of responses by state and non-state actors such as 'PHAILIN' and 'HUDHUD' in which hundreds and thousands of lives were saved with effective early warnings. The project was also found in line with the WMO Executive Council at its 66th session (2014) (EC-66), when it was decided that impact-based forecasting and risk-mapped warning in the WMO Multi-Hazards Early Warning System would be promoted. This requires multi-agency, multi-stakeholder coordination and cooperation.

A number of country level consultancy missions found the project relevant and needed. For example, in Philippines a consultancy mission found that although PAGASA had documented procedures and practices for major hazards, there was no evidence of supporting SSOP documentation with the exception of river/stream flooding; neither had PAGASA signed any MoUs with key disaster management agencies and the media (James Thomas Davidson J. T. et.al. 2015)¹⁹. Similarly, in Myanmar, weather events such as heavy rainfall and tropical cyclones were found relevant but were not well documented by the DoM&H in SSOPs (Dr. Y.E.A.Raj et.al. 2015)²⁰. In Maldives, no comprehensive system was established to effectively coordinate the dissemination of information after a hazard event had occurred (Dr. Y.E.A.Raj et.al. 2015)²¹. Even in Lao PDR, while DMH obviously has operational practices in place there was evidence of only one draft SSOP (Davidson J. T. et al. 2015)²².

Furthermore, from the review of the project proposal and documents, it is clear that the project was relevant and built on a) the key findings of Early Warning Systems in the Indian Ocean and Southeast Asia – 2011 Report on Regional Unmet Needs prepared by the ESCAP Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries, which clearly pointed out that an end-to-end disaster early warning system should be a fundamental component of all nations' DRR strategies and; b) the two priorities of the Hyogo Framework for Action (HFA) 2005-2015 that emphasized the importance of EWS and public awareness.

One of the interviews revealed that the implementation of the project should have been preceded by an inquiry addressing interest of all PTC and TC Members. Selection of countries could have been made based on the level of interest shown. This could have led to better results. Countries such as Oman (which is not a member of ESCAP) could have been considered for the project as it remains the only PTC country not targeted under the project. It was felt that the project was financially constrained, and interventions such as training missions should have covered more beneficiary countries.

The project directly contributed to the HFA. By identifying, assessing, and monitoring disaster risks, as well as enhancing early warning, the project was in line with the second priority for action. It contributed to the third priority by using knowledge, innovation and education to build a culture of

¹⁹ James Thomas Davidson J. T. et.al. 2015, Consultancy Mission Report for Philippines, February 2015.

²⁰ Dr. Y.E.A.Raj et.al. 2015. Consultancy Mission Report Myanmar. Final version dt 16-03-2015.

²¹ Dr. Y.E.A.Raj et.al. 2015. Consultancy Mission Report Maldives. Final version dt 08-03-2015.

²² James Thomas Davidson J. T. et.al. 2015. Report on Second Consultancy Mission for Lao PDR. February 2015.

safety and resilience at all levels. The project strategy remains relevant even for future interventions as it takes into account the three key components of an effective EWS i.e., issuance of warnings, interpretations of warnings, and communication of warnings to the last-mile (and not just accurate and timely forecasts). An interviewee from Cambodia explained that the project concept was useful but was new and yet to be applied in targeted countries. It was also mentioned that no obvious benefits of linking TC-PTC are observed so far. Another representative from Cambodia mentioned that the link with PTC remains unclear.

Even though the formulation of the SSOP project preceded the Sendai Framework for DRR, the project fits perfectly to this Framework, to the extent that its main outcomes (Outcome 1: Integrated, effective standard operating procedures for coastal multi-hazard EWS for TC and PTC Members and the Outcome 2: Improved performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through integration, synergization, cooperation, and training) fit the main priorities of the Sendai Framework for DRR, particularly the Priority 4 (Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction”). Even though countries such as Australia were not targeted, a representative from Australia considered the SSOPs Manual and the associated Quick Reference Guide a valuable resource and mentioned that the project has strengthened the communication and cooperation between TC and PTC countries, which will indirectly benefit Australia as a major provider of coastal multi-hazards EWS in the Region. Thus, processes and interventions undertaken under the project are also found to be relevant to other developed nations in the targeted regions.

The following table shows the project’s relevance in terms of country level priorities and needs expressed in their recent statements, policies, and plans.

No.	Country	Priorities and needs
1	Bangladesh	‘Bangladesh needs detailed study to scientifically assess the tsunami vulnerability. Bangladesh also needs to develop a tsunami early warning system and mass awareness of tsunami threat at the coastal areas (Government of Bangladesh 2008) ²³ .
2	Cambodia	The Royal Government of Cambodia has reported that it is making significant progress on developing and testing actionable EWS using newly developed technology such as Unified SMS and Voice Alert System during the Third World Conference of Disaster Risk Reduction(Sovan R. 2014) ²⁴ .
3	China	Recently, China has reported that ‘nature disaster monitoring, early-warning system further improved in terms of meteorological, hydrological, earthquake, geological, ocean, forest fire and pests and disease issues’ (Mr. Liguo Li 2015) ²⁵ .
4	India	As per the provisions of 2005 Disaster Management Act, the country is required to ‘set up, maintain, review and upgrade the mechanism for early warnings and dissemination of proper information to public’ (Government of India 2005) ²⁶ . ‘The Indian National Centre for Ocean Information Services operates the Tsunami Early Warning System... As a part of SAARC Monsoon Initiative, an integrated operational system for monitoring and forecasting monsoon weather

²³ Government of Bangladesh 2008. National Plan for Disaster Management 2008-2015.
http://www.preventionweb.net/files/9472_NationalPlanforDisastermanagement.pdf

²⁴ Sovan R. 2014. Statement of his Excellency Mr. Ross Sovan, Deputy Secretary General of the National Committee for Disaster Management, Royal Government of Cambodia. First Session of the PrepCom1 of the Third UN WCDRR. Geneva, Switzerland. July 14-15, 2014. <http://www.preventionweb.net/files/globalplatform/statementcambodia.pdf>

²⁵ Mr. Liguo Li 2015. Official Statement Speech by Mr. Liguo Li, Minister, Ministry of Civil Affairs of People’s Republic of China. March 14, 2015. Sendai. [http://www.preventionweb.net/files/globalplatform/china\[1\].pdf](http://www.preventionweb.net/files/globalplatform/china[1].pdf)

²⁶ Government of India. The Disaster Management Act 2005. http://www.preventionweb.net/files/9134_dmact20051.pdf

