



ESCAP

Multi-donor Voluntary Trust Fund on Tsunami
Early Warning Arrangements in the Indian
Ocean and Southeast Asia

TERMINAL REPORT

PROJECT TITLE	Enhancing Weather and Climate Resilience in RIMES Member States through Capacity Building on Impact Forecasting
ORGANIZATION	Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES)

Total project budget	US\$ 591,689	Funding received to date	US\$ 580,376
Percentage of total project budget spent	89.8%	Percentage of funding received to date that has been spent	91.6%
Interest earned on funding received from ESCAP	US\$ 2		
Date of signature of Letter of Agreement	6 February 2017	Date of project completion	31 December 2018

I certify the accuracy of the substantive and financial information contained in this report.

A.R. Subbiah
Director
31 January 2019

The terminal report is accepted.
I hereby certify that I am satisfied with the delivery of the project from the funds ESCAP provided to partner and the expense reporting from IP reflects the realistic progress of the project.

I.D.

(Signature) 24.05.2019
Date
Mr. Sanjay Srivastava, Chief of DRS/IDD

OVERALL ASSESSMENT

Briefly state the main results of the project so far. These could include key activities and, more importantly, should include any evidence of capacities the project has built. Is there any evidence that the project has reduced gender inequalities?

Goal: Enhanced resilience to weather- and climate-related hazards in select RIMES Member and Collaborating States

Expected Outcome: Decision-making and seasonal planning in at least 3 climate-sensitive sectors in Cambodia, Myanmar, Sri Lanka, Fiji, Papua New Guinea, and Samoa are informed by weather and climate information at different timescales by end of the project

Performance Indicators:

1) Demonstrated application by user agencies in at least 3 climate-sensitive sectors in each target country of weather and climate information in potential impact assessment and risk analysis, and in the identification and implementation of impact management strategies/actions before and during the season by 3rd semester of the project

Among the 6 project countries, NMHSs of Myanmar and Sri Lanka have long experience in engaging with users for weather and climate information application, to guide planning and decision-making ahead of and during the monsoon seasons.

Myanmar:

Agriculture

- Township-specific rainfall from Cyclone Maarutha was captured by the Specialized Expert System for Agro-Meteorological Early Warning for Climate-Resilient Agriculture (SESAME) on 15 April 2017. The cyclone made a landfall in Myanmar's Rakhine coast on 16 April 2017, and started dissipating by 17 April 2017.
 - Based on the rainfall forecast, Department of Agriculture's (DOA's) district/township officials and extension workers in Nyaung Oo analyzed potential impacts on livelihood activities in Myanmar's Dry Zone. Advisory for farmers in the district/township to safe-keep harvested crops and other resources was issued. Compliance by farmers to the advisory resulted to saved harvest and other resources.
 - DOA district/township officials and extension workers in Nyaung Oo, together with farmers from Taung Zin Village, also analyzed the possible planting of sesame, to take advantage of the potential rainfall from Cyclone Maarutha. Based on outcomes of this analysis, these farmers advanced the planting of sesame in mid-April, instead of the usual planting in mid-May.
- SESAME's 3- and 10-day forecasts for Monywa indicated the likelihood of significant rainfall on 25 and 26 May 2017. Based on this forecast, advisory for early harvest of green gram was disseminated. Five villages in the township responded, and saved 1,927 acres of green gram.
- Episodes of untimely rainfall in Myanmar during the course of the 2017-2018 dry season (November 2017 – April 2018), due to severe weather disturbances that developed in the Bay of Bengal, were captured in DMH-generated forecasts and SESAME products. On receipt of forecast, DOA issued advisories to prevent flooding in farms. While heavy rainfall-associated damages to standing crops could not be totally avoided (damages to about 5,375 acres of crops in Nay Pyi Taw City and in Sagaing, Bago, Magway, and Ayeyarwady Regions were reported), DOA estimated that damages could have been worse had it not analyzed forecast-based impacts and risks to standing crops, and generated and disseminated advisories to farmers.

