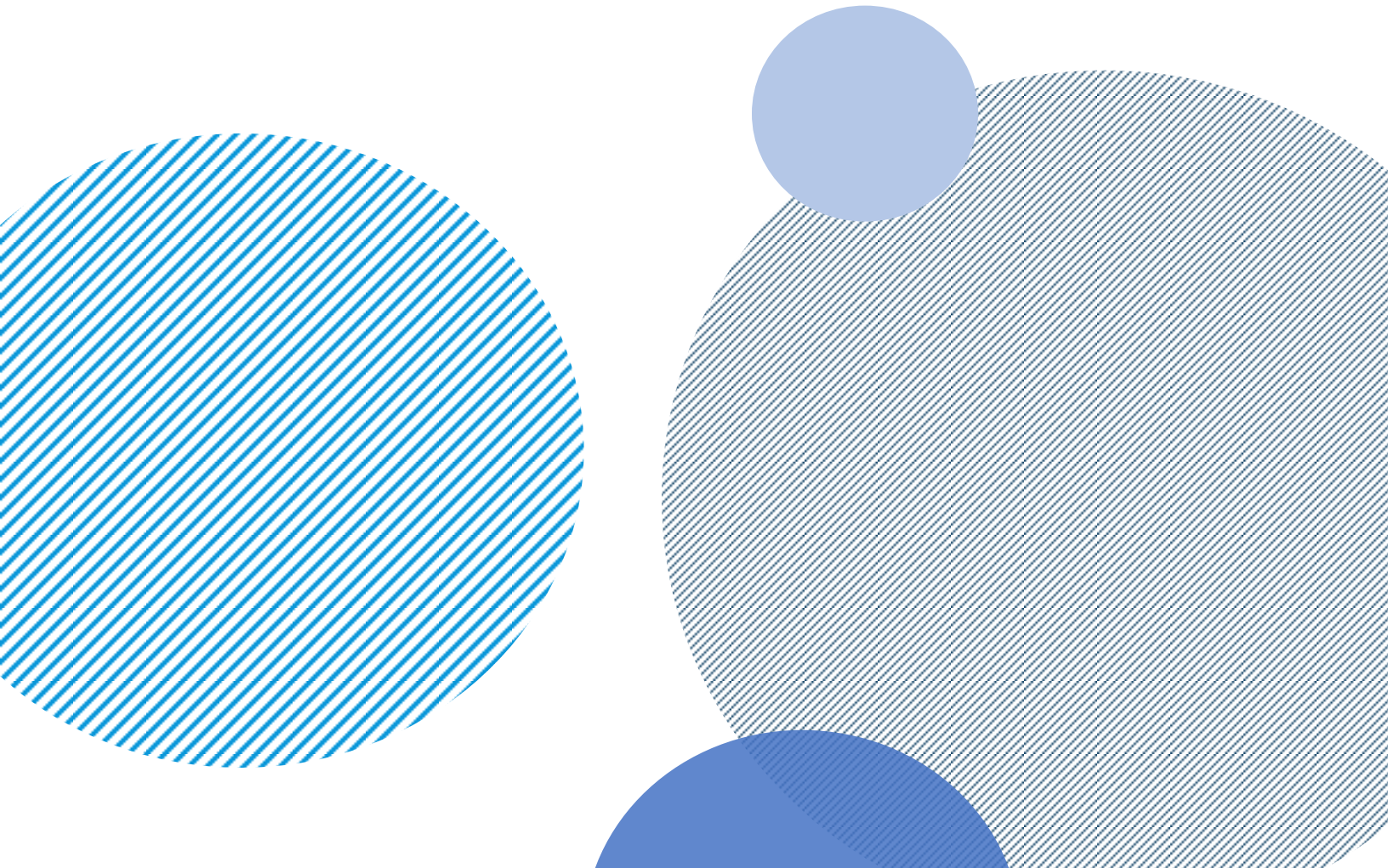


# Strengthening Multi-Hazard Risk Assessment and Early Warning Systems with Applications of Space and Geographic Information Systems in Pacific Island Countries



Project Evaluation Report | October 2018



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October 2018

Prepared by  
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Commissioned by  
Information and Communications Technology and Disaster Risk Reductions Division, ESCAP

## **ACKNOWLEDGMENTS**

The evaluator is very grateful for the cooperation in the information gathering and for the generous time given to the evaluation process, particularly from those individuals who responded as key informants to the questionnaire survey, often on short notice.

Deep appreciation is also due to all those in ESCAP and its partners for the comprehensive and efficient support and information they provided and their insightful comments and opinions. The evaluation was conducted under considerable time pressure and, without their back-up, the necessary data could not have been gathered effectively, nor this report written.

October 2018

Tadashi NAKASU, Ph.D.

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## LIST OF ACRONYMS

AI	Artificial Intelligence
AFTN	Aeronautical Fixed Telecommunication Network
AIFS	Adriatic-Ionian Forecasting System
AIT	Asian Institute of Technology
APRSAF	Asia-Pacific Regional Space Agency Forum
BMKG	Indonesian Agency for Meteorology, Climatology and Geophysics
CCSTEAP	Centre for Space Science and Technology Education in Asia and the Pacific
CUHK	Chinese University of Hong Kong
DAC	Disaster Advisory Committee
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EGM	Expert Group Meeting
EMWIN	Emergency Managers Weather Information Network
EOC	Emergency Operating Center
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
EWS	Early Warning System
FDMO	Fiji Disaster Management Office
FLEES	Fast, Leveraging, Easy, Economic, Sustainable
FMS	Fiji Meteorological Service
FSM	Federated States of Micronesia
GDP	Gross Domestic Product
GEO	Group on Earth Observations
GFS	Global Forecasting System
GIS	Geographical Information System
GSMAP	Global Satellite Mapping of Precipitation
GTS	WMO Global Telecommunication System
IDD	Information and Communications Technology and Disaster Risk Reduction Division
IFS	Integrated Forecasting System
ISCS/WAFS	International Satellite Communications System / World Area Forecast System
JAXA	Japan Aerospace Exploration Agency
LDCs	Least developed countries
LLDCs	Landlocked Developing Countries
MHEWS	Multi-Hazard Early Warning Systems
MNRE	Ministry of Natural Resources and Environment
NDC	National Disaster Center
NDMO	National Disaster Management Office
NEMO	National Emergency Management Office
NEOC	National Emergency Operations Center
NGO	Non-Governmental Organization
NMHSs	National Metrological and Hydrological Services
NMS	National Meteorological Service
NWP	Numerical Weather Prediction
PICs	Pacific Island Countries

PNG	Papua New Guinea
PNG NWS	Papua New Guinea National Weather Service
RESAP	Regional Space Applications Programmes for Sustainable Development
RIMES	Regional Integrated Multi-Hazard Early Warning System
RSMC	Regional Specialized Meteorological Center
SAS	Space Application Section (IDD/ ESCAP)
SDGs	Sustainable Development Goals
SFDRR	Sendai Framework for DRR
SIDMO	Solomon Islands Disaster Management Office
SIMS	Solomon Islands Meteorological Service
SMD	Samoa Meteorological Department
SMS	Short Message Service
SNS	Social Network Service
SOP	Standard Operating Procedure
SOPAC	Applied Geoscience and Technology Division
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
TCAC	Tropical Cyclone Advisory Center
TCWC	Tropical Cyclone Warning Center
The Charter	International Charter Space and Major Disaster
TMS	Tonga Meteorological Service
TRRM	Tropical Rainfall Measuring Mission
UAV	Unmanned Aerial Vehicle
UN-GGIM	United Nations Global Geospatial Information Management
UNOSAT	United Nations Operational Satellite Applications Programme
UN-SPIDER	United Nations Platform for Space-based Information for Disaster Management and Emergency Response
VMGD	Vanuatu Meteorology and Geo-Hazards Department
WMO	World Meteorological Organization
WRF	Weather Research and Forecasting

## SUMMARY

This evaluation report details the findings of the evaluation undertaken on the project “Strengthening Multi-hazard Risk Assessment and Early Warning Systems with Application of Space and Geographic Information Systems in Pacific Island Countries” (also referred to as the EWSPICs Project or the Project) that was conducted between May 2016 and August 2018. The evaluation was commissioned by ESCAP.

The purpose of this final evaluation is to support efforts to improve the overall results-orientation of ESCAP capacity development work. It aims to assess the performance and outcomes of the Project.

### Main Conclusions

Overall, the interventions undertaken by the EWSPICs Project have helped to improve early warning systems, strengthen the capacity of human resources and enhance disaster resilience in participating Pacific countries. Accordingly, the Project has contributed to improving protection of vulnerable Pacific Island communities to the impact of natural disasters.

The Project implemented a total of nine major activities primarily involving capacity development and technical assistance, with a total of 66 main key participants registered, comprising 42 males (64%) and 14 females (36%). The Project also produced three knowledge products (two Gap and Needs Analysis Report and Knowledge Hub Report) and completed seven pilot projects in five Pacific island countries (PICs), focusing on building and strengthening geo-portals for multi-hazard early warning systems.

The evaluation was assessed with following parameters as being “Very Low” (1 point), “Low” (2 points), “Average (acceptable)” (3 points), “High” (4 points), “Very High” (5 points). The various key stakeholders that participated in the nine major activities gave an overall average rating of 4.2 for the combined criteria of relevance (4.6), efficiency (4.3), effectiveness (4.1), sustainability (4.1) and gender mainstreaming (3.9).

### Relevance

The objectives and activities of the Project were highly relevant to the needs of Pacific countries. Prior to its inception, there was a clear need for an enhanced use of space applications and capacity building at the regional and country level, particularly in the target PICs, assessed through a comprehensive gap and needs analysis conducted by the Project. The gap and needs analysis for both geo-portals and multi-hazard early warning systems (MHEWS) provided baseline information and understanding regarding what the Pacific region and individual countries are facing and doing to address the issue. In responding to national needs, the Project provided support for the organization of two expert group meetings (EGMs) in Fiji and Jakarta to analyze and exchange views and ideas on existing Pacific knowledge hubs; three regional workshops in Fiji, Indonesia and Tonga and two intensive training sessions (one month duration each) to provide practical knowledge and training on the issues; and a total of seven pilot projects in five PICs to provide customized assistance to individual Pacific countries. This process contributed to the formulation of five draft national work plans to enhance sustainability in Fiji, FSM, PNG, Solomon Island and Tonga.

**Efficiency:**

Strategic partnership arrangement, engagement of technical expertise and support from the Project management officers in providing expert advice contributed to the efficient and successful implementation of all planned activities in a sustainable manner to achieve the Project's purpose. Overall, the interventions were delivered in a cost-effective manner and implemented on time.

**Effectiveness:**

The Project's objectives and key outputs were successfully achieved through effective planning and implementation. Improved knowledge contributed to strengthening MHEWS, GIS and utilization of geospatial data in the target PICs. The gap and needs analyses were effectively used to develop a detailed implementation plan of the Project and served as a guide to identify areas of strengths and weaknesses within countries. To strengthen regional knowledge and facilitate policy dialogue on the Project's impact, updated progress of the Project and outcomes were presented regularly at the three regional workshops that were held throughout the Project period and the final outputs were presented at the side event of the 74<sup>th</sup> session of the ESCAP Commission, held in Bangkok on 15 May 2018.

Major outputs demonstrating evidence of effective implementation of the project are as follows:

- Downscaled and high-resolution weather models to improve forecasting.
- Geoportals and GIS operation skills and capacity improved.
- Actual emergency response with minimal fatalities and property damage improved.
- Warning efficiency in time.
- Higher warning accuracy.

**Sustainability:**

Many of the resources produced by the Project live on through national strategies, other policy documents and websites that have been developed by the beneficiaries. These include the draft national work plans that were prepared in five PICs. These mid-term work plans will serve as a mid-term milestone guide to strengthen early warning systems, promote geospatial technologies and data and improve human capacity in the Pacific countries. Given the Project's success at the regional level, further initiatives are warranted. To make these efforts sustainable, there is a need for a continuous national level implementation effort with the assistance from international organizations and donors. ESCAP is expected to remain as the best partner in the Asia Pacific region for implementing such activities. Suggestions for implementing these is as follows:

- Increase government budget allocations on early warning systems
- Investment in capacity of human resources at the regional and national level
- Develop guidelines, norms and standards using the projects outcomes
- Share and disseminate knowledge and systems developed by the project
- Regular consultation and communication between governments on technical support needed
- Make efforts to secure Ministerial level commitment

Throughout the implementation of the Project, South-South cooperation was demonstrated and valued. One partner of the Project, BMKG played an important role in sharing with and



transferring knowledge, capacity and technologies to Pacific countries, as South-South cooperation. In addition, the Project emphasized regional cooperation between Pacific countries at regional workshop and capacity building programmes.

**Gender mainstreaming:**

The Project has been rated relatively high on the gender aspect by the responding participants, although actual participation data shows only modest achievement. Overall, the participants of the various activities implemented under the EWSPICs Project were composed of about 36% women and 64% men, implying a modest achievement in terms of gender mainstreaming. This issue was considered during early planning stages and was significantly incorporated into the design and outputs of the Project.

**Main Recommendations**

The followings are the main recommendations for the EWSPICs Project:

- (1) Recommendation 1:** In order to promote key outcomes of the Project, reinforce the achievements obtained from the Project and further strengthen institutions and systems, it is recommended that consistent support such as 3-5 year mid-term assistance projects and programmes be secured as next actions. These should specialize in using geospatial data management for early warning systems and focus on institutional building and long-term human capacity building. For example, building drone-used geospatial data centers in the Pacific (request from the Minister in Tonga), enhancing digital mapping capacity and disaster-related data management systems could be considered.
- (2) Recommendation 2:** It is essential to further improve close cooperation and partnerships with sub-regional and civil society organizations to deliver key impacts of programmes and projects on MHEWS to more people at the community levels of the Pacific countries. In this connection, active engagement of civil society and communities at the planning stage is recommended to reflect their voices and needs in implementation plans.
- (3) Recommendation 3:** More active face to face dialogues and visits to Pacific countries by project officers and implementing partners are recommended in order to understand and incorporate emerging needs from Pacific countries through direct consultations and planning meetings in the Pacific region, which could be jointly organized by ESCAP, partner organizations in the Pacific region, government officials and representatives of civil society.