		systems has been set up to address monsoon induced hydro-meteorological disasters in the region' (Government of India 2015) ²⁷ .
5	Lao PDR	Lao PDR has stated that it will continue to cooperate with the international community on range of DRR issues including 'strengthening an early warning system and preparedness at all levels while decentralizing more responsibilities to the local authorities' (Lao People's Democratic Republic 2014) ²⁸ .
6	Malaysia	'Due to the fact that an effective early warning system can make the difference between life and death, Malaysia is looking towards integrating the country's early warning system. The ability to deliver vital information and impact forecast to the right target groups allows for swift decision making and response to protect people's livelihoods' (Government of Malaysia 2015) ²⁹ .
7	Maldives	'Meteorological, oceanographic and seismic hazard monitoring networks established by the Maldives Meteorological Service is in operation 24X7, except 8 automatic weather stations (AWS) and Doppler Weather Radar (DWR). Multi-Hazards Early Warning System (MHEWS) is operational, advisory and timely warnings are issued for extreme events and disseminated to focal points via mobile network and to citizens through media' (Fathimath Thasneem 2013) ³⁰ .
8	Myanmar	'The dissemination of early warning is unable to reach remotest sections of community... dissemination framework for early warning should be restructured or redefined by bringing in wider participation of stakeholders, horizontally and vertically. The message of early warning needs to be understandable and simplified for community. Warning signals are also not standardized. Local level preparedness plans are yet to integrate early warning along with necessary response measures' (Mr Soe Aung. 2011) ³¹ .
9	Pakistan	The country recommended to 'Synergies in scientific innovations and use of modern technology to strengthen hazard forecasting and early warning dissemination' at the 3 rd WCDRR at Sendai, Japan (Government of Pakistan 2015) ³² .
10	Philippines	The National Disaster Risk Reduction and Management Plan 2011-2028 of Philippines under its Thematic Area 1: Disaster Preparedness and Mitigation has included establishment and/or improved 'End-to-end monitoring (monitoring and response), forecasting and early warning systems' as one of the key outcomes by identifying Department of Science and Technology (DOST) as overall responsible/lead agency (Government of Philippines 2011) ³³ .
11	Sri Lanka	The National Policy on Disaster Management in Sri Lanka has clearly stated that: a) in case of a known or predicated emergency, a single designated agency should disseminate clear, concise and early warning messages at national, sub-national and community levels; b) early-warning and emergency response systems must be operational and regularly tested at national, regional, local and

²⁷ Government of India 2015. 3rd WCDRR. Sendai. Japan, 14-18 March, 2015. Country Statement by Union Home Minister, Government of India. <http://www.preventionweb.net/files/globalplatform/countrystatementindiafinal.pdf>

²⁸ Lao People's Democratic Republic 2014. Statement by His Excellency Mr. Asang Laoly, Deputy Prime Minister, Chair of the National Disaster Prevention and Control Committee at the Third UN World Conference on Disaster Risk Reduction. March 14-18, 2014. <http://www.preventionweb.net/files/globalplatform/statementofthelaopdr.pdf>

²⁹ Government of Malaysia 2015. Third WCDRR. Official Statement by H.E. Tan Sri Muhyiddin Mohd Yassin, Deputy Prime Minister. March 15, 2015. Sendai. <http://www.preventionweb.net/files/globalplatform/ministerialstatementmalaysiafinalre.pdf>

³⁰ Fathimath Thasneem 2013. Maldives: National progress report on the implementation of the Hyogo Framework for Action (2011-2013). http://www.preventionweb.net/files/28967_mdv_NationalHFAprogress_2011-13.pdf

³¹ Mr Soe Aung. 2011. Myanmar HFA Progress Report 2009-11. http://www.preventionweb.net/files/16315_mmr_NationalHFAprogress_2009-11.pdf

³² Government of Pakistan 2015. Draft statement by Pakistan: Third UN WCDRR. Sendai: Japan. March 14-18, 2015. <http://www.preventionweb.net/english/policies/v.php?id=44042&cid=129>

³³ Government of Philippines 2011. National Disaster Risk Reduction and Management Plan (NDRRMP) 2011-2028. http://www.ndrrmc.gov.ph/attachments/article/41/NDRRM_Plan_2011-2028.pdf

		community level; c) the early warning system must be integrated into regional and global networks and service providers and d) in the event of tsunami threat, a Technical Advisory Committee should take the decision to evacuate people (NCDM 2010) ³⁴ .
12	Thailand	'Thailand by responsible national agencies has systems in place to monitor, archive and disseminate data on key hazards and vulnerabilities, such as tsunami, landslide, telemetering for flood, and earthquake. Besides, we also set up the community-based systems to monitor flashflood and landslide in the risk prone areas' (Mr Chatchai Phromlert 2015) ³⁵ .
13	Vietnam	'Despite the resource constraint, Vietnam still gives priority to science and technology projects, particularly IT and remote sensing technologies to develop the database providing basic information about natural disasters, the early-warning systems, and sustainable communication systems' (Nguyen Thi Doan 2015) ³⁶ .

3.2.2 Effectiveness

The assessment against the effectiveness criterion refers to the extent to which the expected objectives of the project have been achieved, and have resulted in changes and effects, positive and negative, planned and unforeseen, with respect to the target groups and other affected stakeholders.

The overall strategy of using the PC and PTC as a common communication network for improving the meteorological and hydrological services through development of SSOPs for coastal multi-hazards early warning system and capacity building for targeted counties has been quite successful. The strategy has made the targeted countries' approach towards accountable and performance oriented early warning systems. The process of review and exchange of ideas for the development of SSOPs has contributed to knowledge enhancement.

The structure of the project composed of a Steering Committee, Project Manager/Technical Advisor, and Task Force has also performed well. The project was carefully planned with inputs from ESCAP and experts from other organizations such as ABU, ADPC, IOC/UNESCO, PTC, RIMES, TC, and WMO. In the ToRs of the SSOP project, success indicators for the main actions were established, and have largely been achieved. A Service Agreement was signed by the Secretary of TC and the Project Manager, and contracts were established between TCS and the consultants for their missions. The ToRs of the Project Manager, Steering Committee and Task Force were also established and approved by the 45th TC Annual Session (Hong Kong, China, January 29 - February 1, 2013). The Implementation Plan of the project was established and approved as well.

The project activities have alerted the TC and PTC beneficiary countries on the advantages in taking advantage of adopting a standardized way of drafting their SSOPs. However, some gaps were pointed out. One of the survey results indicated that though implementation arrangements were effective, mobilizing support and involvement of multiple actors and agencies at regional and national levels for planning purposes were challenging and took time. Similarly, another interviewee felt that the trainings conducted under the project needed more practical examples from disaster events, and that the incorporation of mock drills could have enhanced the overall value of the training package.

³⁴ National Council for Disaster Management (2010). The National Policy on Disaster Management in Sri Lanka <http://www.disastermin.gov.lk/web/images/pdf/sri%20lanka%20disaster%20management%20policy%20english.pdf>

³⁵ Mr Chatchai Phromlert 2015. Thailand. National progress report on the implementation of the Hyogo Framework for Action (2013-2015). http://www.preventionweb.net/files/41674_THA_NationalHFAprogress_2013-15.pdf

³⁶ Nguyen Thi Doan 2015. Remarks: By Vice State President Nguyen Thi Doan at 3rd UN World Conference of Disaster Risk Reduction. March 14-18, 2015. <http://www.preventionweb.net/files/globalplatform/Viet-Nam-statement-at-Sendai-Conference.pdf>

The efforts of the TC Secretary for new and strengthened cooperation between the TC and the PTC through the project under review were appreciated by the ESCAP in a formal letter dated February 25, 2015 (Akhtar S. 2015)³⁷. Similarly, support from the TC Secretary was appreciated by the WMO Secretary-General for strengthening the regional cooperation mechanism to support the delivery of typhoon early warnings to Members by establishing SSOPs among meteorology, hydrology, and DRR communities and for promoting stronger links with the WMO/ESCAP Panel on Tropical Cyclones (Jarraud M. 2015)³⁸.

Outcome 1 (Integrated, effective standard operating procedures for coastal multi-hazard EWS for TC and PTC Members) and Outcome 2 (Improved performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through integration, synergization, cooperation, and training) were successfully achieved in some beneficiary countries. In order to fully achieve both outcomes in the 13 beneficiary countries, a SSOP Phase II is advisable. For fully achieving both outcomes in the 13 beneficiary countries and applying results of this project in other countries of TC and PTC, a SSOP Phase II would be advisable. The proposal of SSOP phase II has planned such up-scaling so that other countries in TC and PTC also benefit from the experience and gains of this project. Regarding Outcome 2 (Improved performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through integration, synergization, cooperation, and training), it is still early to state that it was fully achieved, but the Manual on SSOPs will greatly contribute for this purpose.