- SESAME's regularly updated township-wise 3-day and 10-day forecasts informed farming activities in Myanmar's Central Dry Zone, viz:
 - In Meiktila Township, updated 3-day forecasts received by local DOA office on 25 May 2018 onwards indicated potential significant rainfall by last week of May 2018. Local DOA officers analyzed possible damaging impacts on standing crops (pre-monsoon cotton, paddy, and sesame planted within February to March 2018, and expected to be harvested in June/July 2018) and opportunity for tapping rainfall to irrigate monsoon crops (sesame, beans, etc.; usually planted in May). DOA township officials in Meiktila generated and disseminated advisories to farmers to: improve drainage in farms with standing crops; adjust irrigation plans for paddy to make use of potential rainfall and, thus, reduce irrigation costs; prepare measures to reduce/mitigate infestation of pests post-rainfall; and delay planting of monsoon crops for farmers who are yet to plant, to avoid crop loss. DOA reported reduction of heavy rainfall damages to crops to only 4% of the total crop area in Meiktila, compared to other years of similar circumstances.
 - 10-day forecasts received by DOA officers in Monywa Township on 21 May and 1 June 2018, and 3-day forecasts received from 25 May 2018 onwards, suggested possibility of heavy rainfall from end of May to early June 2018. Potential beneficial/ detrimental impacts to standing and newly planted crops were analyzed by DOA officers in Monywa. Advisories were issued to: defer scheduled irrigation of standing and newly-planted crops, and optimize use of rainfall for nourishing crops; and prepare/enhance drainage canals in areas planted with green gram, sesame, and other water-sensitive crops to prevent possible damages. Application of these advisories resulted to:
 - MMK 2,013,000 (about USD 1,500) of irrigation cost saved
 - 87 acres of green gram protected from damages, thereby saving farmers' investments of about MMK 4,700,000 (approximately USD 3,500)
 - 24 acres of pre-monsoon sesame saved; 2018 pre-monsoon sesame production (average of 14.85 baskets/acre; each basket consisted of 24.55 kg) exceeded the 2017 production (average of 14.25 baskets/acre)

Disaster management

- DMH issued a series of forecasts/ warnings of potential wind and rainfall from low-pressure area and deep depression in the Bay of Bengal during the last dekad of May 2017. The low-pressure area/ deep depression later became Cyclone Mora, which made a landfall in Cox's Bazar, Bangladesh, on 30 May 2017. Based on this information, Myanmar Red Cross Society (MRCS) activated its Emergency Operations Center to monitor the extreme weather event, and convened Emergency Task Force meetings for analyzing potential impacts to Rakhine State and for mobilizing resources for response.
- DMH forecasts/warnings captured the formation/development of low-pressure areas (LPAs) and depressions over the Bay of Bengal in November and December 2017. DMH also issued untimely rainfall and wind warnings on 1 and 16 April 2018. Myanmar Red Cross Society (MRCS) assessed potential risks, and disseminated advisories for: implementation of safety measures in relevant areas; and pre-positioning of response equipment/paraphernalia and replenishment of non-food stocks in strategic warehouses, which facilitated MRCS' speedy assistance to the affected population in Nay Pyi Taw City and in Sagaing, Bago, and Ayeyarwady Regions.

Water resources

- DMH's climate outlook for 2017 Southwest monsoon season indicated normal rainfall for the early monsoon period (May-June 2017) and above normal rainfall for the mid-/ peak monsoon period (July-August 2017). Based on this information, the Irrigation and Water Resource Utilization Management Department (IWUMD) reinforced embankments along key rivers, renovated drainage canals, and strengthened spillways to mitigate potential flood impacts.