## 1. INTRODUCTION

### 1.1 Background of the evaluation

This is the evaluation report of the EWSPICs Project that was conducted between May 2016-August 2018. The original Project document lists the following beneficiary countries: Cook Islands, Fiji, FSM, Kiribati, PNG, Samoa, the Solomon Islands, Tonga and Vanuatu. During the course of implementation, some adjustments had to be made for effective output. The duration was expanded until August 2018 to include the side event held during the 74<sup>th</sup> session of the ESCAP Commission, “Universal Access to Disaster Early Warning Information: Perspective from Pacific”. The evaluation was conducted by Tadashi NAKASU, PhD, an external evaluator from Chulalongkorn University in Thailand. The evaluation norms and standards by the United Nations Evaluation Group (UNEG 2016) are followed in all evaluation processes.

### 1.2 Purpose, objectives and scope

The Space Applications Section (SAS) of the Information and Communications Technology and Disaster Risk Reductions Division (IDD), ESCAP implemented a project entitled “Strengthening multi-hazard risk assessment and early warning systems with applications of space and geographic information systems in Pacific island countries (the EWSPICs Project or the Project)”. The key objectives of the Project were to strengthen multi-hazard risk assessment and early warning systems of Pacific island developing countries (PICs) through enhanced institutional capacity building to use space and geospatial information data, and to promote regional cooperation platforms on sharing the existing and newly built geospatial data for disaster risk management in the Pacific region.

The main objectives of the evaluation include: (i) to assess the Project outcomes and outputs as indicated in the Project results framework against the following criteria: relevance, effectiveness, efficiency, sustainability and the gender aspect; (ii) to derive lessons learned from the Project to improve the quality of the Project design and implementation; and (iii) to provide constructive and forward-looking recommendations based on the lessons learned.

The following evaluation criteria are used in the evaluation.

**Table 1. Evaluation Criteria and Definition**

Criteria	Definition
Relevance	Appropriateness of objectives (of a theme or subprogramme) or outcomes (of a project) in terms of ESCAP’s priorities, governments’ development strategies and priorities, and requirements of the target groups.
Efficiency	Extent to which human and financial resources were used in the best possible way to deliver activities and outputs, in coordination with other stakeholders.
Effectiveness	Extent to which the expected objectives (of a sub-programme or theme) or

	outcomes (of a 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.
Sustainability	Likelihood that the benefits of the subprogramme, theme or project will continue in the future.
Gender mainstreaming	The extent to which design, implement-actions and coherence of the project align with gender equality.

### **Evaluation approach**

Key evaluation stakeholders were consulted in the development of the evaluation work plan and framework from governments, development partners and other informants knowledgeable in the field through the final stage of the Project. ESCAP was provided with an opportunity to review the evaluation work plan and framework and received an early presentation of the preliminary findings.

The conceptual framework for the evaluation used a results-based approach, based on the revised Project logical framework using an evaluation matrix that was developed to match the evaluation criteria and an explanation of these criteria with the evaluation questions, the source of data and collection methods (Annex D).

### **Scope**

The scope of the evaluation was the EWSPICs Project and its outcomes, outputs and activities over the duration of three and a half years. The evaluation considered both regional activities and those delivered at the national level (Cook Island, Fiji, FSM, Kiribati, PNG, Samoa, the Solomon Islands, Tonga and Vanuatu), assessing the work of the EWSPICs Project against the expected results detailed in the Project document and logical framework of the Project (Annex C) using relevance, efficiency, effectiveness, sustainability and gender mainstreaming as criteria.

In addition, evaluation criteria were put in the logical framework to clarify the evaluation scope as shown in Annex E.

### **Evaluation Questions**

The ToR posed 17 evaluation questions relating to the five evaluation criteria, 19 evaluation questions under the criteria were considered. The key informant questionnaire is in Annex F.

Both national and international stakeholders were surveyed. 17 out of 66 stakeholder participants gave quantitative ratings, with a response rate of 26%. The questionnaire survey was conducted by individual email, with follow up as necessary on detailed answers as mentioned in the methodology section. To minimize the demand on time, the number of questions was limited and questionnaires were prepared two ways, a web form and a questionnaire sheet (Annex H), which could be selected by respondents to maximize the efficiency of the process and to respect informants' time availability.

The evaluation report will be printed in hard copy for dissemination within ESCAP and to the donor, as well as published on [ESCAP's website](#).

## 2. OBJECT OF EVALUATION DESCRIPTION AND CONTEXT

The purpose of this final evaluation has been, as the Terms of Reference (ToR) (Annex B) articulate, to assess the implementation and outcome of ESCAP's EWSPICs Project.

The evaluation has focused on the achievement of Project outputs and their contribution to planned outcomes. The evaluation's specific purpose is to:

- Assess progress achieved or being made towards achievement of the expected outputs and overall performance of the Project;
- Determine whether the Project has contributed to achieving the stated Project outcomes, and explain why/why not;
- Provide forward-looking recommendations on how to build on the achievements of the Project and ensure that they are sustained by the relevant stakeholders; and
- Document lessons learned from success stories and good practices to capitalize on the experience gained through the Project.

The entire study and evaluation process was mainly undertaken from April 2018 to July 2018 in Bangkok, Thailand.

The evaluation has been done for the purpose of promoting accountability and learning, as well as support results-based management. The evaluation covers an analysis of the achievement of Project results at the level of objectives and expected accomplishments by examining the results framework, process, contextual factors and causality using appropriate criteria. The evaluation also assesses the design, strategy and implementation of the Project to inform future programming and implementation. The evaluation was done with reference to the ESCAP Monitoring and Evaluation system and evaluation guidelines, and any relevant UNEG guidance, where appropriate as mentioned before.

The target users of the evaluation results include EWSPICs Project members, international organization partners, PICs weather related and DRR officers, ESCAP management and staff, Japanese government related officers and stakeholders.

## 3. METHODOLOGY

### 3.1 Methodology

#### **Description of Methodology**

The scope of the evaluation sought to analyze and evaluate the performance of the Project against five key parameters: effectiveness, relevance, efficiency, sustainability and gender mainstreaming.

Based on these key parameters, evaluation questions were developed. These evaluation questions were posed to stakeholders involved in the project who were able to take part in this assessment. They were also internally posed by the evaluator when assessing relevant outputs and survey results undertaken in conjunction with the Project. The questionnaire can be seen in Annex H.

#### **Data Collection and Analysis**

The evaluation made use of the following methods of information and data collection and analysis, which were triangulated for purposes of evaluation:

**i) Desk review of project-related documents**

A desk review of project-related documents and reports was made including, among others, the documents and reports listed in Annex G.

**ii) Participatory observations and unstructured-informal interviews**

The evaluator participated in two key wrap-up workshops held in Bali, Indonesia (March 2018) and Nuku'alofa, Tonga (April 2018). The evaluator also participated in the side event of the 74<sup>th</sup> session of the ESCAP Commission: Universal Access to Disaster Early Warning Information: Perspective from Pacific. During these events, the evaluator conducted observations and nonstructural and informal interviews with several key stakeholder members and participants of the Project as indicated in Annex F.

**ii) Project questionnaire survey**

A project evaluation survey was conducted to solicit the opinion of individuals who participated in various project activities to help assess the outcome of the Project. The survey questionnaire was prepared as a web-form, as well as an answer sheet. The survey was conducted through individual email with the above questions asked, as seen in Annex H (The response rate was 26%). Depending on the answer given, the evaluator made further communication with the respondents to gain a more detailed explanation.

#### **Gender mainstreaming**

Further, a human rights-based and gender-sensitive approach, consistent with the ESCAP Monitoring and Evaluation system, UNEG Handbook for Integrating Human Rights and Gender Equality Perspectives in Evaluations in the UN System, as well as the UNEG Norms and Standards for Evaluation, Ethical Guidelines and Code of Conduct, was ensured during the

evaluation through consultation with and participation by Project beneficiaries, relevant stakeholders and partners involved in the implementation of the programme.

Survey questions acknowledged and addressed human rights, particularly participation and non-discrimination rights and, necessarily, the rights of migrants and gender equality issues. It had been intended to hold interviews with women stakeholders in all target countries, but for differing reasons, this was found not to be possible. Nonetheless, disaggregated data was collected and analysed and the data collection tools employed during the evaluation process facilitated the inclusion of views and perspectives of stakeholders throughout the evaluation.

Considering that women and children are disproportionately affected by disasters, the Project addressed gender concerns by providing geospatial information prior to disasters and by making efforts to provide more training opportunities for women GIS specialists.

### **Changes to the methodology compared to the ToR**

It was not feasible to conduct face-to-face interviews with the wider stakeholders in each country because of time and financial restrictions. Therefore, an e-mail survey was undertaken to gather feedback from the broader constituency of the stakeholders involved after the wrap up workshops and Project completion.

## **3.2 Limitations**

The following are the limitations and problems encountered during the evaluation and the overall implications for the validity of the evaluation findings.

- **Participatory observations and unstructured-informal interviews**  
Due to budget and time constraints, face-to-face interviews with all country project participants were not possible, except for a few unstructured interviews conducted mainly through workshop participation in Indonesia and Tonga. It was found that this way was not as effective as face-to-face interviews with well-prepared questions to obtain their opinions in a systematic manner. However, through some unstructured-informal interviews during the workshops, the evaluator was successful in obtaining some feedback on participants' considerations and opinions on the Project.
- **Lack of field visits**  
In addition, due to budget and time constraints, visits to relevant country counterparts and their organizations were not undertaken. The field visits would have allowed a broader group of stakeholders to be approached and spoken to, allowing a broader diversity of views. However, the evaluator had the opportunities to participate in the last two significant wrap-up workshops and understand the reality and meet almost all-important stakeholders. Unstructured-informal, at random interviews were successfully conducted during these workshops.

## 4. FINDINGS

The findings below are based on the criteria and key evaluation questions set out in the ToR. To provide a rating of Project performance, the overall Project outcomes have been summarized from all data sources based on the scoring rubric below.

In the narrative that follows, the views of the Project’s direct and (where available) ultimate beneficiaries, are set out explicitly as benefits along a human rights-based approach and the participatory approach taken in this evaluation.

**Table 2. Rating of Project Performance**

Rating criteria	Performance description
5. Very High	Performance is very strong in relation to the evaluation question/criterion. No gaps or weaknesses were identified.
4. High	Overall strong performance on virtually all aspects of the evaluation question/criterion. Weaknesses are not significant and have been managed effectively.
3. Average	Performance is acceptable on most aspects of the evaluation question/criterion. No significant gaps or weakness, or less significant gaps or weaknesses have mostly been managed effectively.
2. Low	Performance is inconsistent in relation to the question/criterion. There are some serious weaknesses. Meets minimum expectations/requirements as far as can be determined.
1. Very Low	Performance is unacceptably weak in relation to the evaluation question/criterion. Does not meet minimum expectations/requirements.

### 4.1 Overview

The Project implemented five major types of activities with a total of 66 main key stakeholder participants, comprising of 42 males (64%) and 14 females (36%).

The project also produced three knowledge products: two gap and needs analysis and knowledge hub reports, four national geo-portal sites (FSM, Fiji, the Solomon Islands and Tonga), an e-learning platform that was disseminated to the recipient countries, customized MHEWs in three sites (Tonga, PNGA, Solomon Islands) and five draft national work plans. Technical assistance and capacity building training was also provided in the following countries, PNG, FSM, Fiji, the Solomon Islands and Tonga, as pilot projects.

The summary of the main activities and products are as shown in Table 3 below:



**Table 3. Main Activities and Products**

<b>Main Activities</b>	
<b>1</b>	<b>Workshops</b> 1) First regional workshop in Nadi, Fiji, 13-15 September 2016 2) Regional workshop in Bali, Indonesia, 7-8 March 2018 3) Final wrap-up workshop in Tonga, 26-27 April 2018
<b>2</b>	<b>Training sessions</b> 1) Intensive training at AIT in Thailand on building and operating geo-portals, geo-database and geospatial data management for early warning systems from 6 February to 3 March 2017. 2) Intensive training at BMKG in Indonesia on multi-hazard risk assessment and early warning systems from 10 July to 2 August 2017.
<b>3</b>	<b>Pilot Projects</b> 1) AIT conducted four pilot projects focusing on operating national geo-portals and geospatial database with capacity building training: Fiji, FSM, the Solomon Islands and Tonga. 2) BMKG conduct three pilot projects focusing on multi-hazard early warning systems with capacity building training: PNG, Tonga and the Solomon Islands.
<b>4</b>	<b>Expert Group Meetings</b> 1) First EGM in Fiji, 7-8 June 2017 in collaboration with Japan, SPREP, RSMCs and NHMSs. 2) Second EGM in Jakarta, 8-9 November 2017.
<b>5</b>	<b>A High Level Policy-Makers Dialogues</b> A side event of the 74 <sup>th</sup> ESCAP commission
<b>Main Products</b>	
<b>1</b>	<b>Gap and needs analysis reports</b> 1) Gaps and needs analysis on multi-hazard early warning systems in the Pacific by BMKG in collaboration with SPREP. 2) Gaps and needs analysis on geo-portal and geospatial data for early warning systems in the Pacific by AIT in collaboration with SPREP.
<b>2</b>	<b>Pacific strategy for knowledge hubs on early warning system by BMKG</b>
<b>3</b>	<b>Geo-DRR portals and e-learning platform by AIT</b>

## 4.2 Performance assessment

There were three sources for the assessment of the evaluation, weighted at: 1) desk reviews – 40%, 2) two key workshops and one side event observations – 20%, 3) questionnaire survey – 40%.