The project contributed to warning knowledge and practices by discussing the concept of SSOPs. This is not yet adopted in many countries. Activities have contributed to better knowledge on how to save time for making decisions in case of a hydro-meteorological disaster. If utilized properly, the manual can further contribute to enhancing the capacity of relevant government departments that deal with monitoring and forecasting of hydro-meteorological hazards.

Financial resources need to be more sustainable, however, so that mission consultants can be paid as per UN norms. While the project performed well with limited resources, in some cases potential collaborators refused to perform the tasks for which they were invited as payment was insufficient. Due to excessive costs, it was necessary to go forward without the collaboration of DRR experts as partner organizations demanded additional payment apart from the cost of travel and DSA.

One of the interviewees mentioned that for multi-agency SSOPs to be comprehensive and fully effective, the engagement and commitment of NMHSs, NDMOs, media, and key government agencies is necessary. However, during some of the missions, it was found that the NMHSs, disaster management offices, and the media did not coordinate well and seldom met jointly. At this stage, the project has partly achieved its expected outcomes as more training and development needs to be done. On a positive note, a number of countries involved in the project have made significant progress in developing SSOPs (both internally and externally), especially during the final phase of the Project.

To an extent, the project has succeeded in presenting a comprehensive overview of EWS in the TC and PTC countries by comparing, documenting and sharing good practices. In a country such as Cambodia, the project has helped shift focus from the meteorological department to the hydrological department, which is considered more effective and useful in improving EWS. In

³⁷ Akhtar S. Under-Secretary-General of the United Nations and Executive Secretary of ESCAP, 2015. Letter to Mr. Olavo Rasquinho, TC Secretary dated February 25, 2015. Bangkok: Thailand.

³⁸ Jarraud M. 2015, Secretary-General WMO OMM. Letter to Mr. Olavo Rasquinho, TC Secretary dated April 1, 2015. Geneva: Switzerland.

Cambodia, the project has improved focus on agriculture, infrastructure, new investment in irrigation projects and dams through the use of EWS, and has lead to better management of human resources. However, it was felt that more money is needed to address climate change issues causing increased extreme events as weather variation across the years have changed.

3.2.3 Efficiency

The assessment against the efficiency criterion refers to the extent to which human and financial resources were used in the best possible way to deliver activities and outputs, in coordination with other stakeholders.

Given the fact that a majority of targeted TC and PTC members are either in developing and/or less developed countries, implementing the project by intergovernmental organizations such as ESCAP/WMO TC and WMO/ESCAP PTC in cooperation with ADPC, ABU, GAATES and IOC of UNCESCO seems appropriate. These organizations have successfully contributed to the development of SSOPs for multi-hazards early warning, concentrating mainly on the meteorological and hydrological services.

The project has brought the NMHSs (institutions that issue warning information) and NDMOs (institutions that make decisions for preparedness and DRR, including warning dissemination and response) closer. As many of the NTWCs are also members of NMHSs, the project linked them with NDMOs for better performance of SSOPs for coastal multi-hazards EWS. The roles of these organizations were kept in mind while developing the Manual of Synergized Standard Operating Procedures for Coastal Multi-hazards Early Warning System. The manual was then distributed to these institutions in all targeted countries.

The Letter of Agreement between ESCAP and TC to fund this project was signed on August 1, 2012, with the established deadline of 31 July 2014. The start of the project was delayed due to the requirement of TC to approve it at the 45st Annual Session (Hong Kong, China, Janauary 29 -February 01 2013). Due to the complexity of the project, the great difficulties in getting agreement for the training dates, difficulties in contracting 6 consultants for two missions in 6 PTC and 6 TC countries, and also the great number of experts commenting and suggesting changes to the first versions of the Manual, ESCAP approved no-cost extensions of the deadline two times; the first extension was until January 31, 2015, and the most recent until May 31, 2015.

The first extension was granted as several Members of TC considered it necessary for the ToRs of the project to be approved. The ToR of the Steering Committee, Task Force, and Project Manager was to be approved by the 45th TC Session, which implied a delay of several months. The second extension was mainly due to great difficulties in harmonizing the dates between the consultants and the countries to be visited in a sequential way. For example, in some countries there were official holidays in the foreseen periods of the visits, which would imply additional costs of the consultants were to remain for longer in those countries. Furthermore, in some Muslim countries, it was not possible to perform the activities during Ramadan. Difficulties in obtaining visas for the consultants contributed to the delay of some activities. Last minute difficulties due to bureaucratic reasons also prevented some potential participants from attending the workshops.

The table below shows the timeline of activities of the project, where one can see how most of the activities were impeded towards the project due to reasons mentioned above.

Year/dates	Nature of actions
January 15, 2012	ESCAP/WMO TC Secretariat submitted a project entitled Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System

	to the Economic and Social Commission for Asia and the Pacific (UNESCAP) for funding through the Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and South East Asia.
August 1, 2012	The Letter of Agreement between ESCAP and TC to fund this project was signed on August 1, 2012, with the established deadline 31 July 2014. The start of the project was delayed due to the requirement of TC to approve at its 45st Annual Session (Hong Kong, China, January29,--February 1, 2013).
When?	Due to the complexity of the project, the involvement of 13 beneficiary countries, the great difficulties in getting the agreement for the training dates, difficulties in contracting 6 consultants for two missions in 6 PTC and 6 TC countries, and also the great number of experts commenting and suggesting changes to the first versions of the Manual, ESCAP approved no-cost extensions of the deadline twice, the first one until January 31, 2015 and the most recent until May 31, 2015.
May 8-9, 2013	Workshop in UNCC, Bangkok, May 8-9, 2013 to identify current status of EWS and associated SSOPs, initial identification of strengths, needs, and unmet gaps of SSOPs for EWS in the selected target countries.
October 2013	Workshops in Pilot Countries (Bangladesh, Pakistan and the Philippines) in October 2013, to review existing coastal multi-hazards EWS SSOPs of hydro-meteorological service, disaster management, media, elected officials, and others from national to local levels; identify best practices, gaps and needs; and recommendations.
June 2014	Training Workshop on Synergized Standard Operating Procedures for Coastal Multi-hazards Early Warning System Nanjing, China, 9 – 11 June 2014)
August/September 2014	Consultants missions in August/early September 2014 to 3 PTC countries (Myanmar, Sri Lanka and Maldives) and 3 TC countries (Malaysia, Cambodia and Vietnam) to review existing coastal multi-hazards EWS SSOPs, identify best practices, gaps and needs, and compile data, information, examples, and diagrams on SSOPs.
October 2014	Working meeting on building a cooperation mechanism (October 2014 in Bangkok)
January/February 2015	Hands-on Training Workshops on SSOPs conducted in 3 PTC (Maldives, Bangladesh and Myanmar) and 3 TC (Cambodia, Lao PDR, and the Philippines) in January and February 2015.
February 2015	Further strengthening of cooperative mechanism was done at the 3 rd PTC/TC Joint Session, Bangkok 9-13 February 2015.

On a positive note, the Project Manager/Technical Advisor was offered USD 54,000 to work for 2 years, part time, for this project. As the project manager believed in and supported the needs identified in the project, he stated he would work for USD 10,000 per year which was USD 20,000 for the 2 years and USD 5,000 for the extension into 2015. The rest he donated to the project itself. The Typhoon Committee was fortunate to have an experienced expert with substantial knowledge on both the mission and vision of TC as project manager. He is one of the authors of its Strategic Plan, which greatly contribute to the success of the SSOP project.