- Climate outlook for the 2017-2018 dry season of potential for above-normal rainfall, owing to severe weather disturbances over the Bay of Bengal, led the IWUMD to anticipate sufficient water availability in its dams and reservoirs and possibility of flooding during the season. Accordingly, IWUMD:
 - Closely monitored DMH's daily/3-day forecasts and undertook measures for gradual release of water from reservoirs and dams when severe weather events were anticipated, avoiding flashflood in some areas
 - Maximized supply of irrigation water for supporting dry season crops in various regions; water shortage was not anticipated and did not occur during the 2017-2018 dry season

Sri Lanka:

Agriculture

- Suppressed rainfall from most of 2016 until around mid-May 2017 resulted to widespread drought over the country. Based on observed conditions and Department of Meteorology (DOM) forecast for 2016-2017 Maha season (September 2016 to March 2017):
 - The Department of Agriculture (DOA) and Department of Irrigation (DOI) provided continuous guidance to farmers, which included: a) reduction of land preparation period for taking advantage of intermittent rainfall for crop planting; b) limiting of cultivation extent; c) cultivation of short-duration, drought-resistant varieties; d) utilization of tank storages for crop growth only, and not for replanting; and e) foregoing cultivation. Most farmers limited planting, reducing losses in investments. Reports received on crop casualties for those who planted were not as much as in other drought events, due to advisories/ decisions provided by DOA and DOI. Also, DOA provided recommendation to the Ministry of Agriculture for immediate rice importation, in view of anticipated reduced production from the 2016-2017 Maha season.
 - The tea sector applied moisture conservation techniques, which resulted to zero death of mature tea plants, as compared to the 1992 drought.
- Updated climate outlook, released by DOM for the 2017-2018 Maha season, indicated higher probability of above-normal rainfall in September 2017, and probability for near normal rainfall on the average from September to November 2017. Based on this information, and noting the continuing very low water levels in most major reservoirs and minor tanks in the country, DOA issued advisories to: use incidental rains for land preparation; select short-duration (3-3.5 months) paddy varieties, where water storage is satisfactory, or switch to *Bethma* system or 2.5 month paddy varieties in areas with low tank storage; and adopt strict water issue schedules in both major and minor irrigation schemes.
- Regularly-received seasonal and monthly climate outlooks from DOM guided DOA in strengthening decisions vis-à-vis persisting drought in Sri Lanka. Climate outlook for November 2017-January 2018 indicated higher potential for below normal rainfall over most parts of the country. DOA analyzed potential impacts and risks based on these outlooks and prevailing low water levels in most reservoirs, and undertook preparedness measures as follows:
 - Conducted meetings with farmers for communicating updated forecasts from DOM, and recommended preparedness measures which included: a) reduction of paddy cultivation in areas with very low water availability; b) cultivation of other field crops/vegetables in areas with low water availability; c) in areas where paddy cultivation was assessed to be feasible, cultivation of short-aged rice varieties should be prioritized; d) cultivation techniques to be considered were dry sowing, alternate wetting and drying, and shared/common cultivation system (*Bethma* system); and e) implementation of water conservation methods. Due to

rigorous efforts of DOA in advising farmers on appropriate crops and cropping practices to take based on observed conditions and forecasts from DOM, among others, it is expected that paddy production of Maha season (September 2017-March 2018) would still be enough for the country's requirements for the next 7.5 months.

Fisheries

- The Department of Fisheries (DOF) reported significant reduction in incidents and casualties from ocean-related natural hazard events to almost zero. This is due to enhanced 3-day and 10-day severe weather warnings, better DOF capacity to understand forecasts, and better communication facilities in multi-day fishing vessels.
- Continued receipt by DOF of 3-day and 10-day forecasts from DOM ensured timely dissemination of cautionary advisories to multi-day fishing boats, maintaining zero natural hazard-related incidents at sea during severe weather conditions