The evaluation questionnaire in the evaluation matrix is shown in Annex D.



Although only 17 out of 66 key stakeholder participants give quantitative ratings, the qualitative assessment by writing their opinions and comments were abundant for evaluation purposes. Table 4 indicates the Project’s overall rating and questionnaire participants rating.

**Table 4. Overview of Project Performance**

Criteria	Project overall Rating	Questionnaire participants rating
Relevance	4.6	4.2
Efficiency	4.3	4.1
Effectiveness	4.1	4.2
Sustainability	4.1	4.4
Gender mainstreaming	3.9	3.7
Average	4.2	4.1

### 4.2.1 Relevance

**Evaluation rating = 4.6 (out of 5)**

**Key Evaluation Questions:**

- To what extent were the Project objectives and outcomes aligned with the priorities and needs of the target countries?
- To what extent has the Project contributed to the broader work and mandate of IDD at ESCAP, particularly as it relates to disaster risk preparedness and reduction?
- To what extent has the Project consulted the target countries and incorporated their requirements into the project design and implementation?

**Concerning whether the Project objectives and outcomes aligned with the priorities and needs of the target countries:**

The countries in the Asia-Pacific region are highly prone to natural disasters. Between 1970 and 2013, nearly two million people were killed by disasters in this region, an alarming figure that represented 59% of global disaster fatalities. Disasters exacerbate poverty, vulnerability and economic inequity, and can impede Sustainable Development Goals (SDGs). In particular, small island developing states in the Pacific are exposed, because of low institutional capacities, to a variety of disaster risks, such as tsunamis, drought, tropical cyclones, storm surges and coastal zone flooding. The World Risk Report (2017) indicates the top 15 countries with the highest risk include five PICs – Vanuatu (1<sup>st</sup>), Tonga (2<sup>nd</sup>), the Solomon Island (6<sup>th</sup>), PNG (11<sup>th</sup>) and Fiji (15<sup>th</sup>). Despite these risks, coastal areas continue to attract people and are growing more rapidly than inland areas, putting additional people at risk of coastal hazards. In order to build resilience to

disasters, in these high-risk areas, the Project focused on the design of multi-hazard risk assessment and customized early warning systems.

Based on the above, the PICs Fiji, Kiribati, Marshall Islands, Micronesia, Nauru, Palau, Papua New Guinea, Samoa, the Solomon Islands, Tonga, Tuvalu, Cook Islands and Niue were the selected target countries. Policy makers and technical officials of ministries relevant to disaster management, land planning and space-related agencies from these countries participated in workshops and training sessions to help build capacity and awareness of geospatial data and applications for disaster risk management. Gender dimensions were considered when organizing meetings of the Project, including the active invitation and support of women GIS specialists from PICs.

However, as undertaking target pilot activities in countries were timely and costly, it was not feasible to conduct pilot activities in all of the PICs. Therefore, through two extensive gaps and needs assessment, five pilot countries, with a total of seven pilot projects, were chosen. Three pilot projects were undertaken on the implementation of early warning systems in order to build systems and capacity through training staff on how to operate and manage such systems.

In response to the above situation, a respondent commented, “an early warning system is one of our priorities,” indicating that PICs strongly need the Project. The questionnaire survey rated “4.4” on average.

**In reference to the Project’s contribution to the broader work and mandate of IDD at ESCAP, particularly as it relates to disaster risk preparedness and reduction:**

As the regional development arm of the United Nations, ESCAP provides an intergovernmental platform for the Member States to address natural disaster challenges, as well as discuss and adopt regional disaster risk reduction strategies that are integrated with an inclusive, sustainable development agenda for the Asia-Pacific region. ESCAP has been helping Member States build their capacity to withstand, adapt to and recover from natural disasters so that their people can continue to lead the kind of lives that they value. To this end, ESCAP assists Member States with high-quality analysis, strategies and policy options, regional advisory services, as well as technical assistance in disaster risk reduction, including those related to climate change adaptation, in order to move towards a resilient Asia-Pacific region.

ESCAP research includes the ESCAP Theme Study on Building Resilience to Natural Disasters and Major Economic Crisis (2013), and the Asia Pacific disaster report (2015; 2017), and evaluation sheets show that the most vulnerable to natural disasters and other exogenous shocks are the LDCs, LLDCs and small island development states (SIDS), in particular, PICs.

ESCAP, especially IDD, has a unique comparative advantage in the area of space technology and GIS applications for disaster management and sustainable development. IDD work at ESCAP is anchored on strong regional cooperation platforms that bring together all space related agencies, as well as meteorological agencies through the ESCAP/WMO Typhoon Committee and WMO/ESCAP Panel on Tropical Cyclones. ESCAP, as an intergovernmental platform for regional and sub-regional cooperation, is well placed to assist the PICs in promoting capacity and regional cooperation on geospatial information for multi-hazard risk

management and early warning systems based on many years of experience in the application of space technologies, GIS and capacity building.

Members States of ESCAP recognized the significant contribution of space technology and GIS applications for disaster management and sustainable development, and adopted resolutions in 2012 and 2013 regarding the implementation of the Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012-2017. These resolutions highlighted the increasing role of GIS for disaster management and the importance of regional cooperation for accessing and sharing geospatial information for disaster management.

While utilization of space technology for disaster risk reduction and sustainable development is now more accessible and affordable than ever, space and GIS applications continue to be underutilized in most PICs primarily because of the lack of capacity in terms of human, scientific, technological, organizational and institutional resources and expertise for operational applications of these technical tools. In this regard, ESCAP, especially IDD, is well placed to assist the PICs and develop their capacity to access and use space-derived information effectively for disaster risk reduction.

Therefore, the Project contributes to the broader work and mandate of IDD at ESCAP, such as strengthening regional cooperation in space technology and GIS application, and improving knowledge and capacity of Member States in space applications and GIS.

As a respondent commented: “Pacific Islands are priority countries of IDD at ESCAP”. The questionnaire survey rated “4.2” on average.

**With regard to the Project consultation of the countries and incorporation of their requirements into the project design and implementation:**

Before the EWSPICs Project, the key problems PICs faced were identified through surveys and evaluations. They include mainly (1) the low level of awareness, preparedness and response of PICs on multi-hazard risks and early warning; (2) the limited capacity to use and access geospatial information and data for multi-hazard risk assessment and early warning systems in PICs; (3) poor development practices to integrate risk-sensitive geospatial data and products into multi-sectoral development processes; and (4) low level of sub-regional knowledge hubs and regional cooperation platforms for the sharing and dissemination of geospatial data, products and services through the Pacific regional centres.

Findings from a preliminary search indicate that there are few documents regarding gap analysis in the Pacific region. Thus, one of the key outputs of the Project was to develop a gap and needs analysis on the countries in the Pacific Region.

To adjust project activities to the detailed needs of the PICs, ESCAP conducted gap and needs analysis with BMKG for meteorological service and AIT for disaster management.

In terms of demand driven and ownership, governments of 14 PICs forwarded letters in late 2015 requesting ESCAP support them in enhancing the capacity and systems of space technology and GIS for disaster risk management and sustainable development.

As respondents commented: “It was done in need and gap analysis workshop in Fiji during 13-15 Sep 2016.” “There are gap-need analysis report and 3 regional workshops in the project” The questionnaire survey rated “3.8” on average.

#### 4.2.2 Efficiency

Evaluation rating = 4.3 (out of 5)
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<p><b>Key Evaluation Questions</b></p> <ul style="list-style-type: none"> <li>• <b>To what extent has the intervention been delivered in a cost effective way?</b></li> <li>• <b>How was the intervention managed in terms of timeliness?</b></li> <li>• <b>Were the activities implemented on time?</b></li> <li>• <b>How can time management be improved?</b></li> </ul>
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**Concerning cost effectiveness of the intervention:**

The budget utilization rate of the project is close to 99%. ESCAP maximized its existing broader networks and partnerships, making the Project implementation effective. ESCAP operates as a regional hub for harnessing the latest advances in space technology and GIS applications for member States by harmonizing, collaborating and coordinating with existing global and regional organizations and initiatives.

Second, the ESCAP Sub-regional Office for the Pacific (EPO), which is based in Suva, Fiji, has supported implementation of the Project. The head of EPO participated in regional workshops conducted by the Project, representing ESCAP, and delivered speeches describing overall situations of disaster impacts in the Pacific region. The head of EPO who attend the first and final regional workshops, provided good input for drafting meeting reports. In addition, EPO helped to mobilize senior officials of Pacific countries’ to participate in regional workshops, including the Minister of Fiji and Tonga, and other United Nations entities stationed in the Pacific region such as UNISDR.

Third, the Project delivered its key outcomes through partnerships with United Nations agencies and regional organizations including, the United Nations Operational Satellite Applications Programme (UNOSAT); United Nations International Strategy for Disaster Reduction (UNISDR); the World Meteorological Organization (WMO); Secretariat of the Pacific Regional Environment Programme (SPREP); the Secretariat of the Pacific Community (SPC); Asian Institute of Technology (AIT); Japan Aerospace Exploration Agency (JAXA), and Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG). ESCAP successfully mobilized United Nations entities and regional organizations to participate in the process of the Project as good partners. These organizations participated in the expert group meetings and regional workshops to develop a regional strategy on knowledge hubs for early warning systems. They reviewed the draft strategy and provided input regarding their own experiences and lessons learned on knowledge hubs. The Project has been a good opportunity to review the effectiveness of existing and previous knowledge hubs in the Pacific region, share good practices and lessons learned, and exchange views on the directions of future projects.

In conclusion, the number of diverse participants from United Nations entities, regional organizations, experts and stakeholders in the Asia Pacific region indicates that ESCAP implemented an effective strategy to mobilize these resources and promote regional cooperation to draw good outputs of the Project. In addition, there was a high expenditure rate of the Project budget that demonstrates good design and implementation of the Project.

A number of respondents noted the efficiency as “High” or “Very High” with comments such as “The resource was effectively utilized.”

The questionnaire survey rated “4.2” (ToR correlated questionnaire’s questions) on average.

**Regarding the intervention managed in terms of timeliness and the activities implemented on time:**

By maximizing the possessed resources, the Project delivered all planned outputs within budget and within a realistic timeframe (the Project was extended to include the side event of the 74<sup>th</sup> ESCAP commission, which was relevant to complete the sharing of the Project outcomes with representatives from the funder, The Government of Japan, in a high-level policy-makers dialogue), and in a well-managed and framed manner. The Project also utilized synergies by working with external agencies when appropriate, in a time effective manner. To cite one example, ESCAP partnered with BMKG and AIT to organize regional workshops to share knowledge and existing good practices for effective operationalization of the project.

A number of respondents noted the efficiency as “High”, reflecting that the activities that ESCAP was responsible for commenced reasonably quickly, as well were handled with reasonable efficiency.

The questionnaire survey rated “4.0” on average.

**Concerning the advice on time management from the respondents:**

The activities undertaken through the Project covered a broad range of areas. Therefore, there were challenges involving time and budget constraints.

Based on the comments received from participating countries, partner organizations and implementing agencies, some key suggestions were made to enhance project efficiency. It was suggested by pilot project countries that they needed more consultants, time and technical support and better coordination between the implementing country and the implementing agency. However, these countries did note that such efforts require 4-5 months of intensive training, which could not be provided because of time and monetary constraints through the Project. A comment from Papua New Guinea suggested that implementation could be improved by having a video call or teleconference every 2-3 months to get updates from each country or organization. They also suggested breaking the Project into phases, with set work for each timeline; through this method goals and objectives can be set based on different project phases, so that countries would know their exact targets and what they were working towards achieving. Utilizing this method, helps to limit the scope, and helps to implement the Project properly in each country, to ensure they are on track to achieve their desired outcomes (a full list of comments made can be seen in Annex J).

### 4.2.3 Effectiveness

Evaluation rating = 4.1 (out of 5)

#### Key Evaluation Questions:

- What is the evidence demonstrating that the Project has achieved its expected outcomes?
- How effective was the Project in strengthening the capacities of participating institutions and ministries in the region?
- To what extent have the male and female participants, participating institutions and ministries used or applied their acquired knowledge and capabilities (knowledge, understanding, skills, techniques, etc.)?
- How were men and women differently affected by the Project activities and outcomes?

#### What evidence demonstrates that the project has achieved its expected outcomes:

The Project was expected to produce four key outputs to achieve the Project objective, as illustrated in the logical framework (Annex C). All four outputs were performed successfully and the evaluation from the participants in the activities indicates high satisfaction.

Concerning the first expected output, an intensive training programme on MHEWs was undertaken for 12 participants from the National Meteorological Service (NMS) and National Disaster Management Office (NDMO) from Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu. The training programme was successfully completed with highly evaluated by the participants.

For the second expected output, a gap and needs assessment was undertaken and found to be effective for the initial stage. Alongside the pilot projects highlighted above, pilot projects on geo-portals were also installed in Tonga, Fiji, FSM and the Solomon Islands. An e-learning platform was also developed during the Project to distribute learning materials for capacity building by the target stakeholders.

Regarding the third expected output, two intensive training sessions were implemented by AIT and BMKG for improved development practices through the integration of risk-sensitive geospatial data and products into multi-sectoral development processes. To support the operation of country-level geo-portals and geo-databases for disaster risk management in the PICs and the operation of early warning systems, experts visited the five Pacific island countries (Fiji, Tonga, PNG, FSM and the Solomon Islands) for further technical assistance and capacity, as for seven individual pilot projects. Three regional workshops provided the space to share stakeholders and countries experience, which the participants evaluated as highly effective.

Finally, for the fourth expected output, two EGMs and three regional workshops contributed to the establishment of the Pacific Knowledge Hub strategy to notify and operate existing

knowledge hubs, analyze their key structures, benefits, gaps and needs, and explore solutions and suggestions to strengthen their MHEWS in the PICs.