On leveraging resources at the national level, the evaluator has received mixed responses. At the country-level, TC leveraged UNDP expertise at the country level. However, it was suggested that it could have used the country office contacts more and could have achieved better integration with UNDP work on the ground. The project has been able to leverage additional resources in most countries. For example, in China, resource persons and hall were provided by the government for the training. Similarly, in Pakistan, local transport and work links were made by Pakistani

counterparts. One of the survey results indicated that more time for project implementation could have allowed the project team to schedule more activities with better outcomes; more trainings could have been organized if a much larger budget had been made available.

The project demonstrated that the concept “Standard Operating Procedure” was not well known in several countries. Despite the WMO publication “Guidelines for Creating a Memorandum of Understanding and a Standard Operating Procedure between a National Meteorological or Hydrometeorological Service and a Partner Agency” some countries had not adopted the SSOP format for their list of procedures in preparing and issuing their alerts, watches or warnings. The cost estimates were correct in a general way despite some corrections made in several budget items (e.g., monetarily compensating workshop participants in some countries had not been foreseen in workshops in some PTC countries).

The following list of actions improved efficiency of the overall project.

- For the 3 Pilot Visits, ADPC and ABU representatives actively participated at each location. TC paid their travel costs, but no stipend or payment was provided for services.
- At the Training Session in Nanjing China, TC had a wide array of excellent speakers and instructors who are international experts in their field. Again, TC paid for their travel, but TC did not pay a stipend towards or payment of services. This includes representatives of TCS, OTCS, WMO, UN, RTC, ADPC, IOC, UNESCO, STI, SMS, Tohoku University and ABU.
- During the second consultant visits to the 3 TC countries, one of the consultants, Ken Kleeschulte, was compensated for travel but was not provided a stipend or payment of services. The USA covered his salary costs for the missions.
- As the SSOPs Manual was developed, revisions were sent to a wide array of people including UN Women, UNDP, and many others. These agencies and organizations provided valuable comments which were incorporated into the SSOPs Manual.
- As the training session was held at the WMO Regional Training Center in Nanjing China, no costs were incurred for the training location.
- The first set of consultant missions, and second set of consultant visits were scheduled to save travel costs and to efficiently use the time of the people conducting the missions. The missions were scheduled around holidays and some work weeks which were Sunday through Thursday. As the work weeks of some countries are Monday to Friday and some are Sunday to Thursday, the missions were able to take advantage of this by scheduling some missions on Sunday and Monday while scheduling others Thursday and Friday. For all of these, TC arranged all travel and schedules so that the least expensive, most efficient method of transportation was used.
- The Project Manager/Technical Advisor costs were cut from USD 54,000 to work to USD 25,000.

3.2.4 Sustainability

The assessment against the sustainability criterion refers to the likelihood that the positive effects of the project will continue in the future.

In response to the December 2004 Indian Ocean Tsunami, many countries in Asia located in the region covered by TC and PTC, developed national tsunami systems supported by regional tsunami warning information services. However, considering the low frequency of tsunami and many other competing priorities at the country-level, sustainable maintenance of an effective, operational tsunami warning system alone would have been a difficult task at national levels. To address this challenge, the project has successfully developed and floated the concept of an operational coastal

multi-hazards early warning system as a more sustainable option. This included other coastal hazards such tropical cyclones, storm surge, floods, inundation, sediment disasters, etc. However, to be fully sustainable, the regional nature of hazards such as tropical cyclones SSOPs as well as dissemination partners are needed, especially at the national level.

The evaluator is of the opinion that there is a great potential for project outcomes and outputs to be continually utilized by ADPC, ABU, GAATES, ADDRC and IOC UNESCO research and activities, as well as by national authorities and institutions targeted. Workshops and missions have helped create some sense of ownership of project outcomes. But to be fully sustainable, the next phase of action, which would focus on provision of financial support at the country-level, should be considered.

One of the interviewees mentioned that the project cannot be sustainable until it is embedded in institutions. We must also realize that the preparation of SSOPs is a continuous process and modifications will be required as we gain more experience in real situations. Thus, the real sustainability of the project would come from national governments and authorities in keeping the SSOPs up to date and refined after every major disaster event.

In India, IMD has prepared a set of SSOPs for Cyclone Hazards, which has proved quite efficient in forecasting very severe cyclonic storms such as 'PHAILIN' and 'HUDHUD'. IMD has signed a MoU with the Indian National Centres for Ocean Information Services (INCOIS), which is the agency for matters related to tsunami in India. Such arrangements would certainly synergize operation for both tropical cyclones and tsunami. More detailed analysis of the adverse impact of natural disasters on communities, geographical areas, and sectors needs to be incorporated into SSOPs to link them with DRR efforts.

The project is sustainable in terms of approach. The project has established a cooperative mechanism through discussions and negotiations, which will serve as the basis for future actions. Countries have indicated that they would like to continue technical transfer as well as trainings at country levels for refinement of SSOPs. The main output 2 of the project (Regular communication and cooperation mechanism between TC and PTC on coastal multi-hazards early warning system, particularly southern countries in the region) is expected to contribute to sustainability.

The TC and the PTC budgets are designed for supporting their regular activities, such as workshops, training courses, meetings, etc. For this reason, support from other organizations (e.g., ESCAP, WMO) for implementing this cooperation mechanism will be necessary. The project generated a great interest in most of the beneficiary countries and alerted the respective NMHSs on the necessity of having well structured SSOPs. As this project involved a great number of countries, the best way to guarantee the exit/ sustainability is ESCAP, PTC and TC Members to support the implementation of the Cooperative Mechanism and prepare a SSOP Phase II.

Project partners seem to be in agreement regarding the importance and continuity of the project. For example, senior officers within PAGASA gave a commitment to continue working with partners to first finalize and then operationalize the new SSOPs by progressing it through administrative channels (James Thomas Davidson J. T. et.al. 2015)³⁹. Similarly, one of the consultancy missions to Cambodia reported that the Director of the Department of Meteorology gave a commitment to continue working on further development and finalization of the SSOPs. It was also indicated that he will make a request to the TC to provide additional assistance to support formulation/development of additional SSOPs with media and NCDM partners (Davidson J. T. et al. 2015)⁴⁰.

³⁹ James Thomas Davidson J. T. et.al. 2015, Consultancy Mission Report for Philippines, February 2015.

⁴⁰ James Thomas Davidson J. T. et.al. 2015. Report on Second Consultancy Mission for Cambodia. February 2015.

A representative from Sri Lanka mentioned that capacity building should be continued but without financial support it would be difficult to carry at systematic and output oriented efforts. Bangladesh, Maldives, and Myanmar would also say that they needed additional resources to fully implement a complete SSOP program for EWS. Partner agencies such as ADPC recommended utilizing the SSOPs Manual in its trainings and other projects related to EWS. Sustainability is more likely with continuing tangible support and encouragement from TC/ESCAP.

The project also offered ways to collaborate with other regional and intergovernmental bodies such as ASEAN, SAARC as well as ADPC. Cambodia mentioned that it has integrated the project outputs into system and process so that budgetary allocations can be made, which also require money for operation and maintenance. However, how the overall project would be sustained was not well thought out. In Cambodia, some activities are expected to continue because of the Regional Mekon River Commission work. As uneven capacities across different stakeholders at the country level were mentioned, further capacity strengthening could be a key aspect in project outcome sustainability.

A number of countries have shown willingness to continue working on the SSOPs. The following comments are from the second consultant missions to 6 countries.