Water resources

- In response to the updated climate outlook for the 2017-2018 Maha season, and considering very dry conditions up to the end of the 2017 Yala season, the Department of Irrigation (DOI) undertook measures for optimizing water storage in reservoirs. This included advisories to farmers to start cultivation on rainfall onset, and to select short-maturing varieties, which are less water-intensive.
- DOM's seasonal and monthly forecasts for Maha Season, particularly for November 2017-February 2018, indicated greater likelihood of below normal rainfall over most of Sri Lanka. To address issues on water availability for various sectors, noting water deficit in many tanks/reservoirs and the anticipated below normal rainfall over the season,:
 - DOI, in collaboration with DOM and DOA, led a multi-institution national awareness program, for presenting the continuing and anticipated risks to water resources and the feasible water management strategies during the season. The program decided to have DOI and other water resources institutions to continue their efforts in optimizing utilization of water in tanks and reservoirs, and to immediately disseminate advisories to farmers to prioritize short-term varieties for new crops, and plan cultivation with potential onset of the Northeast monsoon.
 - Planning meetings involving institutional decision-makers in DOI and DOA, other relevant sectors, and farmers were conducted to decide on the cultivation extent.
- Meticulous and informed planning and decision-making in DOI facilitated meeting of 100% of potable water requirement, 85% of irrigation water requirement for agriculture, and sufficient water for environment, wildlife, and inland agriculture in various districts, except in Vavuniya, Mannar, Puthalam, Anuradhapura and Kurunegala where no reasonable cultivation could be pursued due to severe water deficit. In these areas, DOI advised farmers to forgo Maha cultivation, thus saving farmers' investments.

Energy

- Based on observed conditions and DOM forecast for 2016-2017 Maha season, Ceylon Electricity Board's (CEB's) Board of Directors undertook decision to focus hydropower generation only on peak hours. Thermal power generation was optimized, and self-generation and solar generation schemes were introduced for industries.
- Information on available water in hydro-catchment areas and forecast of greater probability for below normal rainfall vis-à-vis 2017-2018 Maha season informed CEB's decision to maximize thermal power generation for meeting electricity demand. Sufficient fuel stocks were procured,

scheduled thermal power outages for maintenance work were postponed, and supplemental 55 MW thermal power plant was put in place. Solar and wind plant schemes were promoted for industries.

Disaster Management

- DOM-generated climate outlooks and weather forecasts guided the Disaster Management Center (DMC) in better responding to drought and minimizing impacts of sea-related incidents due to strong wind and high waves.
 - Based on regularly received seasonal and monthly outlook from DOM, which indicated higher probability for below normal rainfall for most of Maha season, DMC mapped current and expected drought-affected areas, discussed with water resource authorities for anticipating potable water requirements in subsequent months, beefed up its capability for water distribution, and issued water-saving strategies to the already affected and likely affected population.
 - DOM warnings on very strong winds and high waves were received by DMC from 21-29 November 2017. DMC released advisories for the likely affected population and sectors to take precaution; all fishing boats were advised not to venture to sea. DMC estimated that the strong wind- and high wave-related damages and impacts would have been worse if forecasts were not used.

2) Multi-hazard seasonal forum established each in Fiji, Papua New Guinea, and Samoa, facilitating potential impact and risk assessments to inform seasonal planning, by 3rd semester of the project

Fiji:

- The seasonal forum in Fiji is named Preparedness Planning Dialogue, with the 1st meeting convened by Fiji Meteorological Service (FMS) in Suva on 12 January 2018. Ten agencies from the agriculture, water, health, energy, and disaster management sectors were amply represented. FMS presented its products and services, and issued the seasonal outlook of higher likelihood of normal to above normal rainfall over most parts of the country, from January to June 2018. Participants analyzed sector-wise potential impacts and risks, based on observed conditions and FMS seasonal climate outlook, and drew preparedness plans for managing potential impacts and risks.
- The 2nd Preparedness Planning Dialogue was convened in Suva on 19 October 2018, with 6 user institutions added to the Dialogue participants. Participants shared actions undertaken during the past season, and identified challenges in using climate information. Users are not yet proactive in making forecast-based decisions. As with users in Myanmar and Sri Lanka, building skill and confidence in using climate information would require time. Participants also analyzed potential impacts of the 7 to 9 tropical cyclones projected to affect Fiji during the cyclone season, and shared corresponding preparedness plans. The meeting also monitored the status of implementation of the recommendations from the 1st Preparedness Planning Dialogue, and provided recommendations to address residual and emerging issues.