Based on the desk reviews, especially the content of the related documents and workshop observations, the satisfaction of the expected four outputs and effectiveness to the outcomes reached “4.0” as shown in Table 5.

**Table 5. Rating of the Four Expected Outputs**

Criteria	Rating
The 1 <sup>st</sup> Expected output	4.5
The 2 <sup>nd</sup> Expected output	4.0
The 3 <sup>rd</sup> Expected output	4.5
The 4 <sup>th</sup> Expected output	3.0
Average	4.0

The comments from participating countries, partner organizations and implementing agencies to the questionnaire provide evidence demonstrating the effectiveness of the Project. Multiple comments stated that through implementation of the Project weather modeling and forecasting was improved including higher resolution, resulting in better WRF outputs for forecasting, seamless transitions, increased warning lead-times, increased preparedness times, higher warning accuracy, minimized fatalities and property damages and improved capacity building within Disaster Management Offices in participating Pacific Island Countries.

The Solomon Islands stated that because of the Project they now have downscaled, high-resolution weather forecasting models, that will contribute to improving their disaster management systems. Micronesia stated that through the Project they now have a functioning geoportal with basic training capacity on the operation of the portal, along with GIS analysis. Papua New Guinea stated that the level of skill that was acquired by training officers through the Project had improved, resulting in a higher technical capacity and coordination of Disaster Management Officers that can work closely with disaster related agencies.

A comment made by Indonesia stated that it was clear from the Project that the pilot countries developed models and systems building capacity of staff and improved their disaster management systems, ultimately achieving the key outcomes. They stated that the project had a strong technical engagement and the Pacific Island Countries demonstrated pride in the outputs they generated, which was impressive. The World Meteorological Organization (WMO) stated that the pilot countries have applied their knowledge gained from training as part of their daily operational activities. It was also noted that communication among the trainer and trainees has been maintained, especially in solving problems in operational implementation. Through the Project, regional cooperation and partnerships have also been developed; an example of this is the initiation by the WMO to scale up applications in other Pacific countries, such as Fiji, through newly proposed activities (a full list of comments made can be seen in Annex J).

**Regarding the effectiveness of the project in strengthening the capacities of participating institutions and ministries in the region:**

ESCAP lead the planning and implementation of the Project. ESCAP and partners, BMKG and AIT, created the structure of a regional gap and needs analysis, including development of an

outline, mobilized regional cooperation from partner organizations, such as SOPAC, AIT, BMKG, SPREP and so on, developed implementation strategies of the project, implemented the project with partner agencies, customized outcomes for targeting PICs, reviewed the outputs from partner agencies, and monitored the progress of the Project.

The Project was implemented in the overall context of participating in the national development plans of the PICs, and in collaboration with national disaster management offices and space-related agencies. ESCAP Pacific Office (EPO) in Fiji contributed to the Project implementation as a sub-regional knowledge hub in the Pacific region. EPO worked closely with substantive Divisions of ESCAP in promoting regional cooperation and knowledge sharing, providing technical assistance and advisory services on economic and social policies and conducting policy research on issues relevant to PICs. In order to produce outputs, the Project worked with international and regional organizations, in particular, the RESAP networks.

Workshops, training programmes, and pilot projects contributed to the project. In particular, the two pilot projects implemented by AIT and BMKG contributed to the effectiveness of the Project in strengthening the capacities of participating institutions and ministries in the regions. AIT’s four pilot projects focus on operating national geo-portals and geospatial database with capacity building training. BMKG’s projects focus on multi-hazard early warning systems with capacity building training. The indicators as shown in Table 6 to exemplify the effectiveness of increasing their EWS capacities of the Project.

**Table 6.** The Two Pilot Project Contributions

<b>AIT’s Pilot Project (Operating national geo-portals and geospatial database with capacity building training)</b>	
<b>Country</b>	<b>Indicators for Measuring Capacity Changes (before/after the Project)</b>
Fiji	Operating geo-portal/ geo-database ( <a href="http://www.fijigeoportal.gov.fj/">http://www.fijigeoportal.gov.fj/</a> )
FSM	Operating geo-portal/ geo-database ( <a href="http://www.geoportal.oem.gov.fm/">http://www.geoportal.oem.gov.fm/</a> )
Solomon Islands	Operating geo-portal/ geo-database (Solomon Islands – Working with in Government Network)
Tonga	Operating geo-portal/ geo-database ( <a href="http://202.134.25.30">http://202.134.25.30</a> )
1) Installation and operation of geo-portal/ geo-database 2) On-site capacity building session on managing geo-portal 3) Development of work plan on geo-portal for disaster risk management in 2018-19	
<b>BMKG’s Pilot Project (MHEWS with capacity building training)</b>	
<b>Country</b>	<b>Indicators for Measuring Capacity Changes (before/after the Project)</b>
Tonga	(1) optimizes the use of global weather models at Tonga Meteorological Service (TMS) and customizes the product into meso-scale models with 7 km and 2.3 km of resolution



	<p>(2) has increased the TMS weather prediction time scale from 3 hours to 1 hours</p> <p>(3) connects TMS to WMO Hub through CAP product settings so that TMS service products can go into the global system</p> <p>(4) starts online platform based on high resolution model at TMS</p> <p>(5) have has had hands-on training for operators and administrators at TMS through the Project.</p>
PNG	<p>(1) has started and operates GSMAP and Tropical Rainfall Measuring Mission (TRMM) satellite data automatically to supply observational data at PNG National Weather Service (PNG-NWS); (2) has launched and operates a satellite-based drought information system at PNG-NWS</p> <p>(3) has increased understanding of PNG-NWS staff in terms of drought monitoring through installation training, customization, modification of climate tools, and training of analysis and prediction of drought</p> <p>(4) has started PNG-NWS for cross-sectoral cooperation in utilizing drought information through the Project.</p>
Solomon Islands	<p>(1) has launched and operates the Wavewatch 3 wave model covered the Solomon Islands area domain at the Solomon Islands Meteorological Service (SIMS)</p> <p>(2) has started, customized, and operates WRF weather models with 7 km resolution</p> <p>(3) have has had a hands-on training for operators and administrators in SIMS</p> <p>(4) held holds meetings between institutions related to flood disaster management.</p>

Respondents commented: “Very effective through information sharing”; “12 persons were trained from 8 countries”; “4 countries can now have operational Geo-node servers”; “The project included training and ensure capacity building.”

Due to the above effort and facts and comments from the respondents, the capacities of participating institutions and ministries in PICs have been effectively strengthened.

The questionnaire survey rated “4.6” on average.

**With reference to: what extent the male and female participants, participating institutions and ministries used or applied their acquired knowledge and capabilities (knowledge, understanding, skills, techniques, etc.) and also how the men and women were differently affected by the Project activities and outcomes:**

Fiji, FSM, PNG, the Solomon Islands and Tonga were selected for the pilot projects based on 1) each country’s requirements and commitments – identified through the gaps and needs assessment and 2) draft work plans on geospatial information system for early warning and disaster risk reduction. In Fiji, FSM, the Solomon Islands and Tonga, fully operational geo-portals were installed at each pilot country’s national disaster management agency offices. Upon the completion of the installation and customization of the geo-portals, available datasets were uploaded to the system. Then, capacity building sessions were provided for national

disaster management office’s staff to improve their technical skills to operate and manage the geo-portal during pilot project missions. The content was tailored to provide skills that would be necessary for operating and maintaining a geo-portal for sharing data. In PNG, Tonga and the Solomon Islands customized, fully operational early warning systems were installed at each pilot countries meteorological and weather service departments. Upon completion of installation, these forecasting systems were customized to the best ability to aid in weather forecasting and prediction models to improve disaster risk management. Capacity was built among implementing agencies and technological knowledge was transferred to ensure sustainable operation and management of the forecasting systems.

Tonga’s Minister for the Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications (MEIDECC) mentioned at the ESCAP 74<sup>th</sup> commission: “It will be presented in a pragmatic format of our response to the Tropical Cyclone Gita that hit the southern islands group of Tonga, in February this year (2018)...Fortunately there was no loss of life, and the damages caused were not as extensive as originally thought, which have been attributed to an effective and timely preparatory campaign...Assistance was accorded as a priority to the vulnerable, the elderly, women and children, for those in special needs, and the marginalized.”

This statement reflects the success of pilot projects, especially in Tonga, that have been implemented through this Project. In the case of Tonga, a multi-hazard early warning system was constructed to establish a high-resolution weather research forecasting (WRF) model. Through implementation of this weather prediction model, it was expected that the Tonga Meteorological Services would be able to obtain relevant data to help disseminate warnings to residents in the event of a disaster, reducing casualties and fatalities. The statement made by the Tonga Minister, it makes it clear that these systems have been successful in aiding in disaster situations.

Respondents commented: “Although the number of female participants was small, all of them were very active”; “Basic remote sensing and GIS knowledge that they gain in the training is using their day to day work”; “The project in the country was led by a woman and she managed the project well”; “Much awareness conducted”; “Geoportal is active after the Project. Example, the Solomon Islands submit a proposal and received a new project from World Bank to continue the work.”

The questionnaire survey rated “4.1” on average.

#### **4.2.4 Sustainability**

Evaluation rating = 4.1 (out of 5)
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##### **Key Evaluation Questions:**

- **What evidence is there that the Project outcomes will be sustained beyond the termination of the project, e.g., government commitments?**
- **To what extent has support from partners, such as AIT, BMKG, UNOSAT, SPC and SPREP, been obtained to take forward the Project outcome?**
- **To what extent is the geo-portal and geodatabase for early warning systems, developed under the Project, sustainable?**
- **What kind of additional intervention is recommended from ESCAP and other regional partners to ensure its sustainability?**

**Concerning evidence that the Project outcomes will be sustained beyond the termination of the project, e.g., government commitments:**

The strategy for the knowledge hub, geo-portals, early warning systems, e-learning system and national work plans were the main products that will be sustained beyond the termination of the Project. More importantly, the skills of the PICs members acquired during the Project will be sustainable and applicable continuously. One of the stakeholders received a scholarship opportunity at CUHK to study MSs in National Geo-Survey, which was announced and encouraged to apply during the project workshop in Indonesia, Bali.

Through comments made in the evaluation questionnaire, it is clear that the Project achieved a high level of sustainability. Most of the countries that implemented the pilot projects, stated that the such implemented projects would be sustained through funding initiatives. The Solomon Islands stated that government budget would be allocated for early warning systems, The Cook Islands stated that funding and human resources were already available at the national level and that they just needed a project, such as this, to upskill and share knowledge and technologies to improve their systems. Micronesia stated that they already had a spatial data strategy to serve as the backbone of this Project and the Project outputs would be shared with the state government to obtain their inputs and to see how this strategy fits to their plans. Papua New Guinea stated that their government strongly supported any work or project that was linked to climate change and therefore the Pacific Project outlines this, considering the severe extreme weather events that have been seen in the past decade. Fiji made a strong statement that without engagement of the respective governments, sustainability would be compromised, which is something that needs to be considered (a full list of comments made can be seen in Annex J).

**With regard to the support obtained from partners such as AIT, BMKG, UNOSAT, SPC and SPREP, to take forward the project outcome:**

The Project was implemented in cooperation with the partners such as WMO, SOPAC, AIT in Thailand and BMKG in Indonesia, to enhance the sustainability. The project partners were included in the development of substantial training materials, provision of local data and training itself. The specific mechanisms for regular information sharing, monitoring, and review of the Project progress will be agreed upon with relevant partners. With regards to the specific management and coordination of the Project activities, IDD provided overall leadership in the organization of sub-regional meetings and events of the Project in coordination with relevant key UN agencies and regional organizations (especially SPREP and SOPAC), as well as with research institutions. The GIS tools and applications used are open sourced, which aims to be modified to accommodate the specific situations of the targeting countries.

The Project outcomes were presented to regional organizations, donors and Member States at the side event of the 74<sup>th</sup> ESCAP commission, UNGGIM and GEO, and shared with participants to transfer knowledge and skills for policymakers. In addition, every effort was made to encourage national decision-making processes to design the knowledge platform to lower the barriers for beneficiary groups.

The questionnaire survey rated “4.4” on average.

**Concerning whether additional intervention is recommended from ESCAP and other regional partners to ensure its sustainability:**

As mentioned in the section on efficiency, the budget and time was restricted in comparison to the needs from the PICs, therefore the Project could benefit from more time to collaborate effectively with other existing related projects or schemes that they have (a second phase could be considered) based on the local needs to maximize the outcomes and make it sustainable.

With regard to the second phase of sustainability, Papua New Guinea highlighted that, although the Project has been implemented, there are still areas that need to be strengthened to ensure sustainability of the Project. Multiple countries and regional organizations commented on further areas for improvement including: validation of the Project outcomes to the existing systems, more awareness of the Project at the community level in order to engage the public on how this technology can help with disaster management responses; improvement in capacity in the form of technical training programmes to ensure competence of staff in order for the countries to have self-maintenance and be able to undertake technical tasks on their own.

Both Fiji and Papua New Guinea highlighted the importance of government support and commitment in implementing the Project initiatives, since it is only through strong policies, work plans and management that these early warning systems can be sustained. Governments need to build collaboration and integration with other country governments and international organizations and agencies, such as the SPC and Pacific Met council, to build close collaboration for effective disaster mitigation.

A reoccurring comment that came up in the responses was for ESCAP and other international organizations to follow up this Project with a second phase. Many Pacific countries are requesting further projects to keep building capacity within staff and build additional data for their databases, this was suggested to be done through the use of new innovative technologies such as UAV/ drone technology for high-resolution image acquisition.