- a. Bangladesh. “There was a very positive attitude of Bangladesh, but insufficient time available to finalize the SSOPs.” “All the participants took part in the development process with full involvement, interest, and showed considerable initiation.” “The experience gained by BMD during the mission should be taken as a good beginning for the development of good SSOPs.”
- b. Maldives. “The willingness of the MMS to establish an urban flood forecast system, the successful effort to write SSOPs, and the motivation and interest generated for SSOPs are success areas for the mission.” “Initiatives during this mission should be taken as a good beginning and needs to be pursued further.”
- c. Myanmar. “The DRR Group experienced a paradigm shift with the ideas of integrated SSOPs in addition to the traditional stand-alone SSOPs”. “For hydrology SSOP, there was the realization for the first time of the need to develop and implement multi-hazards and integrated SSOPs.”
- d. Cambodia. “Participants were keen and enthusiastic to take part in the discussions and development of the SSOPs.” “The Director of the Department of Meteorology gave a commitment to continue to work on further development and finalization of the SSOPs.”
- e. Lao PDR. “The Mission to Lao PDR was most effective in achieving the main objectives. Participants were keen and enthusiastic to take part in the discussions and finalization of the SSOP.” “DMH is looking forward to finalizing the SSOP within two weeks for further review. DMH is also aiming to get it translated to the local language within three months. The next step would be to get it approved within its own department followed later on by the national stakeholders group comprising of 12 Ministries. Implementation of the SSOP would then be expected to follow.”
- f. Philippines. In the final session, senior officers within PAGASA gave a commitment to continue to work with partners to first finalize and then operationalize the new SSOP by progressing it through administrative channels. They further suggested that more SSOPs might be developed with time not only at the national level but also at lower levels (Regional, Provincial and Local).

It was mentioned to the evaluator that the WMO Tropical Cyclone Programme (TCP) is obliged to expand coordination and cooperation mechanisms in all tropical cyclone regional bodies including TC and PTC, so that implementing the EC-66 decision on promoting impact-based forecasting and risk-mapped warning can be facilitated.

4. Lessons

This chapter contains key lessons learned from the project execution. These are organized in the framework of SFDRR priorities of action and further categorized into policy and implementation areas.

SFDRR Priorities	Key lessons	
Priority 1. Understanding disaster risk	Policy	<p>It is learned that if similar projects in future include preparatory activities, a better impact can be achieved if assessments of risk and country demand are included. Policy makers need to be engaged right from the start for the ease of execution later. Risk assessments need to take into consideration trans-boundary issues as well as climate risk in coastal areas.</p>
		<p>It is learned that the project has allowed countries to start establishing links with their neighbors to work jointly on hazards such as floods and cyclones. This has been limited. However, risk assessments need to take into consideration trans-boundary issues as well as climate risk in coastal areas.</p>
	Operational	<p>It is learned that risk assessments must precede development of a multi-hazards SSOPs at the country level. It is also learned that since EWS is an important governance issue, it needs to be tied up with performance monitoring and evaluation mechanisms so that their performance can be measured.</p>
		<p>It is learned that without comprehensive risk assessment carried out jointly with national stakeholders, modifying, improving, and approving SSOPs or standing orders takes time.</p>
Priority 2. Strengthening disaster risk governance to manage disaster risk	Policy	<p>It is learned that in spite of efforts made, the coordination and cooperation mechanisms between TC and PTC regional remain weak. ESCAP, WMO, TC and PTC could have helped countries by linking MoUs with each other. ESCAP is well suited to do more work in this direction.</p>
		<p>It is learned that the engagement of media and other key stakeholders at the country-level could have been better recognized, acknowledged, and formalized within the national frameworks for DRR and EWS. Formalization of relationships within countries for effective implementation SSOPs through ToRs and MoUs is considered key by many people interviewed. The importance of engaging with the highest authority at the country-level and linking SSOPs with existing national legislation and plans was also considered important.</p>
	Operational	<p>It is learned that projects similar to this, formulate clear and achievable objectives with an established timeframe and clear outcomes to create ownership at the national levels. Much wider participation from country level stakeholders and comparison of SSOPs would have helped identify gaps and opportunities for better impact.</p>
		<p>It is learned that the project would have performed much better if it had a dedicated team at various levels as well as some basis for countries to coordinate early warnings and disaster response,</p>

			including monitoring and evaluation for continuous improvement.
Priority Investing in disaster risk reduction for resilience	3.	Policy	<p>It is learned that the project could have leveraged resources and strengths of other country level initiatives such as ADB initiative in Cambodia and other ESCAP initiatives in the TC and PTC regions. Such connections could have been identified and made at an early stage of project planning.</p> <p>It is learned that the economic case for effective EWS can be made clear to policy makers if integration is emphasized instead of creating parallels SSOPs. Some allocation of resources could have been planned and made for counties to carry out follow-up activities on their own to continue momentum.</p>
		Operational	<p>It is learned that as it is a complex process, better allocation of time and resources is needed so that change and rescheduling of activities can be made without compromising quality of outputs and outcomes. For example, consultants' missions to countries usually take 3-4 month to plan and prepare because of varying requirements for: approval by the government; coordinating mission dates (especially for multiple missions conducted after each other); issuance of invitation letters; scheduling travel; obtaining visas; agreeing upon an agenda; scheduling of consultants; work week differences; as well as country holidays and other commitments.</p> <p>It is learned that the project activities have not been able to involve all 13 beneficiary countries. Within targeted countries, the level of inputs required and progress achieved differed. This indicates the value of tailor-made allocation of resources and technical assistance for future actions.</p>
	4.	Policy	<p>It is learned that for an EWS to be effective, SSOPs must incorporate concepts of multi-hazards and fit into the framework of country's EWS and disaster response arrangements with clearly established roles and responsibilities of stakeholders involved, including communities at risk (TC 2014)⁴¹.</p> <p>It is learned that SSOPs need to be integrated at sub-national levels, and that local languages and demands for information need to be taken into account. The integration of small city level pilots could have revealed issues and challenges of such integration, which could have informed the SSOPs Manual.</p>
		Operational	<p>It is learned that development and review of multi-country owned document such as the SSOPs Manual takes time and rigorous follow-up for inputs and approvals. For such processes, offering a small stipend based upon hours expended on the task can increase the number and timeliness of responses. It is also learned that to overcome the difficulty of coordinating availability of an expensive expert, it might be better to hire recently retired experts at lower rates (most of the consultants hired for this project were retired experts).</p>
			<p>It is learned that workshops/training should be planned as far in advance as possible to coordinate agendas, attendees, venue, and visas. Often authorizations of the respective governments; responses to proposed agendas, objectives, and planned outcomes; and</p>

⁴¹ TC 2015. Manual on Synergized Standard Operating Procedures (SSOP) for Coastal Multi-hazards Early Warning System.

		building a good working relationship requires a great deal of time and patience, many times more than expected. The inclusion of hands-on exercises in small groups, based upon specific scenarios, is needed to reinforce the lecture material and also to generate training-related conclusions and recommendations.
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5. Recommendations

The recommendations are organized in a framework of ten principles common to seven good early warning systems—Bangladesh, China’s Shanghai city, Cuba, France, Germany, Japan and the United States—documented under an international effort coordinated by WMO and published in a book “Institutional Partnerships in Multi-Hazard Early Warning Systems” (Golnaraghi, M (Ed.) 2012)⁴² and the recently agreed Sendai Framework for Disaster Risk Reduction (SFDRR)⁴³.