Papua New Guinea:

- The Seasonal Forum in Papua New Guinea was established in October 2016, with RIMES facilitation. Under this project, two forums were convened by the National Weather Service (NWS).
- The 2nd National Seasonal Forum was convened on 13 October 2017 in Port Moresby, with participation from 10 user institutions. Participants analyzed potential impacts based on the seasonal outlook for 2017-2018, and identified impact management strategies. The Department of Mineral Policy and Geohazards Management (DMPGM), Department of Health, PNG Power, Department of Agriculture and Livestock (DAL), and PNG Red Cross presented their impact outlooks and management strategies/ measures.

- The 3rd Seasonal Forum was convened on 25 May 2018 in Port Moresby. Three institutions were added to the Forum participants: Department of Agriculture and Livestock (DAL), National Fisheries Authority (NFA), and National Maritime Safety Authority (NMSA). Six institutions shared experiences during the past season. As with Fiji, participating user institutions are yet to be proactive in making forecast-informed decisions. Participants assessed potential impacts and risks to their sectors, based on persisting relevant conditions and NWS' climate outlook for June to August 2018 for various provinces.

Samoa:

- The Seasonal Forum was not established in Samoa. Rather, the Samoa Meteorological Department (SMD) requested to first engage with users through a training on multi-hazard early warning, for better user appreciation of institutional roles in the end-to-end EWS. The training was held in Apia from 16-18 July 2018, attended by 27 participants from 9 user institutions from the water, transportation, development, and academic sectors. Participants appreciated the range of products and services available from SMD. Participants received training on understanding forecasts, translating these into potential impacts, and identifying appropriate management options.

3) Decision support systems aid potential impact/risk analysis in the agriculture sector in Cambodia, Myanmar, Sri Lanka, and Papua New Guinea to inform decision-making for managing resources/risks, by end of the project

Under this phase of the project, SESAME was customized for Cambodia, Sri Lanka, and Papua New Guinea, and expanded to 8 more townships in Myanmar. The systems are ready for experimental operation. (SESAME is a web-based decision support system that maps crop sensitivity to a particular weather condition, processes how the predicted weather shall influence crop growth, and generates crop management advisories using machine-learning algorithm. The system has capability to disseminate bulletins via email, SMS, fax, and social media. A mobile application complements the dissemination system. Also, the system has capability to verify weather forecasts and receive user feedback.). The table below lists key features of the system, for each target country.

	Cambodia	Sri Lanka	Papua New Guinea	Myanmar
Baseline	-	-	-	<ul style="list-style-type: none"> o Provides 3-day and 10-day forecasts to 285 of the 325 townships in Myanmar o Full services (weather and climate information, and agro-advisories) to 5 townships: Monywa, Nyaung U, Chauk, Myingyan, and Shwebo
Pilot sites and priority crops	<ul style="list-style-type: none"> o Samroang District (Kampong Speue Province) o Thmor Koal District (Battambang Province) o For both sites: Rice – Pkha Rumduol variety 	<ul style="list-style-type: none"> o Ibbagamuwa Division (Kurunegala District)/ intermediate climate zone: Rice o Ipalogama Division (Anuradhapura District)/ dry zone: Maize 	<ul style="list-style-type: none"> o Eastern Highlands Province: Coffee o Oro Province: Oil palm 	<ul style="list-style-type: none"> o Hpa-an Township: Groundnut o Kawkareik Township: Groundnut o Keng Tung Township: Maize o Kyauk Phyu Township: Rice o Labutta Township: Rice o Mawlamyine Township: Rice o Meiktila Township: Rice, pigeon pea, and sesame o Pekon Township: Soybean

Forecast system	<ul style="list-style-type: none"> ○ 3-day weather forecast ○ 10-day weather forecast 	<ul style="list-style-type: none"> ○ 3-day weather forecast ○ 10-day weather forecast 	<ul style="list-style-type: none"> ○ 3-day weather forecast ○ 10-day weather forecast 	<ul style="list-style-type: none"> ○ 3-day weather forecast ○ 10-day weather forecast
-----------------	---	---	---	---

4) NMHSs in each target country deliver at least one user-demanded new/enhanced product/service in support of impact forecasting/ risk analysis by end of the project

This component is not covered during this phase of project implementation, except for the capacity building component by WMO.