#### ***4.2.5 Gender and human rights mainstreaming***

Evaluation rating = 3.9 (out of 5)

**Key Evaluation Questions:**

- **To what extent was gender integrated into the design and implementation of the intervention?**
- **To what extent did men, women, and relevant social groups participated in the implementation of the intervention as implementers and stakeholders?**

**Concerning gender integrated into the design and implementation of the intervention and relevant social groups that participated in the implementation of the intervention as implementers and stakeholders:**

The gender main streaming was considered during early planning stages and was significantly incorporated into the design and outputs of the Project. For instance, the gender issue was discussed in the EGMs. As well, the training programmes held by BMKG and AIT had the gender aspect as a key agenda item. Through this process, the drafted national work plan of Fiji, FSM, PNG, Solomon Island, and Tonga include the specific needs for women and other vulnerable groups.

As mentioned in the executive summary, the major key stakeholders included 36% female members. These female participants were very active and motivated, and played a key role in the activities implemented through the project. Therefore, this cannot be seen as just a number and definitely indicates a good sign from a long term perspective. Concerning social groups, disasters impact the entire community with no gender and age group differences, therefore more civil society participation in the Project should be strongly considered.

Respondents commented: "The workshop is helping everyone"; "In one country, a woman was involved very much in the project"; "They help provide information on their experience on disasters that is used to design the project."

The questionnaire survey rated "3.7" on average.

## 5. CONCLUSIONS

### 5.1. General Conclusions

The overall evaluation score of the project is 4.2 (out of 5). The highest value is the relevance category (4.7) and lowest value is gender mainstreaming category (3.9). The Project is highly relevant and successful in its implementation, however, there are some challenges to improve the Project outcome. The general evaluation, conclusion and challenges are expressed along with the following specific conclusion.

#### 1. Overall

The interventions undertaken by the EWSPICs Project have contributed to an increase in the protection of PICs who are particularly vulnerable to the impact of natural hazards and thus have achieved the three main objectives of the Project.

The Project is relevant in that the Project setting, process and outcomes contributed to global development agendas, such as the SDGs, Sendai Framework for DRR (SFDRR) and the Paris Agreement on Climate Change, and especially given that the Project procedure was aligned with the United Nations Plan of Action on Disaster Risk Reduction for Resilience: Towards a Risk-Informed and Integrated Approach to Sustainable Development, which has the aim to ensure coherence with respect to the broader 2030 Agenda for Sustainable Development, including the need to effectively support its universal, integrated, transformative and people-centered approach and its promise to reduce inequalities and “leaving no one behind” in the UN’s development work.

As important factors and key issues that contributed to the Project’s impact, the methods of technical transfer, such as customized pilot projects within countries, equipment provided, the plan of operation and the services provided by the Project, are all adequate. The selection of a target region is relevant, however, the size of the target audience seems too broad and, therefore, requires more time and budget to maximize the outcomes or alternatively more focus should be given on the specific subjects and the countries considered.

#### 2. Examination of activities

The activities were carried out as planned and ESCAP contributed to this with partners and stakeholder’s collaborations. The Project inputs, activities and products are relevant.

#### 3. Relationship with the target group

The Project objectives were consistent with the needs of the target group, which was apparent through the positive attitude and behavior of the target group to support the Project.

#### 4. Project activities

The level of participation and perception towards the Project activities by the target group, related organizations and community was high and positive.

The level of satisfaction of the target group towards services delivered by the Project and the level of their utilization were high and clear.

## **5. Project management**

The working attitude of the Project staff was positive to implement operations effectively. The level of commitment of the Project staff to project activities was high and good communication between experts and Project staff was established. The monitoring was conducted by ESCAP and the partners, AIT and BMKG, in an appropriate way and the Project strategy was modified accordingly. However, more regular communication among stakeholders is recommended.

## **5.2. Specific Conclusions**

### **5.2.1. Relevance**

The Project was highly relevant. Prior to its inception, there was a clear need for enhanced capacity building on geospatial technologies, such as geo-portals and early warning system at the regional level, in the Pacific region particularly in the target PICs.

The following are the conclusions responded to the ToR.

- **The Project objectives and outcomes deeply aligned with the priorities and needs of the target countries.**
- **The Project highly contributed to the broader work and mandate of IDD at ESCAP, particularly as it relates to disaster risk preparedness and reduction.**
- **The project consulted the target countries and incorporated their requirements into the Project design and implementation well.**

### **5.2.2. Efficiency:**

The budgetary provision, engagement of technical expertise and support from the Project management officers, in providing expert advice contributed to the efficient and successful implementation of all planned activities in a sustainable manner to achieve the Project's purpose.

The following are the conclusions responded to the ToR:

- **The intervention was delivered in a highly cost effective way.**
- **The intervention was managed well in terms of timeliness.**
- **The activities were mostly implemented on time.**

### **5.2.3. Effectiveness:**

The Project's purpose and key outputs were successfully achieved. Improved knowledge contributed to strengthening MHEWS and geospatial data, including GIS, utilization in the target PICs. Gap and needs analyses were effectively used for the Project implementation. To strengthen regional knowledge and facilitate policy dialogue on the Project's impact, the Project

outcomes were presented at the regional workshops held throughout the project and at the side event of the 74<sup>th</sup> ESCAP commission.

The following are the conclusions responded to the ToR:

- **The Project effectiveness in strengthening the capacities of participating institutions and ministries in the region was relatively high.**
- **The male and female participants, participating institutions and ministries used or applied their acquired knowledge and capabilities (knowledge, understanding, skills, techniques, etc.) was relevant.**
- **The men and women were not so differently affected by the Project activities and outcomes.**

In addition, the evidence demonstrating that the Project achieved its expected outcomes is as follows:

- **Downscaled and high resolution weather models, to improve forecasting.**
- **Geoportals and GIS operation skills improved and capacity built.**
- **Actual Emergency response with minimal fatalities and property damage.**
- **Increase in warning lead-time.**
- **Higher warning accuracy.**

With reference to the Project's main activities and products, they were all relatively effective.

#### ***5.2.4. Sustainability:***

Many of the resources produced by the Project continue through national strategies, such as policy documents and websites that have been developed by the beneficiaries. Given the Project's success at the regional level, further initiatives are warranted. To make it sustainable, there is a need for continuous national level implementation efforts with the help of international collaboration. ESCAP would be the best partner.

The followings are the conclusions responded to the ToR:

- **Support from partners, such as AIT, BMKG, UNOSAT, SPC and SPREP, was fully obtained to take forward the Project outcome.**
- **The geo-portal and geodatabase and early warning systems, developed under the Project, are sustainable.**

In addition, the following is evidence, as mentioned in the findings, that the outcomes will be sustained beyond the termination of the Project:

- **Government budget allocations.**
- **Funding human resources available at the national level.**
- **A spatial database.**
- **Guidelines using the Project outcomes.**
- **Knowledge and systems developed by the Project.**
- **Communication for the technical operation needs.**
- **Weather forecast output.**
- **Ministerial level commitment.**



With reference to the Project's main activities and products, they were all relatively sustainable. In particular, the Geo-DRR portals and e-learning platform, as well as early warning systems, were highly evaluated for sustainability. The Pacific strategy for knowledge hubs on early warning systems has the potential to be developed for the next step as a seed.

### ***5.2.5. Gender mainstreaming:***

The Project has been rated high on the gender aspect by the responding participants, but actual participation data shows only modest achievement. This issue was considered during early planning stages and was significantly incorporated into the design and outputs of the Project.

The followings are the conclusions responded to the ToR:

- **Gender was moderately integrated into the design and implementation of the intervention.**
- **The participations of the men and women were not so well-balanced and relevant social groups were not so actively involved in the implementation of the intervention as implementers and stakeholders.**

Concerning the Project's main activities, more female and civil society organizations would be necessary to help improve gender mainstreaming.

Although gender mainstreaming received the lowest evaluation score, this is not a major concern as the Project had strong key female stakeholders who were actively contributing and leading activities within the Project. However, more diverse social groups should be actively involved and considered.

## 6. RECOMMENDATIONS

The following three main recommendations are derived from the findings and conclusions drawn through the analysis of data/information obtained from mainly project related documents; two key wrap-up workshops and one side event observation; and the questionnaire survey. These were considered along with supporting evidence, such as project related documents contents; unstructured and informal interviews with several participants; questions, comments and discussions during the two workshops; and questionnaire survey's responses and further related communications.

**Recommendation 1:** In order to promote key outcomes of the Project, reinforce the achievements obtained from the Project and further strengthen institutions and systems, it is recommended that consistent support such as 3-5 year mid-term assistance projects and programmes be secured as next actions. These should specialize in using geospatial data management for early warning systems and focus on institutional building and long-term human capacity building. For example, building drone-used geospatial data centers in the Pacific (request from the Minister in Tonga), enhancing digital mapping capacity and disaster-related data management systems could be considered.

**Recommendation 2:** It is essential to further improve close cooperation and partnerships with sub-regional and civil society organizations to deliver key impacts of programmes and projects on MHEWS to more people at the community levels of the Pacific countries. In this connection, active engagement of civil society and communities at the planning stage is recommended to reflect their voices and needs in implementation plans.

**Recommendation 3:** More active face to face dialogues and visits to Pacific countries by project officers and implementing partners are recommended in order to understand and incorporate emerging needs from Pacific countries through direct consultations and planning meetings in the Pacific region, which could be jointly organized by ESCAP, partner organizations in the Pacific region, government officials and representatives of civil society.

### **Recommendation 1: Strengthen EWS with institutional and long-term human capacity buildings**

EWSs have to meet several requirements, including the use of appropriate technologies and operations, clear responsibilities of parties and effective decision-making mechanisms, a functioning communication system and well-prepared evacuation and response structures.

As mentioned in the sustainability of the findings, many PICs are requesting further projects to keep building capacity within staff and build additional data for their databases. Accordingly, reinforcement of the achievement obtained from the Project and further strengthen of institutions and systems, such as higher level of operation of EWSs and geo-portals in PICs, should be considered.

Also, EWSs for the Project could emphasize utilization of geospatial data management that focus on institutional building and long-term human capacity building that can produce and

disseminate understandable warnings driven by monitoring and forecasting impending events of the hazards to political authorities and the population allowing them to undertake appropriate and timely action in response to the warnings. To conduct this, it is recommended 3-5 year mid-term assistance projects and programmes be implemented.

In addition, new technology blending for DRR, such as UAV/ drone technology, AI and big data, can be used at low cost as a base for enhancing DRR and MHEWSs. The building of drone-used geospatial data centers in the Pacific (as request by the Minister in Tonga), building digital mapping capacity and disaster-related data management system should be considered for integration in order to provide for more efficient and effective outcomes. This would trigger further strengthening of capacity building and collaboration among related organizations by using the lessons learnt from this Project. To do that, a cascaded mechanism of resource and knowledge sharing and the “FLEES” approach for the target countries, with consideration of particular social and natural backgrounds, could be a suggestion. More customization, as well as more focus with an efficient and effective way of using such technologies, are also key. As stakeholders mentioned: “There is a strong desire among beneficiary governments for data and disaster risk models at a higher spatial granularity, and more relevant to the specific needs of each PIC. The Project made a big step forward in this direction.” The Project can be a starting point for the next step to have a more productive approach to the outcomes.

**Recommendation 2: Facilitate participation by sub-regional and civil society organizations to reach the community needs**

In order to achieve sustainability and cost-benefit efficiency, EWSs have to take into account and be adapted to country circumstances, as well as the underlying structural deficiencies, such as poverty, centralism and lack of human resource, which can be influenced through the long-term development process. To be effective, early warning systems need to have not only a scientific and technical basis, but also a strong focus on the people exposed to risk. The role of the human elements in the system and the management of risks, rather than just warning of hazards, are necessary to bring about effective early warning and response. There is also the reality of people's indifference to EWS except in conditions of direct threat.

To reflect these facts, strong suggestions are made from the sustainability and gender parts of the Project, including the respondent comments. These emphasize the importance of the more down to earth approach.

In addition to that, since the most significant role of MHEWS is to save people’s lives that are at risk, and as UNISDR defines EWS as “the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss (UNISDR 2018)”, the Project should consider facilitating collaboration with more ground-based organizations, such as sub-regional and civil society organizations, in order to reach the people effectively within their local contexts. Active engagement of civil society and communities are recommended to reflect their voices and needs in developing implementation plans since hazards impact the entire community with no gender and age group differences.

The following two messages from experts should be referred to when implementing next steps concerning the needs.

Ms. Mizutori mentioned in the 74<sup>th</sup> ESCAP commission side event: “Factors such as power dynamics, knowledge, culture, social status and family dynamics often determine whether people pay attention and heed early warnings, and take early action to protect their lives and livelihoods. By engaging communities in the development of the early warning systems from the beginning, many of these challenges can be addressed.” “Enhanced early warning systems are only effective if they lead to early responses and this depends largely on how communities receive and react to early warning messages.” (Mami Mizutori Special Representative of the Secretary-General for Disaster Risk Reduction, UNISDR 2018)

Mr. Keran Wang also indicated in the regional workshop in Bali: “One of the major elements to reduce the impact of the disaster risk, is early warning. It prevents loss of life and reduces the economic and material impact of disasters. An effective early warning system has to actively involve the communities at risk, facilitate public education and awareness of risks, effectively disseminate messages and warnings and ensure there is constant state of preparedness” (Mr. Keran Wang, Chief, SAS-IDD at ESCAP 2018)

### **Recommendation 3: Customize local needs by active communication among Project officers and implementing partners**

Local needs are indifferent among PICs with natural and social conditions. Therefore, direct consultation by Project officers and implementing partners should be considered. The consultation can also be undertaken with PICs regarding extending similar national-level activities to other surrounding PICs. Increased discussion with the target countries regarding their local needs and adjustment is necessary in order to put a strong focus on the local needs and incorporate them accordingly.