No.	Principles	Who	What	Linkages with SFDRR (2015-2030)
1	There is a strong political recognition of the benefits of EWS reflected in harmonized national to local disaster risk management policies, planning, legislation and budgeting.	TC/PTC, NMHSs, NDMOs, Media and other Stakeholders.	It is recommended that next phase of action focuses on the formalization of SSOPs and implementation arrangements in terms of signing clear ToRs and MoUs with relevant stakeholders at national and other levels.	Priority 2. Strengthening disaster risk governance to manage disaster risk
2	Effective EWS are built upon four components: (i) hazard detection, monitoring and forecasting; (ii) analysis of risks and incorporation of risk information in emergency planning and warnings; (iii) dissemination of timely and “authoritative” warnings; and (iv) community planning and preparedness.	TC/PTC, NMHSs, NDMOs.	It is recommended that next phase of action focuses on a more comprehensive set of actions to include all four components of effective EWS starting from hazard detection to community preparedness. A method such as “The Stocktaking for National Adaptation Planning (SNAP)” ⁴⁴ with modification could be adopted to identify a common point of departure from standard procedures of effective EWS, which can help countries to standardize their SSOPs.	Priority 1. Understanding disaster risk
3	EWS stakeholders are identified and their roles, responsibilities, and coordination mechanisms clearly defined and documented within national to local plans,	TC/PTC, NMHSs, NDMOs.	It is recommended that the TC/PTC encourage their Members as needed to engage with the highest authority at the country level to define specific roles and responsibilities of each stakeholder in the EWS as per	Priority 4. Enhancing disaster preparedness for effective response and to “Build Back Better”

⁴² Golnaraghi, M (Ed.) 2012. *Institutional Partnerships in Multi-Hazard Early Warning Systems*, Springer Verlag Publishers, ISBN 978-3-642-25372-0 (2012). https://www.wmo.int/pages/prog/drr/projects/Thematic/MHEWS/MHEWS_en.html

⁴³ UNISDR 2015. Sendai Framework for Disaster Risk Reduction (2015-2030). March 2015.

http://www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf

⁴⁴ GIZ 2014. The Stocktaking for National Adaptation Planning (SNAP) Tool, https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/ms/mainstreaming-tools/giz-2014_Factsheet-SNAP-EN.pdf

	legislation, directives, Memorandums of Understanding (MoUs), etc.		existing national legislation and plans and make this arrangement public via CSOs and media.	in recovery, rehabilitation and reconstruction
4	EWS capacities are supported by adequate resources (e.g., human, financial, equipment, etc.) across national to local levels and the system is designed for long-term sustainability.	Donors/ESCAP.	<p>It is recommended that adequate financial resources are mobilized for the next phase of action to both widespread and deepen the follow up actions. In its HFA progress report for the period of 2013-2015, the Philippines (Pama A. 2015)⁴⁵, Lao PDR (Thanthathep K. 2015)⁴⁶ and Pakistan (Siddiqui W. 2015)⁴⁷ reported that against the core indicator 3 (Early warning systems are in place for all major hazards, with outreach to communities) of HFA Priority 2, institutional commitment has been attained, but achievements are neither comprehensive nor substantial. Countries such as Vietnam (Kirsch-Wood J. 2015)⁴⁸, Sri Lanka (Seneviratne A. 2015)⁴⁹ and India (Sarma G V V. 2015)⁵⁰, while reporting progress on the same indicator for the HFA Priority 2 mentioned that substantial achievement had been attained but with recognized limitations in key aspects, such as financial resources and/ or operational capacities. In Cambodia, SSOPs are high on the agenda, but limited budget and plans are yet to be developed. Many of the 6 countries committed</p>	Priority 3. Investing in disaster risk reduction for resilience

⁴⁵ Pama A. 2015. Philippines: National Progress Report on Implementation of the Hyogo Framework of Action (2013-2015), March 2015. http://www.preventionweb.net/files/43379_PHL_NationalHFAprogress_2013-15.pdf

⁴⁶ Thanthathep K. 2015. Lao People's Democratic Republic: National progress report on the implementation of the Hyogo Framework for Action (2013-2015), http://www.preventionweb.net/files/41813_LAO_NationalHFAprogress_2013-15.pdf

⁴⁷ Siddiqui W. 2015. Pakistan: National progress report on the implementation of the Hyogo Framework for Action (2013-2015) http://www.preventionweb.net/files/42312_PAK_NationalHFAprogress_2013-15.pdf

⁴⁸ Kirsch-Wood J. 2015. Vietnam 2015. National progress report on the implementation of the Hyogo Framework for Action (2013-2015), http://www.preventionweb.net/files/42305_VNM_NationalHFAprogress_2013-15.pdf

⁴⁹ Seneviratne A. 2015. Sri Lanka: National progress report on the implementation of the Hyogo Framework for Action (2013-2015) Interim. http://www.preventionweb.net/files/41730_LKA_NationalHFAprogress_2013-15.pdf

⁵⁰ Sarma G V V. 2015. India: National progress report on the implementation of the Hyogo Framework for Action (2013-2015) http://www.preventionweb.net/files/40210_IND_NationalHFAprogress_2013-15.pdf

			to continue this SSOP work after the consultants departed, but they believed additional assistance—technical, training, and financial—would be very beneficial. This may be in terms of staff in place as well as expertise available on call. Involvement of international actor such as DFID, ADB, The World Bank, IFRC OXFAM and others can jointly fund some activities of the next phase.	
5	Hazard, exposure and vulnerability information are used to carry-out risk assessments at different levels, as critical input into emergency planning and development of warning messages.	WMO, TC/PTC.	It is recommended that next phase of the project include preparatory activities such as scoping of multi-hazards EWS awareness among authorities and governments. Moving from integration to synergizations will take time and resources, including technical inputs. While climate change is gaining momentum globally, EWSs should be linked to climate risk more so that comprehensive assessment of risk can be made and resources from climate change adaptation initiatives could be better leveraged.	Priority 1. Understanding disaster risk
6	Warning messages are: (i) clear, consistent and include risk information; (ii) designed with consideration for linking threat levels to emergency preparedness and response actions (e.g., using colour, flags) and understood by authorities and the population; and (iii) issued from a single (or unified), recognized and “authoritative” source.	TC/PTC, NMHSs, NDMOs, Media and other Stakeholders.	It is recommended that more capacity building activities along with small city level pilots and performance rating of SSOPs in a real or mock situation be carried out. It is also recommended that communication and cooperation between TC and PTC countries is facilitated through a secure website (with password access) where MoUs and SSOPs can be deposited and shared. This has to be approved and agreed upon by Members as procedures for sharing critical information has to go through	Priority 4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction

			a long bureaucratic process.	
7	Warning dissemination mechanisms are able to reach the authorities, other EWS stake-holders and the population at risk in a timely and reliable fashion.	WMO, Donors/ESCAP TC/PTC	It is recommended that the next phase of action should be longer than three years, for five years so that enough time is available for finalization of SSOPs as well as testing and performance measurement during emergencies in beneficiary countries.	Priority 2. Strengthening disaster risk governance to manage disaster risk
8	Emergency response plans are developed with consideration for hazard/risk levels, characteristics of the exposed communities.	NMHSs, NDMOs, Media and other Stakeholders.	It is recommended that gains of the current project are consolidated and SSOPs are integrated in national policy frameworks and at sub-regional levels, especially at city-levels, integrating risk from both natural disasters as well as climate extremes.	Priority 1. Understanding disaster risk
9	Training on hazard/risk/emergency preparedness awareness integrated in various formal and informal educational programmes with regular drills to ensure operational readiness.	Intergovernmental organizations	It is recommended that the SSOPs Manual and Quick Reference Guide are now used as a solid basis for training and education by creating a SSOP trainer group in the region through a ToR. There is a need to share outcomes more widely as well as deepen the outcomes in the targeted countries with the existing partners. South-South knowledge exchange, research and networking activities around the theme of SSOPs are highly recommended to conserve and build on what is already gained.	Priority 3. Investing in disaster risk reduction for resilience Priority 4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction
10	Effective feedback and improvement mechanisms are in place at all levels of EWS to provide systematic evaluation and ensure system improvement over time.	WMO, TC/PTC	It is recommended that EWSs are made to be seen as risk governance issues, tied up with performance monitoring and evaluation mechanism so that impact could be measured.	Priority 2. Strengthening disaster risk governance to manage disaster risk

To turn the recommendations into road map, a suitable task forces or working group should be set up with regional bodies such as ADPC, ADRC, SAARC, and others.