WMO facilitated 2 capacity building activities, which resulted to the following:

- Introduction of the concept of impact-based forecasting and warning services to senior forecasters of Bhutan, India, Maldives, Myanmar, Sri Lanka, and Thailand at the regional meeting of NMHSs in South Asia, held from 28 November to 1 December 2018 in Colombo. The meeting also finalized the Regional Subproject Implementation Plan of WMO’s Severe Weather Forecasting Demonstration Project for Bay of Bengal. The Plan includes NMHS capacity development on NWP product interpretation, generation of user-relevant information, and public weather service delivery.
- Training of 28 operational forecasters and public weather services staff of NMHSs of Bhutan, India, Maldives, Myanmar, Nepal, Sri Lanka, and Thailand on severe weather and impact-based forecasting and warning services (3-8 December 2018 in Colombo). The training focused on ensemble forecasting for improving forecast confidence, impact-based forecasting and warning, and verification of forecasts and warnings.

ACTIVITY WORK PLAN

	Activity	Time Frame	Description of Results																														
1	<p>Project initiation</p> <ul style="list-style-type: none"> o <i>Regional meeting of project partners to finalize work plan, confirm roles, propose pilot sites, establish/confirm baseline, assess further needs</i> 	<p>Feb – Mar 2017</p> <p><i>Note: Project start date adjusted according to date of LOA signing</i></p>	<p>Project focal points (NMHSs) and participating user agencies understood the project, agreed with the project framework, and provided further inputs, from project initiation meetings held at two levels: a) regional meeting that dovetailed ESCAP's Regional Learning Platform for Mainstreaming Disaster Risk Reduction for Poverty Eradication in Asia-Pacific, 31 March 2017; and b) country-specific meetings, which allowed participation of more user agencies.</p> <p>Partner NMHSs and user agencies expressed their commitment to and appreciation of the project, anticipating capacity building activities for the NMHS and user agencies, and noting its potential contribution in integrating the NMHS with user sectors and communities.</p> <p>RIMES noted user demands articulated during the meetings. Some of these demands, however, were beyond the scope of the project (e.g. decision support system development for Fiji and Samoa, capacity development on flood forecasting for Fiji, and enhancement of Samoa Meteorological Department's earthquake and tsunami services).</p> <p>The table below lists the project focal points and user agencies that have participated in the project.</p> <p><i>Institutions that participated in project implementation/ activities</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 16.6%;">Cambodia</th> <th style="width: 16.6%;">Myanmar</th> <th style="width: 16.6%;">Sri Lanka</th> <th style="width: 16.6%;">Fiji</th> <th style="width: 16.6%;">Papua New Guinea</th> <th style="width: 16.6%;">Samoa</th> </tr> </thead> <tbody> <tr> <td colspan="6">Lead agency</td> </tr> <tr> <td>Department of Meteorology (DOM)</td> <td>Department of Meteorology and Hydrology (DMH)</td> <td>Department of Meteorology (DOM)</td> <td>Fiji Meteorological Service (FMS)</td> <td>National Weather Service (NWS)</td> <td>Samoa Meteorological Department (SMD)</td> </tr> <tr> <td colspan="6">Participating agencies</td> </tr> <tr> <td> <ul style="list-style-type: none"> o Ministry of Agriculture, Forestry and Fisheries: <ul style="list-style-type: none"> - General Directorate of Agriculture (GDA) - Rice Crop Department - Department of Horticulture and Subsidiary Crop - Council for Agriculture and Rural Development - Cambodian Agricultural Research and Development </td> <td> <ul style="list-style-type: none"> o Department of Agriculture (DOA) o Forest Department o Livestock Breeding and Veterinary Department (LBVD) o Department of Fisheries o Irrigation and Water Resources Utilization and Management Department (IWRUMD) o Department of Hydropower Implementation/ Ministry of Electricity and Energy </td> <td> <ul style="list-style-type: none"> o Department of Irrigation (DOI) o National Building Research Organization (NBRO) o Department of Agriculture (DOA) o Rubber Research Institute o Tea Research Institute o Sugarcane Research Institute o Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) o Field Crop Research and </td> <td> <ul style="list-style-type: none"> o Ministry of Agriculture <ul style="list-style-type: none"> - Animal Health and Production Division - Extension Division - Land Resource Planning and Development Division - Research Division o Sugar Research Institute of Fiji o Fiji Sugar Corporation (FSC) o Fiji Electricity Authority o Energy Fiji Limited (EFL) </td> <td> <ul style="list-style-type: none"> o Department of Mineral Policy and Geohazard Management (DMPGM) o Climate Change and Development Authority o Conservation and Environment Protection Authority (CEPA) o Department of Agriculture and Livestock (DAL) o National Disaster Centre o National Maritime