The results of observations and the questionnaire survey clarified that there was a strong need for more frequent consultation and communication by project officers and implementing partners to have more positive and efficient Project outcomes. They emphasized the need for more detailed planning and a more limited scope with the consultation and communication to make the Project more relevant, efficient, effective, sustainable and gender sound. They also suggest communication among stakeholders can be arranged and facilitated in a cost-effective way, for example, regular teleconferences as well as direct face-to-face consultation by project officers and implementing partners. Such communication can reduce any misleading information and perception gaps and maintain a common picture among the members and share the experience, while strengthening the network for the Project.

In addition, it was suggested by pilot project countries that they needed more consultants, time and technical support and better coordination between the implementing country and the implementing agency.

Based on the above needs, the direct consultation and planning meetings in the Pacific region, which could be jointly organized by ESCAP, partner organizations in the Pacific region, government officials and representatives of civil society should be undertaken.

With reference to the above three main recommendations, the future recommendations of the Project from partner organizations were made as follows:

JAXA emphasized the importance of information sharing, as well as people exchange in the region, including East and South East Asia and the USA, as this would be helpful for disaster mitigation and management for the Pacific countries. Tonga and the Solomon Islands also supported this with a comment stating that small island countries need support and further collaboration with partners in sharing ideas to improve technical support, especially in their early-warning systems. Papua New Guinea stated that after implementation of their early warning systems, through the Project, they are still in their infant stages and will require more assistance to make their systems sustainable. Micronesia reiterated that Pacific Island Countries have many gaps, and although geoportals were developed through the Project, they need additional ways to keep this data updated and would recommend a further project that would help them collect additional support data that can aid in further disaster situations. They mentioned the importance of capacity building and technical support through additional projects, such as the drone/ UAV project and stated that they would give their full support to ensure this project is mobilized (a full list of comments made can be seen in Annex J).

## 7. LESSONS LEARNT

With reference to the UNISDR's definition of early warning systems mentioned before, it is clear that the MHEWS is not an outcome product, but is a continuous effort among related stakeholders, including the people in the community. In this respect, successive projects should utilize lessons learnt from the Project.

A summary of the lessons learnt is highlighted below.

- **Partnerships, coordination and collaboration are key**
- **A more top down approach is required for implementation**
- **The project should be more relevant to the specific needs of each PICs**
- **Utilization of the “FLEES” (Fast, Leveraging, Easy, Economic, Sustainable) approach**

The lessons learnt should be derived from the actual experience of those involved in the Project's implementation, and therefore these lessons are reflected through the comments made in the evaluation questionnaires (Annex J<sub>1</sub>). Many of the suggested lessons learnt have reoccurring themes that have been discussed in length throughout this report.

The main lesson learnt is that partnerships, collaboration and sharing is the key for success. The Cook Islands highlighted that sharing is very important; the Solomon Islands also agreed with this by stating that working together with experts is crucial to learn and gain knowledge from their technical expertise. This can be done through close collaboration and partnerships with other Pacific Island Countries and international and regional organizations.

The second point of concern was that a more top down approach is needed for proper project implementation, especially on project activities. BMKG highlighted that project preparations are highly needed and that it is vital that country needs are understood in order to undertake successful project initiatives. Papua New Guinea also reiterated this by stating that although ESCAP has gathered the funds and partners, they need to ensure that the countries will benefit from the products implemented through the project and that they can be sustained through government support and other aid sources in the future.

The third point was that project activities need to be in line with the needs of the countries, which relates to the previous point about a more top down approach. It was highlighted that there is a strong desire among beneficiary governments for data and disaster risk models at a higher spatial granularity, and that is more relevant to the specific needs of each PIC. The Project made a big step forward in this direction. There are many challenges that are related to disaster management, and in the Pacific context both the human resources and financial resources are limited in this regard, therefore there are opportunities to bridge these gaps further.

An approach that was found successful in bridging gaps, was the utilization of the “FLEES” (Fast, Leveraging, Easy, Economic, Sustainable) approach, which can contribute to the issues relating to the limitation of human and financial resources. The World Meteorological Organization stated that first, target countries are capable of embracing new technologies to

cope with ever increasing disasters if they are facilitated through proper methodology, such as the "FLEES" method; and second, the implementation of a new way of doing things need time to penetrate. Countries need the support of services to help them adapt to new technology, which is beyond the Project's cost and timeline, and thus the need for communication and contact between trainer and trainees seems to be much greater. It was also recognized by Tonga, that the FLEES method helps to provide sustainability of the project through fast, cheap and useful implementation.

Overall it was recognized that this Project, and the implementation of MHEWS, will help to save lives, reduce property loss and strengthen PICs capabilities in mitigating disaster impact. This will go a long way into enhancing resilience and thus survival in the long term.

## **ANNEXES**


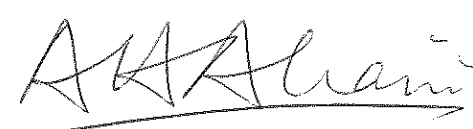
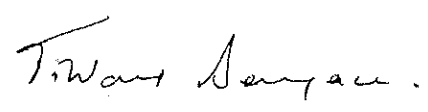
### **Annex A. Management Response**



## Management Response and follow-up Action Plan

**Title of Evaluation:** Strengthening Multi-Hazard Risk Assessment and Early Warning Systems with Applications of Space and Geographic Information Systems in Pacific Island Countries.

**Date of completion:** August 2018

	Signature	Date
Ms. Armida Salsiah Alisjahbana Executive Secretary		January 4, 2019
Mr. Adnan Aliani Director, Strategy and Programme Management Division		03 JAN 2019
Ms. Tiziana Bonapace Director, Information and Communications Technology and Disaster Risk Reductions Division		20 November 2018

### General Remarks by Management

Management welcomes the overall positive evaluation of the relevance, efficiency, effectiveness, sustainability, and gender mainstreaming of the project based on assessment evidence. Eight participating Pacific countries have made significant progress in the use of geospatial data for early warning systems and disaster risk reduction with support from ESCAP.

Management noted with satisfaction the assessment results on strengthened knowledge and capacity of human resources for early warning systems in the Pacific region, operation of a geoportal for disaster risk reduction, and enhanced sub-regional cooperation with regional organizations such as the Pacific Community (SPC) and the Secretariat of the Pacific Regional Environment Programme (SPREP) with the combined criteria of relevance (4.6), efficiency (4.3), effectiveness (4.1), sustainability (4.1) and gender mainstreaming (3.9) through implementation of nine project activities. Furthermore, management noted with satisfaction that the setting, process and outcomes of the project contributed to global development agendas, such as the SDGs, Sendai Framework for Disaster Risk Reduction (SFDRR) and the Paris Agreement on Climate Change, and that the project implementation procedure was aligned with the United Nations Plan of Action on Disaster Risk Reduction for Resilience: Towards a Risk-Informed and Integrated Approach to Sustainable Development.

In general, management found the recommendations clear, relevant and actionable. To reinforce the impact that key outputs of the project will have on institutions and systems over the medium term, management supports the recommendations made. In particular, it supports the recommendation for continued and consistent programme and project support for a period of 3 to 5 years on:

1. Geospatial data management for early warning systems;
2. Strengthened cooperation and partnerships with sub-regional and civil society organizations to deliver key impacts of programmes and projects on early warning systems; and
3. The promotion of more active face to face dialogues and visits to Pacific countries by project officers and implementing partners to understand and incorporate emerging needs in the sub-region.

Report Recommendation	Management Response	Follow-up Action <sup>1</sup>	Lead Unit/Collaborating Units	Expected completion date	Indicator of completion of follow-up action <sup>2</sup>
1. Strengthen early warning systems with institutional and long-term human capacity building	Management generally agrees with this recommendation. ESCAP has been emphasizing the long-term nature of institutional building and human capacity building.	IDD, in collaboration with EPO and regional organizations will continue to support capacity building on risk analysis and forecasting for effective early warning through the South-South cooperation modality.	IDD/EPO	August 2019	Secretariat invited as resource persons to capacity building programmes of Pacific
		IDD will continue with resource mobilization efforts, including through the ESCAP Multi-Donor Trust Fund,	IDD	December 2019	Replenishment of Trust Fund, with funding for the Pacific

<sup>1</sup> For the purposes of the management response, follow-up actions should be implemented within next 12 months. For actions that require longer implementation period, division/office is advised to indicate any critical preparatory actions that can be taken within the next 12 months.

<sup>2</sup> This information provides evidence of completion of action. Examples include issuance of an official memo, completion of a study or report, launching of a website, etc.

		<p>which since 2015 expanded its geographic scope to include Pacific small island developing states.</p> <p>Additionally, IDD will explore funding sources from donors such as Japan and the Republic of Korea and draft a follow-up project and activities. Consultation meetings will be organized to discuss how to effectively develop joint cooperative project and activities through relevant partners such as WMO and UNOSAT.</p>	IDD	December 2019	Selection of project in next round of funding proposals by December 2019
2. Facilitate participation by sub-regional and civil society organizations to address community needs	Management generally agrees with this recommendation. ESCAP has promoted the participation by sub-regional and civil society organizations.	IDD will through EPO, engage UNCTs and Pacific-based regional organizations and academia such as SPC, SPREP, UNISDR, WMO and the University of the South Pacific in Fiji in the project design and implementation stages.	IDD	June 2019	Inclusion of active participation of partner organizations and civil society in the implementation plan of the new projects and programme.
3. Customize local needs by active communication	Management generally agrees with this recommendation.	IDD will include project activities in the new project documents and programmes focused on	IDD	June 2019	Indicated activities of new projects and programme on direct

among Project officers and implementing partners		consultations with target countries, partner organizations including UNCTs, and civil society to reflect higher customization in line with local needs and demands in the project design and implementation.			communications and consultations with project officers of targeting countries, implementing partners and civil society.
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## **Annex B. Terms of Reference**

### Annex C. Logical Framework

	Intervention Logic	Objectively verifiable indicators	Sources and Means of information	Assumption
Overall Objective	Reduce disaster risk in the Pacific region.	National policies and strategies are in place.	National statements, reports and presentations of participating PICs.	
Project Purpose	Strengthen multi-hazard risk assessment and early warning systems put in place in the Pacific region.	At least five PIC draft work plans for multi-hazard risk assessment and early warning systems.	Progress reports, final reports, and presentations of participating PICs. Expert group meeting reports, pilot project reports and national work plans.	Experts continue their work.
Expected Output	1. Enhanced awareness of multi-hazard risk assessment and early warning systems for strengthening preparedness and response to disasters in PICs.	At least five PICs acknowledge enhanced awareness of multi-hazard risk assessment and early warning systems.	Progress reports, final reports, gap analysis reports, pilot project reports and presentations of participating PICs.	
	2. Strengthened multi-hazard risk assessment and early warning systems in PICs for extreme weather related disasters through the effective use of space-derived information and institutional capacity development.	At least five PICs establish and operate national Geo-DRM portals and geospatial databases.	Training reports and national work plans.  Progress reports, final reports, gap analysis reports, pilot project reports and presentations of participating PICs.	Experts in PICs remain constant.

	<p>3. Improved development practices by the integration of risk-sensitive geospatial data and products into multi-sectoral development processes through the dissemination and sharing of critical location-based disaster information and good practices.</p>	<p>70 percent of participants confirmed the integration of risk sensitive geospatial data and products into national work plans.</p>	<p>Training reports and national work plans.  Progress reports, final reports, gap analysis reports, pilot project reports and presentations of participating PICs.</p>	<p>Necessary data is constantly available.</p>
	<p>4. Strengthened network of National Meteorological and Hydrological Services (NMHS) with the members of the ESCAP/WMO Typhoon Committee (TC), including through the Regional Specialized Meteorological Centres (RSMC) in Fiji and Japan.</p>	<p>At least two joint events have been organized with NMHS and RSMC in Fiji.</p>	<p>A strategy paper (knowledge hub).  Progress reports, final reports, gap analysis reports, pilot project reports and presentations of participating PICs.</p>	<p>Related organizations' members sufficient collaboration interest continues.</p>
<p>Activities</p>				
<ol style="list-style-type: none"> <li>1. First Pacific regional workshop in Nadi from 13 to 15 September 2016</li> <li>2. Conduct two analysis reports (Mar 2017-Mar 2018)</li> <li>3. Two, one month intensive capacity building trainings</li> <li>4. Conduct pilot projects in the Pacific</li> <li>5. Developed the draft Pacific strategy for knowledge hubs on early warning systems with an emphasis on use of geospatial data (Aug-Dec 2017)</li> <li>6. Develop e-learning platform for DRR and space technology (Aug 2017-Mar 2018)</li> <li>7. Regional workshop (7-8 Mar 2018)</li> <li>8. Final wrap-up workshop (26-27 Apr 2018)</li> <li>9. A high-level policy-makers dialogues (15 May 2018)</li> </ol>				

## Annex D. Evaluation Matrix

Evaluation Criteria	Description	Evaluation Questions		Basis for Judgement	Data Sources	Data Collection Methods
		TOR questions	Survey Questions			
Relevance	Appropriateness of objectives (of a theme or subprogramme) or outcomes (of a project) in terms of ESCAP's priorities, government development strategies and priorities, and requirements of the target groups.	To what extent were the project objectives and outcomes aligned with the priorities and needs of the target countries?	1. To what extent were the project objectives and outcomes aligned with the priorities and needs of the target countries?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		To what extent has the project contributed to the work and mission of IDD at ESCAP, particularly as it relates to disaster risk preparedness and reduction?	2. To what extent has the project contributed to the work and mission of IDD at ESCAP, particularly as it relates to disaster risk preparedness and reduction?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		To what extent has the project consulted the target countries and incorporated their requirements into the project design and implementation?	3. To what extent has the project consulted the countries and incorporated their requirements into the project design and implementation?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
Efficiency	Extent to which human and financial resources were used in the best possible way to	To what extent has the intervention been delivered in a cost effective way?	4. How efficient was the process of achieving outputs?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey



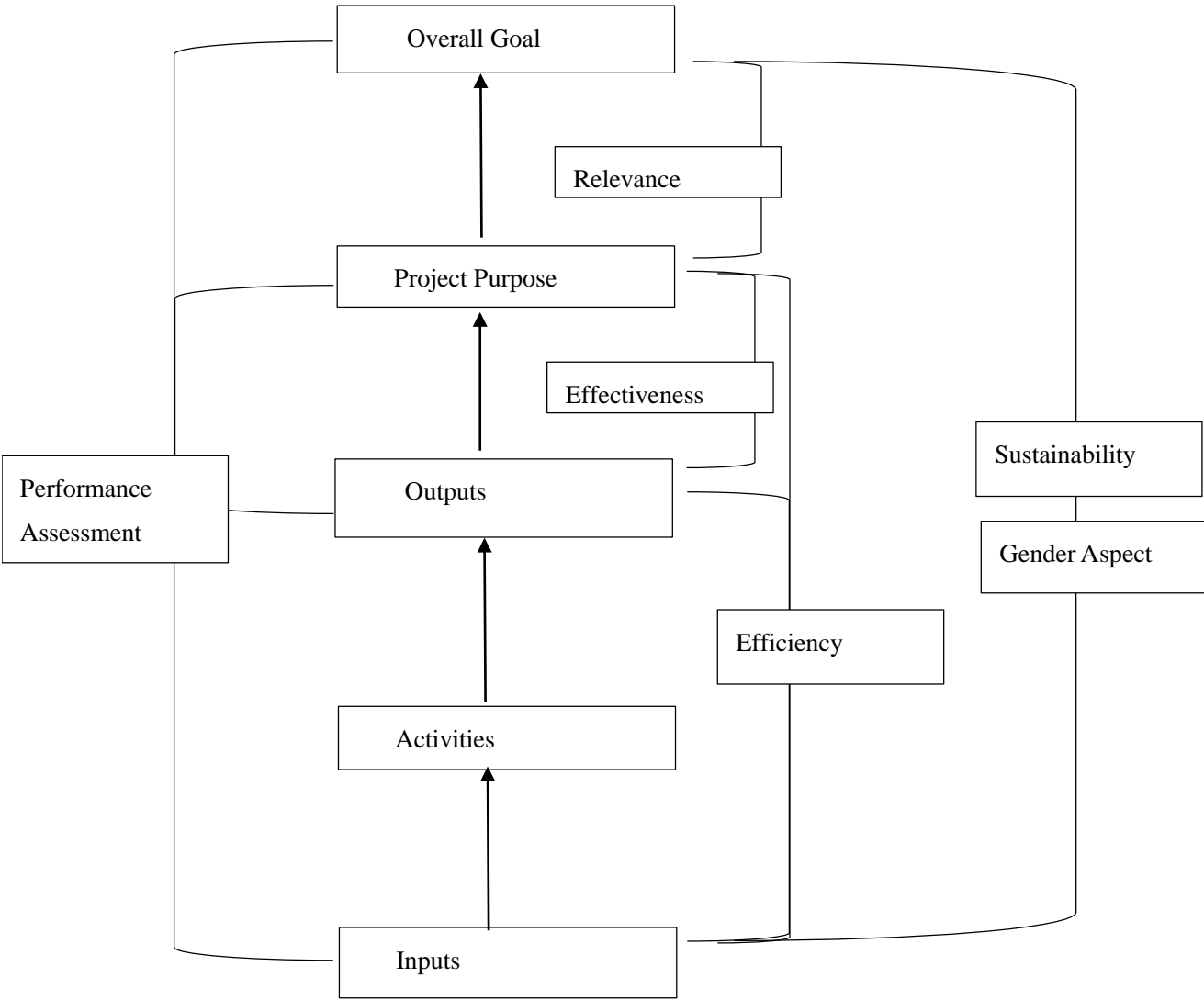
deliver activities and outputs in coordination with other stakeholders.		5. Did the actual or expected results (outputs and outcomes) justify the costs incurred?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		6. Were the resources effectively utilized?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
	How was the intervention managed in terms of timeliness?	7. How was the intervention managed in terms of timeliness?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
	Were the activities implemented on time?	8. Were the activities implemented on time?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
	How can time management be improved?	9. How can time management be improved?	1. Before/After and With/Without combination 2. Questionnaire Survey DATA	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey

Effectiveness	The extent to which the expected objectives (of a subprogramme or theme) or outcomes (of a 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.	What is the evidence demonstrating that the project has achieved its expected outcomes?	10. What is the evidence demonstrating that the project has achieved its expected outcomes?	1. Before/After and With/Without combination 2. Questionnaire Survey DATA.	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		How effective was the project in strengthening the capacities of participating institutions and ministries in the region?	11. How effective was the project in strengthening the capacities of participating institutions and ministries in the region?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		To what extent have the male and female participants, participating institutions and ministries used or applied their acquired knowledge and capability (knowledge, understanding, skills, techniques, etc.)?	12. To what extent have the male and female participants, participating institutions and ministries used or applied their acquired knowledge and capability (knowledge, understanding, skills, techniques, etc.)?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		How were men and women differently affected by the project activities and outcomes?	13. How well was gender equality reflected in activities and outcomes?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey

Sustainability	The likelihood that the benefits of the subprogramme, theme or project will continue in the future.	What evidence is there that the project outcomes will be sustained beyond the termination of the project, e.g., government commitments?	14. What evidence is there that the project outcomes will be sustained beyond the termination of the project, e.g., government commitments?	1. Before/After and With/Without combination 2. Questionnaire Survey Data.	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		To what extent has support from partners, such as AIT, BMKG, UNOSAT, SPC and SPREP, been obtained to take forward the project outcome?	15. To what extent has support from partners, such as AIT, BMKG, UNOSAT, SPC and SPREP, been obtained to take forward the project outcome?	1. Before/After and With/Without combination 2. Questionnaire Survey Score.	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		To what extent is the geo-portal and geodatabase for early warning systems developed under the project sustainable?	16. To what extent is the geo-portal and geodatabase for early warning systems developed under the project sustainable?	1. Before/After and With/Without combination 2. Questionnaire Survey Score.	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		What kind of additional intervention is recommended from ESCAP and other regional partners to ensure its sustainability?	17. What kind of additional intervention is recommended from ESCAP and other regional partners to ensure its sustainability?	1. Before/After and With/Without combination 2. Questionnaire Survey DATA.	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey

Gender	The extent to which design, implement-actions and coherence of the project aligns with gender equality.	To what extent was gender integrated into the design and implementation of the intervention?	18. To what extent was gender integrated into the design and implementation of the intervention?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey
		To what extent did men, women, and relevant social groups participated in the implementation of the intervention as implementers and stakeholders?	19. To what extent did men, women, and relevant social groups participated in the implementation of the intervention as implementers and stakeholders?	1. Before/After and With/Without combination 2. Questionnaire Survey Score	1. Project related documents, PPTs, and websites 2. Questionnaire survey answers	1. Desk reviews 2. Participatory observation 3. Questionnaire survey

**Annex E. Logical Framework and Evaluation Criteria**



## Annex F. List of Two Wrap-up Workshops Participants and Questionnaire's Respondents

Country/Other Entities	Gender	Position	Agency
Cook Island	Mr.	Asset Management Technician	Infrastructure Cook Islands
Cook Island	Mr.	Director	Emergency Management Cook Islands
Fiji	Mr.	Director	Fiji Meteorological Service
Fiji	Mr.	Director	National Disaster Management Office
Kiribati	Mr.	GIS Office	Ministry of Fisheries and Marine Resources Development
Micronesia	Mr.	Hazard Mitigation Program Manager	Office of Environment and Emergency Management
Papua New Guinea	Mr.	Meteorologist	PNG Meteorological Services
Papua New Guinea	Ms.	Acting Senior Climatologist, National Weather Service	PNG National Weather Services (NDMO)
Papua New Guinea	Mr.	Director	Papua New Guinea National Weather Services (PNG-NWS)
Solomon Island	Mr.	Senior Forecasting Officer	Solomon Island Meteorological services
Solomon Island	Mr.	Director	Solomon Islands Meteorological Office
Solomon Island	Mr.	Director	National Disaster Management Office
Samoa	Ms.	Senior Mapping Officer	Ministry of Natural Resources and Environment
Samoa	Mr.	Principal Scientific Officer	Samoa Meteorology Division, Ministry of Natural Resources and Environment.
Tonga	Ms.	BSRP Country Coordinator	Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Information, National Emergency Management Office
Tonga	Mr.	Acting Director	National Emergency Management Office
Tonga	Mr.	Director	Tonga Meteorological & Coastal Radio Services
Tonga	Ms.	Assistant Secretary	National Emergency Management Office
Tonga	Ms.	Logistics Officer	National Emergency Management Office
Tonga	Mr.	Meteorological Officer	Tonga Meteorological Service, Tonga
Tonga	Mr.	Director	Meteorologist, Tonga Meteorological & Coast Radio Service
Vanuatu	Ms.	Acting Director	Vanuatu Meteorology and Geo-Hazards Department (VMGD)
AIT	Dr.	Director	Geoinformatics Center, Asian Institute of Technology
AIT	Mr.	Research Associate	Geoinformatics Center, Asian Institute of Technology
BMKG	Ms.	Director of Center for Public Meteorology, Agency for Meteorology, Climatology and Geophysics of the Republic of Indonesia	BMKG

BMKG	Mr.	Head of Remote Sensing Division, Agency for Meteorology, Climatology and Geophysics of the Republic of Indonesia	BMKG
Japan Embassy	Mr.	Representative, Embassy of Japan in Thailand	
JAXA	Dr. (Mr.)	Senior Researcher	JAXA
Jeju National University	Prof. (Mr.)	Professor	Jeju National University
JMA	Mr.	Scientific Officer	JMA
Pacific Community (SPC)	Dr. (Mr)	Manager	Ocean and Coastal Geoscience, SPC
SPC	Ms.	Senior Advisor Risk Reduction	SPC GEM-Pacific Resilience Programme
Pulse Lab Jakarta	Mr.	Programme Specialist	Pulse Lab Jakarta
Secretariat of the Pacific Regional Environmental Programme (SPREP)	Mr.	COSPPac Climatology Officer	SPREP
UNGGIM	Mr.	Director General of Geographic Department	Geospatial Information Authority of Japan (GSI)
World Meteorological Organization(WMO)	Dr. (Mr.)	President, WMO Ra V	WMO
WMO	Mr.	WMO Representative for South-West Pacific	WMO
WMO	Mr.	Meteorological Consultant / former Permanent Representative of Fiji for WMO / former Director of Fiji Meteorological Service	WMO

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## Annex H. A Questionnaire Sheet

Dear key informant,

You have been identified in connection with the ESCAP Evaluation of the Project: Strengthening Multi-Hazard Risk Assessment and Early Warning Systems with Applications of Space and Geographic Information Systems in Pacific Island Countries. In order to provide your feedback to the project evaluator, you are kindly requested to fill in the following questionnaire, which should take no more than 12 minutes to complete and return it by 13 June 2018.

Kindly note, your feedback is critical for the evaluation. For each question, you are requested to check the box corresponding to your answer and provide a brief explanation of your response.

Thank you very much for your collaboration and efforts in providing feedback.

Tadashi NAKASU, Ph.D.  
ESCAP Project Evaluator

Name:

Position:

Affiliation:

Sex Male  Female

Questions (Check Only One)	Very High	High	Average	Low	Very Low	Please Explain Why
1. To what extent were the project objectives and outcomes aligned with the priorities and needs of the target (your) countries?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. To what extent has the project contributed to the work and mission of IDD at ESCAP, particularly as it relates to disaster risk preparedness and reduction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. To what extent has the project consulted the countries and incorporated their requirements into the project design and implementation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. How efficient was the process of achieving the outputs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Did the actual or expected results (outputs and outcomes) justify the costs incurred?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Were the resources effectively utilized?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. How was the intervention managed in terms of timeliness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Were the activities implemented on time?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9. How can time management be improved?	Please elaborate:					
10. What is the evidence demonstrating that the project has achieved its expected outcomes?	Please elaborate:					
11. How effective was the project in strengthening the capacity of participating institutions and ministries in the region?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12. To what extent have the male and female participants, participating institutions and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

ministries used or applied their acquired knowledge and capability (knowledge, understanding, skills, techniques, etc.)?						
13. How well was gender equality reflected in the activities and outcomes?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14. What evidence is there that the project outcomes will be sustained beyond the termination of the project, e.g. government commitments?	Please elaborate:					
15. To what extent has support from partners, such as AIT, BMKG, UNOSAT, SPC and SPREP, been obtained to take forward the project outcome?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16. To what extent is the geo-portal and geodatabase for early warning systems developed under the project sustainable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17. What kind of additional intervention is recommended from ESCAP and other regional partners to ensure its sustainability?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18. To what extent was gender integrated into the design and implementation of the intervention?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19. To what extent did men, women and relevant social groups participated in the implementation of the intervention as implementers and stakeholders?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20. What are the main lessons learned from the project?	Please elaborate:					
21. What are your recommendations for similar support in the future?	Please elaborate:					
22. Any other comments	Please elaborate:					

## Annex I. Evaluation Rates

Survey Questions	Indicators		Overall ((1)+(2))*0.6 +(Ave(3))*0.4
	1)+2)	3)	
<b>Relevance</b>			
1. To what extent were the Project objectives and outcomes aligned with the priorities and needs of the target (your) countries?	4.8	4.4	4.6
2. To what extent, do you think, has the Project contributed to the work and mission of IDD at ESCAP, particularly as it relates to disaster risk preparedness and reduction?		4.4	
3. To what extent has the Project consulted the countries and incorporated their requirements into the Project design and implementation?		3.8	
<b>Efficiency</b>			
4. How efficient was the process of achieving outputs?	4.5	4.2	4.3
5. Did the actual or expected results (outputs and outcomes) justify the costs incurred?		4.0	
6. Were the resources effectively utilized?		4.3	
7. How was the intervention managed in terms of timeliness?		3.8	
8. Were the activities implemented on time?		4.1	
9. How can time manage be improved?		—	
<b>Effectiveness</b>			