Annexes

Annex I. List of people interviewed/surveyed

Sr. No.	Name
1	Jiping Liu, Hydrologist, UN ESCAP/WMO Typhoon Committee Secretariat (TCS)
2	Mr. Olavo Rasquinho, Former Secretary of TC (Feb. 2007 – March 15, 2015), member of SSOP Steering Committee and head of the SSOP Task Force)
3	Rajesh Sharma, Regional Expert, UNDP, Thailand
4	S. R. Ramanan, ISRO, India
5	James Weyman, Project Manager/Technical Assistant, along with TCS managed the Project, USA
6	Boonthum Tanglumlead, Thai Meteorological Department
7	Jim Davidson, Formerly Australian Bureau of Meteorology, Formerly Queensland Regional Director, Australia
8	A.R.Warnasooriya, Department of Meteorology, Sri Lanka, Deputy Director (Forecasting)
9	Atiq Kainan Ahmed, Asian Disaster Preparedness Center (ADPC), Bangkok, Programme Specialist (Early Warning Systems), Collaborating partner, and Expert Team/Mission Member Country, Asia Pacific Region.
10	Taoyong Peng, WMO, Chief Tropical Cyclone Programme Division, Management of the WMO Tropical Cyclone Programme
11	Yin Savuth, Hydrology Department, Director, Cambodia
12	Oum Ryna, Meteorological Department, TC member, Cambodia
13	Sota Kimkon Mony, Cambodia Disaster Management Committee, Deputy Director, Cambodia
14	Feng Min Kan, ISDR, Thailand
15	Sanjay Srivastava, Chief, DRR Section, ESCAP
16	Atiq Kainan Ahmed, ADPC, Thailand
17	Santosh Kumar, NIDM and SAARC DMC, India
18	Alf Ivar BLIKBERG, Programme Officer, ESCAP, Thailand
19	Naohisa KOIDE, Japan Meteorological Agency, Japan

Annex II. Questionnaires for project team and stakeholders and survey

A. For project team

Respondent background

Name:

Organisation:

Designation:

Role performed:

Questions are built around: How the project has been implemented and received at national and regional levels and what follow-up actions can be drawn for the next phase based on lessons learnt.

Relevance

- How appropriate was the project design?
- Was the design of project interventions the most appropriate way to achieve intended outcomes and outputs?
- Are the objectives and design still relevant for potential future phases of the project?
- How well do you think project activities are connected with local needs, national priorities and regional demands?
- What is the evidence of use/application of project activities/outputs?
- What are the unmet needs that remain in spite of the project activities?
- To what extent was the project consistent with the broader work and mandate of your organization?
- What was the relevance of and possible synergies between the project and HFA priorities?
- Are project activities advancing knowledge and learning on national/regional risk?
- In what way outcomes of the project can be used at national and regional level to support Sendai Frame work of DRR?

Effectiveness

- How well the project activities were planned and implemented?
- Are there any quality standards defined, procedures or protocols in place and are they followed in the implementation?
- Did the project achieve its intended outcomes?
- Did the project contribute to the advancement of early warning knowledge and practices?
- To what extent were the activities effective in strengthening capacity of countries involved?
- Are project approaches, resources and partnerships relevant to achieve planned outcomes?

Efficiency

- How efficiently did TC manage the project?
- Was the implementation arrangement suitable for this type of project?
- Were there any important unintended outcomes, either positive or negative?
- What resources the project supported activities have leveraged at national and regional levels?

Sustainability

- How sustainable is the project model?
- What exit strategies/sustainability plans were incorporated in the project design and to what extent they contributed to sustainability?
- For outcomes and activities that the targeted agencies would like to continue, do they have capacity and resources to do so?
- What systems are in place to ensure that the project outcomes are sustained beyond the termination of the project?
- What level of interest has the project generated at country level in support of the project outcomes?
- How has the project ensured sustainability of the results to which it contributed? Have there been exit/sustainability strategies developed?

B. For key stakeholders

Respondent background

Name:

Organisation:

Designation:

Role in national/regional/subnational level policy making – government, advisory etc.

Questions are built around: How the project has been implemented and received at national and regional level and what follow-up actions can be drawn for the next phase based on lessons learnt.

Relevance

- How appropriate was the project design? To what extent do you think project has achieved its objectives?
- Was the design of project interventions the most appropriate way to achieve intended outcomes and outputs?
- Are the objectives and design still relevant for potential future phases of the project?
- What is your perception of the key priorities for DRR in your country? Did the project address these priorities? How? How well do you think project activities were connected?
- In what areas of DRR the project has made maximum impact? What is the evidence of use/application of project activities/outputs?
- What are the unmet needs that remain in spite of the project activities? Are there any areas where the project has made no or little impact?
- To what extent was the project consistent with the broader work and mandate of your organization?
- What was the relevance of and possible synergies between the project and HFA priorities?
- Are project activities advancing knowledge and learning on national/regional risk?
- In what way outcomes of the project can be used at national and regional level to support Sendai Frame work of DRR?

Effectiveness

- How well the project activities were planned and implemented?
- Did the project contribute to the advancement of early warning knowledge and practices?
- To what extent were the activities effective in strengthening capacities of countries involved?
- Are project approaches, resources and partnerships relevant to achieve planned outcomes?
- What have been the key challenges and criticism of the project at the country level?

- What could have improved the overall results from the project?
- To what extent were national governments involved in the design and implementation of project?
- What changes can be observed as a result of the project outcomes at both national and regional levels?
- What are the key lessons to be learnt?

Efficiency

- In your opinion, how efficiently did TC manage the project?
- Was the implementation arrangement suitable for this type of project? Were there any important unintended outcomes, either positive or negative?
- What resources the project supported activities have leveraged at national and regional levels?

Sustainability

- How sustainable is the project model?
- What exit strategies/sustainability plans were incorporated in the project design and to what extent they contributed to sustainability?
- For outcomes and activities that the targeted agencies would like to continue, do they have capacity and resources to do so?
- What systems are in place to ensure that the project outcomes are sustained beyond the termination of the project?
- What level of interest has the project generated at country level in support of the project outcomes?
- How has the project ensured sustainability of the results to which it contributed? Have there been exit/sustainability strategies developed?
- Who do you think own outputs and outcomes of the project?
- What institutions are in place at national or sub-regional levels and how their capacities have been strengthened for sustainability of the project?
- Are there any concrete examples of countries reducing their vulnerability using the project resources?
- Has the project helped countries to share knowledge, experiences and lessons learnt as well as develop joint initiatives?
- How do you plan to sustain impact of the project activities?
- Learning from the project execution, how can the follow-up action be better institutionalised?
- How and who should finance the follow-up project?
- Do you wish to continue your engagement in the project activities?

C. Survey form

This brief survey has 10 key questions for your response. This survey is a part of End of the Term Evaluation of ‘Synergized Standard Operating Procedures for Coastal Multi-hazard Early Warning System’ project. Questions are built around: How the project has been implemented and received at national levels and what follow-up actions can be drawn for the next phase based on lessons learnt.