Safety Authority (NMSA) </td> <td> <ul style="list-style-type: none"> o Ministry of Natural Resources and Environment/ Water Resource Division o Samoa Water Authority o Samoa Land Transportation Authority o Ministry of Works, Transport and Infrastructure/ Maritime Division o Ministry of Women, Community and Social Development o Samoa Umbrella for Non- </td> </tr> </tbody> </table>	Cambodia	Myanmar	Sri Lanka	Fiji	Papua New Guinea	Samoa	Lead agency						Department of Meteorology (DOM)	Department of Meteorology and Hydrology (DMH)	Department of Meteorology (DOM)	Fiji Meteorological Service (FMS)	National Weather Service (NWS)	Samoa Meteorological Department (SMD)	Participating agencies						<ul style="list-style-type: none"> o Ministry of Agriculture, Forestry and Fisheries: <ul style="list-style-type: none"> - General Directorate of Agriculture (GDA) - Rice Crop Department - Department of Horticulture and Subsidiary Crop - Council for Agriculture and Rural Development - Cambodian Agricultural Research and Development 	<ul style="list-style-type: none"> o Department of Agriculture (DOA) o Forest Department o Livestock Breeding and Veterinary Department (LBVD) o Department of Fisheries o Irrigation and Water Resources Utilization and Management Department (IWRUMD) o Department of Hydropower Implementation/ Ministry of Electricity and Energy 	<ul style="list-style-type: none"> o Department of Irrigation (DOI) o National Building Research Organization (NBRO) o Department of Agriculture (DOA) o Rubber Research Institute o Tea Research Institute o Sugarcane Research Institute o Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) o Field Crop Research and 	<ul style="list-style-type: none"> o Ministry of Agriculture <ul style="list-style-type: none"> - Animal Health and Production Division - Extension Division - Land Resource Planning and Development Division - Research Division o Sugar Research Institute of Fiji o Fiji Sugar Corporation (FSC) o Fiji Electricity Authority o Energy Fiji Limited (EFL) 	<ul style="list-style-type: none"> o Department of Mineral Policy and Geohazard Management (DMPGM) o Climate Change and Development Authority o Conservation and Environment Protection Authority (CEPA) o Department of Agriculture and Livestock (DAL) o National Disaster Centre o National Maritime Safety Authority (NMSA) 	<ul style="list-style-type: none"> o Ministry of Natural Resources and Environment/ Water Resource Division o Samoa Water Authority o Samoa Land Transportation Authority o Ministry of Works, Transport and Infrastructure/ Maritime Division o Ministry of Women, Community and Social Development o Samoa Umbrella for Non-
Cambodia	Myanmar	Sri Lanka	Fiji	Papua New Guinea	Samoa																												
Lead agency																																	
Department of Meteorology (DOM)	Department of Meteorology and Hydrology (DMH)	Department of Meteorology (DOM)	Fiji Meteorological Service (FMS)	National Weather Service (NWS)	Samoa Meteorological Department (SMD)																												
Participating agencies																																	
<ul style="list-style-type: none"> o Ministry of Agriculture, Forestry and Fisheries: <ul style="list-style-type: none"> - General Directorate of Agriculture (GDA) - Rice Crop Department - Department of Horticulture and Subsidiary Crop - Council for Agriculture and Rural Development - Cambodian Agricultural Research and Development 	<ul style="list-style-type: none"> o Department of Agriculture (DOA) o Forest Department o Livestock Breeding and Veterinary Department (LBVD) o Department of Fisheries o Irrigation and Water Resources Utilization and Management Department (IWRUMD) o Department of Hydropower Implementation/ Ministry of Electricity and Energy 	<ul style="list-style-type: none"> o Department of Irrigation (DOI) o National Building Research Organization (NBRO) o Department of Agriculture (DOA) o Rubber Research Institute o Tea Research Institute o Sugarcane Research Institute o Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) o Field Crop Research and 	<ul style="list-style-type: none"> o Ministry of Agriculture <ul style="list-style-type: none"> - Animal Health and Production Division - Extension Division - Land Resource Planning and Development Division - Research Division o Sugar Research Institute of Fiji o Fiji Sugar Corporation (FSC) o Fiji Electricity Authority o Energy Fiji Limited (EFL) 	<ul style="list-style-type: none"> o Department of Mineral Policy and Geohazard Management (DMPGM) o Climate Change and Development Authority o Conservation and Environment Protection Authority (CEPA) o Department of Agriculture and Livestock (DAL) o National Disaster Centre o National Maritime Safety Authority (NMSA) 	<ul style="list-style-type: none"> o Ministry of Natural Resources and Environment/ Water Resource Division o Samoa Water Authority o Samoa Land Transportation Authority o Ministry of Works, Transport and Infrastructure/ Maritime Division o Ministry of Women, Community and Social Development o Samoa Umbrella for Non- 																												