10. What is the evidence demonstrating that the Project has achieved its expected outcomes?	4.0	—	4.1
11. How effective was the Project in strengthening the capacities of participating institution and ministries in the region?		4.6	
12. To what extent have the male and female participants, participating institutions and ministries used or applied their acquired knowledge and capabilities (knowledge, understanding, skills, techniques, etc.)?		4.1	
13. How well was gender equality reflected in the activities and outcomes?		4.0	
<b>Sustainability</b>			
14. What evidence is there that the Project outcomes will be sustained beyond the termination of the Project, e.g., government commitments?	4.0	—	4.1
15. To what extent has support from partners, such as AIT, BMKG, UNOSAT, SPC and SPREP, been obtained to take forward the Project outcome?		4.5	
16. To what extent is the geo-portal and geodatabase for early warning systems, developed under the Project, sustainable?		4.2	
17. What kind of additional intervention is recommended from ESCAP and other regional partners to ensure its sustainability?		—	
<b>Gender mainstreaming</b>			
18. To what extent was gender integrated into the design and implementation of the intervention?	4.0	3.8	3.9
19. To what extent did men, women, and relevant social groups participate in the implementation of the intervention as implementers and stakeholders?		3.5	

(1) Desk Review; (2) Workshops observations; (3) Questionnaire survey; Ave: Average



## Annex J. Descriptive Questionnaire Comments in Detail

Survey Questions
<b>Efficiency</b>
<b>9. How can time management be improved?</b>
<ul style="list-style-type: none"> <li>– Need more time and technical support. (Solomon Islands)</li> <li>– Time management was adequate (Cook Islands)</li> <li>– More consultation. (Anonymous in PICs)</li> <li>– Better coordination between country of implementation and implementer. (Micronesia)</li> <li>– We need to choose a Prioritization Strategy for disaster management. (Korea)</li> <li>– Improve by having video or teleconferencing every 2-3 months or so on updates via each country or organization. (PNG)</li> <li>– It was pretty great because it was preceded by gap analysis and assessment. Were more resources and access made available during the gap analysis and assessment period, the effectiveness would be much better. (WMO)</li> <li>– It needs 4-5 months to require a very enhance training. (TONGA)</li> <li>– Proper survey/consultations with the responsible authorities of recipient countries, including their governments. (Fiji)</li> <li>– Having regular communication with the countries through email, teleconference, etc. (AIT)</li> <li>– Active communication.</li> <li>– Break the project up into a number of phases. Set a timeline for each phase and work within the set time frame. Furthermore, set goals and objectives to the different project phases so that we can know exactly what we are working to achieve in each phase. Considerations should also be given in case we run into certain difficulties. (PNG)</li> <li>– Liaise with countries to implement. (SPREP)</li> <li>– Perhaps more limited scope should be considered since the gaps and analysis study. (BMKG)</li> </ul>
<b>Effectiveness</b>
<b>10. What is the evidence demonstrating that the Project has achieved its expected outcomes?</b>
<ul style="list-style-type: none"> <li>– Solomon Islands now has downscale and high resolution models. (Solomon Islands)</li> <li>– Tonga's NEMO response. (Cook Islands)</li> </ul>

- We have a geoportal up and running along with basic capacity building on operation and GIS. **(Micronesia)**
- We need to select a test bed country and apply the evidence to the country. **(Korea)**
- It is clear from the ownership of the partner countries in the Pacific, of the models and systems developed by the Project, that the Project has achieved its outcomes. The strong technical engagement and pride in the Project outputs that the Pacific Island Countries demonstrated is impressive. **(UN related organization in Indonesia)**
- The level of skill acquired by officers who were trained and each countries profile has since been improved. The coordination of Disaster Management Offices with the agencies who work closely with them in DRR. **(PNG)**
- First, the targeted countries have currently applied what they were trained as part of their daily operational activities. Second, the communication among the trainer (BMKG) and trainees (targeted countries – Tonga, the Solomon Islands, PNG) is being maintained, especially in solving any problem in the operational implementation 24/7. Third, the project has initiated WMO to scale up to other countries, such as Fiji, through newly proposed activities (kindly refer to the latest meeting held in Fiji sponsored by WMO and SPREP. **(WMO)**
- Some countries have developed a weather model with higher resolution. **(JAXA)**
- Now we make use of the wrf output for the forecast. **(TONGA)**
- Seamless transition to operational mode. **(Fiji)**
- Increase in warnings lead-times, thus more preparedness times. **(Fiji)**
- Higher warning accuracy. **(Fiji)**
- Minimal fatalities and property damage. **(Fiji)**
- 5 countries implemented their own geo-nodes and analyzed GIS data by themselves in disasters after the AIT training. **(AIT)**
- The Project is now seen MHEWS in PNG, particularly drought monitoring at the district level. We can now monitor especially meteorological drought (yet to confirm the other drought types) for locations within each district of PNG. **(PNG)**
- Testimonies from the operational officers of NMSs who use the tools for their operational tasks daily shows the success of the Project clearly. **(BMKG)**

**Sustainability**

**14. What evidence is there that the Project outcomes will be sustained beyond the termination of the Project, e.g., government commitments?**

- Government budget allocated for early warning. **(Solomon Islands)**
- Funding and human resources already available at the national level. Just needed projects like the MHEWS to up-skill and share knowledge and technologies. **(Cook Islands)**
- We have a spatial data strategy to serve as the backbone of this project outcome. This spatial data strategy would be shared with the state government to get their input and to see how this strategy fits to their context. **(Micronesia)**
- We make guidelines using the Project outcomes and distribute it to member states. **(Korea)**

- The ownership by the Project beneficiaries of the Project outputs will help sustain the knowledge and systems developed by the Project. Also, coordination with stakeholders and search for synergies with other ongoing programmes will help sustain the outcomes. **(UN related organization in Indonesia)**
- The government strongly supports any work/project that is linked to climate change and so the Project outlines this in light of severe extreme events that we have seen in the past decade or so. **(PNG)**
- They still communicate with each other in exchanging technicalities to support the daily operational technical needs commitments by government and international agencies. **(WMO)**
- Weather forecast output will reflect information from the WRF and the WMO CAP will be operational 24/7 and feed at routine time. **(TONGA)**
- Without engagement of recipient governments, sustainability is compromised. **(Fiji)**
- The honorable minister from Tonga acknowledged the importance of the outcomes of the Project during his speech at the side event organized on 15 May in UNESCAP. It is evident that Tonga is very serious to carry toward the Project and they are interested to have a follow up project on drone. **16**
- PNG NWS has already met and discussed at the ministerial level regarding the Project. The responsible ministry has seen the Project to be a boost in the area of MHEWS and so has made some commitments. **(PNG)**
- It's part of the normal operations of some countries. **(SPREP)**
- Pilot activities provided is actually simple to be maintained financially. **(BMKG)**

**17. What kind of additional intervention is recommended from ESCAP and other regional partners to ensure its sustainability?**

- Maintenance and staff to attend technical training. **(Solomon Islands)**
- Term reviews on the status of MHEWS implementations on PICs. **(Cook Islands)**
- Work plan was developed along with the geo-portal to help guide the management of the portal. **(Micronesia)**
- Further integration with SPC, which is receiving much funding for these activities, and is strengthening its capacity in this field. **(UN related organization in Indonesia)**
- Strong policies and strong marriage of government and its commitment to sustain early warning systems. **(PNG)**
- The geoportal and geodatabase will be more effective when both NDMO (National Disaster Management Office) and NMS (National Meteorological Service) collaborate to implement the new paradigm of Disaster Mitigation. **(WMO)**
- Capacity building on GIS, Remote Sensing as well as disaster mitigation and management. **(JAXA)**
- Train our own employee to self-maintenance and handle the implemented project. **(TONGA)**
- Ensure recipient country governments' total commitment. **(Fiji)**
- ESCAP should support some follow-up projects. For example, most of the Pacific countries are data-poor, so data acquisition using drones could be very advantageous for the countries. **(AIT)**
- Capacity Building. **(AIT)**
- The Project is now up and running. However, there are still quite a few more areas that need to be consulted before ensuring its sustainability. **(PNG)**
- Below are some areas worth mentioning:

- Validation of the outcomes of the Project to the existing systems, as well as the actual events.
- Awareness of the Project by the potential users of the Project, especially at the community level.
- Training programs setup for capacity building within the PNG NWS **(PNG)**
- Work closely with Pacific Met council to work on project proposal development for implementation for sustainability and to achieve long term goals from the region. **(SPREP)**
- To continue with project phase 2. **(BMKG)**

### Lessons learnt and recommendations

#### 21. What are the main lessons learned from the Project?

- Working together with experts is very important for their technical expertise to help the small developing countries, like the Solomon Islands. **(Solomon Islands)**
- Sharing is important. **(Cook Islands)**
- Not enough consultations on activities. More top down approach. **(Anonymous in PICs)**
- Coordination and collaboration are key to a project success. **(Micronesia)**
- Disaster problems must be divided into ocean and land sides, respectively. **(Korea)**
- There is a strong desire among beneficiary governments for data and disaster risk models at a higher spatial granularity, and more relevant to the specific needs of each PIC. The Project made a big step forward in this direction. **(UN related organization in Indonesia)**
- Additional computing capacity is required in the beneficiary country governments to progress further. **(UN related organization in Indonesia)**
- In any developing nation, there is always assistance available to develop capacity and improve the lives of people. I have learnt the work of UNESCAP in gathering many different partners to commit to funding projects and ensuring that not only does the country benefit from the products, but also they can be able to sustain it through the support of government and other aid sources. **(PNG)**
- First, targeting countries are capable of embracing new technology to cope with the ever increasing disasters if they are facilitated through proper methodology ("FLEES"). Second, implementation of new way of doing things needs time to penetrate. The support of services in helping them to get used to new technology is beyond project cost and timeline, thus and in that case communication and contact seems to be much greater in need to be fostered between trainer and trainees (BMKG and NMS targeting countries). **(WMO)**
- There are many challenges on disaster management, however both the human resources and financial resources are limited for the Pacific countries. **(JAXA)**
- Ensure the sustainability of the Project and FLEES method is best for fast, cheap and useful implementation. **(TONGA)**
- MHEWS will save lives, reduce property loss and strengthen PICs capabilities in mitigating disaster impact. This will go a long way to enhancing resilience and thus survival in the long term. **(Fiji)**
- Long term capacity building through long durational capacity building programs. ?

- The existing products used by PNGNWS only allows viewing the final products. The Project saw PNGNWS to install. Furthermore, PNGNWS can now manage and edit the input data to get certain outcome so as to best fit its purpose. ( **PNG**)
- Work closely with regional organizations. ( **SPREP**)
- Project preparations is a must, and understanding of each country needs is the most important. ( **BMKG**)

**22. What are your recommendations for similar supports in the future?**

- A more solid group is worth establishing in supporting LCD or SIDS on the same activities as lessons learnt has successfully been obtained. ( **No Identify**)
- Information sharing, as well as people exchange in the region, including East and South East Asia and the USA, will be helpful for disaster mitigation and management for the Pacific countries. ( **JAXA**)
- We need further collaboration in sharing ideas (MOU) to improve the early-warning system. ( **TONGA**)
- Future project focus is necessary.
- Drone and their applications is recommended.
- More on Multi-Hazard Risk Assessment is required. ( **AIT**)
- Review current projects. ( **Anonymous in PICs**)
- The small island countries need your support and with partners with technical support. ( **Solomon Islands**)
- Similar support on the acquisition of high resolution satellite imagery for small island states using UAV technology. ( **Cook Islands**)
- Consult countries on their needs. ( **Anonymous in PICs**)
- The PICs lacks so many things, however, since this geo-portal has been developed we also need ways to keep updating and uploading maps to serve its purpose, therefore I would really appreciate if a project that would help us collect data in times of peace and disaster be an option. During the closing of the Project, ESCAP shared their willingness to support a drone project and capacity building, FSM is on board and would give our full support to ensure this project materializes. I personally would like to thank you ask for your continuous support to support this project for the need is there. ( **Micronesia**)
- We need to make guidelines based on a successful outcome of the projects and distribute it to member countries in UN. ( **Korea**)
- I think it is important to further develop the country-specific weather, wave inundation, climate and disaster risk models, and that it would be useful to integrate different datasets into the disaster impact models, such as mobile network data. You could also look to include information from UAVs for which you could partner with. Also, it is important to keep focusing on the capacity of the local met offices and disaster response offices (as was done under the Project), as the capacity to understand and act on the models is very important for reducing disaster risks. ( **UN related organization in Indonesia**)
- Involve the high-level ministry in first regional meetings so agreements can be reached prior through implementing

- projects. Especially those in finance, planning and foreign affairs. **(PNG)**
- The activities can be scaled up with other countries as also raised during our last meeting in Nuku'alofa (Tonga). Targeting countries (Tonga, PNG, Solomon Islands and others) in need of roadmap of long-term development that consistently be implemented. Seminar and workshop for technical assistance and collaboration with technically advanced countries, such as Japan, Korea, China, Australia and USA. Further the study of the staffs for the implemented project. **(WMO)**
  - Do the fundamental fact-finding surveys correctly and thoroughly with total engagement of governments and responsible authorities. **(Fiji)**
  - Engage an appropriate project consultant. **(Fiji)**
  - Include more training programs in the Project and focus more on feasibility of technology that is used.
  - The Project is currently in its infant stages and so PNGNWS will require much more assistance prior to making it sustainable. However, this will not stop us from further setting projects in other areas of the MHEWS. **(PNG)**
  - SPREP is willing to work closely with partners to implement MHEWS in the Pacific region. **(SPREP)**
  - Project phase 2 for continuing and further improving the project output & outcome. **(BMKG)**