Respondent background

Name:

Organisation:

Designation:

Role performed:

Country:

Key survey questions

1. Do you think that the project goal (of promoting community resilience to coastal multi-hazards and improving the policy and institutional arrangements at national, district, and community levels through integrated, effective standard operating procedures for multi-hazards EWS) was appropriate and relevant to your country needs? YES/NO. If YES, how, if NO, why?
2. Are project outputs (1. manual on Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System and 2. regular communication and cooperation mechanism between TC and PTC on coastal multi-hazard early warning system, particularly southern countries in the region) useful and relevant to your needs? YES/NO. If YES, how, if NO, why?
3. Do you think that the implementation arrangements of implementing the project mainly in collaboration with National Meteorological and Hydrological Services (NMHSs), National Disaster Management Offices (NDMOs), Media organizations, and other stakeholders at the country level was effective? YES/NO. If YES, how, if NO, why?
4. Were the project activities (1. review and synergize existing SSOPs for coastal multi-hazard EWS in the Members of TC and PTC and develop the Manual of Synergized SSOPs for Coastal Multi-Hazards EWS and 2. enhance the performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through capacity building) effective in strengthening your capacities? YES/NO. If YES, how, if NO, why?
5. Has the project managed to leverage any resources at national levels? YES/NO. If YES, how.
6. Do you think the project has achieved its expected outcomes (1. integrated, effective standard operating procedures for coastal multi-hazard EWS for TC and PTC Members and 2. improved performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through integration, synergization, cooperation, and training)? YES/NO, if NO, please explain why.
7. Do you think that project activities, outputs and outcomes are sustainable? YES/NO. If YES, how, if NO, why?
8. For outcomes and activities that you as a targeted agency would like to continue (please list at least two such activities in your response), do you have capacity and resources to do so? YES/NO. If YES, how, if NO, why?
9. What lessons have you learned through your participation in the project activities? Please enlist at least two lessons.
10. What should the project focus and priorities if there is a next phase of say three years? Please enlist focus areas and priorities as recommendations to the TC/ESCAP.

Thank you for your time and inputs.

Annex III. Evaluation schedule

Activities	Role/responsibilities		March (in weeks)				April (in weeks)				May (in weeks)		
	International consultant	TC	1	2	3	4	1	2	3	4	1	2	3
Application/ ToRs	Application/proposal	Review / inputs											
Desk review and discussions with evaluation management team	Undertake detailed review of project documents and literature available.	Provide all project related document and relevant document on the state of tsunami / other hazard early warning systems											
Develop inception report, including data collection methods	Develop tools, review evaluation matrix and work plan and do report outline.	Review inception report and comment on fusibility of proposed tools and timeframe, including report outline.											
Data collection and Analyses (e.g., interviews with respondents, etc.)	Meeting with project teams and key stakeholders in select countries	Help arrange logistics and selection of interviewees											
Debriefings / feedback to management through validation workshop	Facilitation.	Organise the session/event											
Final draft evaluation report	Report writing.	Review and commenting.											
Final report	Submission.	-											

Annex IV. Role and contributions of consultants in SSOPs

Sr. No.	Name	Expertise	2014	2015
			Expected Outcome 1: Integrated, effective standard operating procedures for coastal multi-hazards EWS for TC and PTC Members.	Expected Outcome 2: Improved performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through integration, synergization, cooperation, and training.
			Activity 1: Review and synergize existing SSOPs for coastal multi-hazards EWS in the Members of TC and PTC and develop the Manual of Synergized SSOPs for Coastal Multi-Hazards EWS.	Activity 2: Enhance the performance and effectiveness of SSOPs for coastal multi-hazards EWS in Members of TC and PTC through capacity building.
1	Dr. Y.E.A. Raj	Expert on Meteorology	Missions to Maldives, Myanmar and Sri Lanka: Carryout missions to collection and compile data, information, examples, and diagrams on SSOPs best practices, gaps and needs, and recommendations for inclusion in the Manual on Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System to meet the needs of the 13 beneficiary countries involved in the Project.	Mission on Hands-on Training and Technical Assistance on Interpretation, Preparation, and Improvement of SSOPs for Users and Issuers in Maldives, Bangladesh and Myanmar: Carryout missions to evaluate the draft SSOPs Manual by using it to provide hands-on training and technical assistance on interpretation, preparation, and improvement of SSOPs for users and issuers.
2	Mr. Abdul Majid	Expert on Hydrology	Missions to Maldives, Myanmar, Sri Lanka, Malaysia, Cambodia and Vietnam: Carryout missions to collection and compile data, information, examples, and diagrams on SSOPs best practices, gaps and needs, and recommendations for inclusion in the Manual on Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System to meet the needs of the 13 beneficiary countries involved in the Project.	Mission on Hands-on Training and Technical Assistance on Interpretation, Preparation, and Improvement of SSOPs for Users and Issuers in Maldives, Bangladesh and Myanmar: Carryout missions to evaluate the draft SSOPs Manual by using it to provide hands-on training and technical assistance on interpretation, preparation, and improvement of SSOPs for users and issuers.
3	Mr. Ahmed Kamal	Expert on DRR	Missions to Maldives, Myanmar and Sri Lanka: Carryout missions to collection and compile data, information, examples, and diagrams SSOPs best practices, gaps and needs, and recommendations for inclusion in the Manual on Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System to meet the needs of the 13 beneficiary countries involved in the Project.	Mission on Hands-on Training and Technical Assistance on Interpretation, Preparation, and Improvement of SSOPs for Users and Issuers in Maldives, Bangladesh and Myanmar: Carryout missions to evaluate the SSOPs Manual by using it to provide hands-on training and technical assistance on interpretation, preparation, and improvement of SSOPs for users and issuers.
4	Dr. Tokiyoshi TOYA	Expert on Meteorology	Missions to Malaysia, Cambodia and Vietnam: Carryout missions to collection and compile data, information, examples, and diagrams on SSOPs best practices, gaps and needs, and recommendations for inclusion in the Manual on SSOPs for Coastal Multi-Hazards Early Warning System to meet the needs of the 13 beneficiary countries involved in the Project.	

5	Mr. Amir Ali KHAN	Expert on Disaster Risk Reduction	Missions to Malaysia, Cambodia and Vietnam: Carryout missions to collection and compile data, information, examples, and diagrams SSOPs best practices, gaps and needs, and recommendations for inclusion in the Manual on Synergized Standard Operating Procedures (SSOPs) for Coastal Multi-Hazards Early Warning System to meet the needs of the 13 beneficiary countries involved in the Project.	Mission on Hands-on Training and Technical Assistance on Interpretation, Preparation, and Improvement of SSOPs for Users and Issuers in Cambodia, Philippines and Lao PDR: Carryout missions to evaluate the draft SSOPs Manual by using it to provide hands-on training and technical assistance on interpretation, preparation, and improvement of SSOPs for users and issuers.
6	Mr. James Thomas Davidson	Expert on Meteorology		Mission on Hands-on Training and Technical Assistance on Interpretation, Preparation, and Improvement of SSOPs for Users and Issuers in Cambodia, Philippines and Lao PDR: Carryout missions to evaluate the SSOPs Manual by using it to provide hands-on training and technical assistance on interpretation, preparation, and improvement of SSOPs for users and issuers.
7	Mr. Kenneth Rae Kleeschulte	Expert on Hydrology		Mission on Hands-on Training and Technical Assistance on Interpretation, Preparation, and Improvement of SSOPs for Users and Issuers in Cambodia, Philippines and Lao PDR: Carryout missions to evaluate the draft SSOPs Manual by using it to provide hands-on training and technical assistance on interpretation, preparation, and improvement of SSOPs for users and issuers.