	Activity	Time Frame	Description of Results					
			Institute (CARDI) - Department of Agricultural Land Resource Management - Department of Animal Health and Production - Fisheries Administration - General Department of Rubber - Department of Agricultural Extension - Department of Agricultural Engineering - Department of Agricultural Cooperative Promotion (DACP) - Department of Administration, Planning, Accountant and International Cooperation o Royal University of Agriculture o Geo-Informatics and Space Technology Development Agency (GISTDA)	o Dry Zone Greening Department o Environmental Conservation Department o Department/Ministry of Public Health o Department of Medical Service o Department of Planning o Department of Rural Development o General Administration Department (GAD) o Relief and Resettlement Department (RRD) (now called Department of Disaster Management (DDM)) o Fire Service Department o Myanmar Radio and Television o Ministry of Information o Myanmar Red Cross Society o International Center for Tropical Agriculture (CIAT)	Development Institute o Department of Fisheries and Aquatic Resources o National Aquatic Research and Development Agency (NARA) o Central Environmental Authority o Ceylon Electricity Board o Mahaweli Authority of Sri Lanka o National Water Supply and Drainage Board o Water Resources Board o Ministry of Health o Disaster Management Center (DMC) o Urban Development Authority o Institute of Policy Studies o Sri Lanka Air Force o Sri Lanka Navy o Sri Lanka Police o Food and Agriculture Organization (FAO) o World Food Programme (WFP) o Arthur C Clarke Institute for Modern Technologies (ACCIMT)	o Water Authority of Fiji o Ministry of Waterways o Department of Environment o Ministry of Health o National Disaster Management Office (NDMO) o Fiji Red Cross Society (FRCS) o University of the South Pacific (USP) o Pacific Food Security Cluster (PFSC) o Food and Agriculture Organization (FAO)	o National Department of Health o PNG Power Ltd. o Water PNG Ltd. o PNG Red Cross Society o University of Papua New Guinea (UPNG) o United Nations Development Programme o Food and Agriculture Organization (FAO)	Government Organizations o National University of Samoa o Samoan Studies Institute o Secretariat of the Pacific Regional Environment Programme (SPREP)