Template for CREWS Project Presentation Note to the Steering Committee

1	**Project Title**	**Weather and Climate Early Warning System for Papua New Guinea**	
2	**Project Reference**	CREWS/CProj/08/Papua New Guinea	
3	**Geographic coverage**	Papua New Guinea (national)	
4	**Timeframe**	3 years, October 2017 – September 2020	
5	**Total cost of CREW contribution**	**US $1,650,000**	
6	**Implementing Partner**	**World Meteorological Organization**	
		a. Allocation Requested for Execution by Government	N/A
		b. Allocation Requested for Execution by Partner	US$1,460,000
		c. Fees of Implementing Partner:	US$190,000
		d. Total:	US$1,650,000
7	**Additional Implementing Partners**	**N/A**	
		a. Allocation Requested for Execution by Partner	N/A
		b. Fees of Additional Implementing Partner:	N/A
		c. Total:	N/A
8	**Other Partners**	**National:** Papua New Guinea (PNG) Department of Transport and Infrastructure, PNG National Weather Service PNG Department of Environment and Conservation, PNG Department of Agriculture and Livestock, PNG Department of Forestry, PNG Department of Commerce and Industry Bureau of Meteorology (BOM) of Australia National Institute of Water and Atmospheric Research (NIWA) of New Zealand	
9	**Project Recipient/Beneficiary**	Papua New Guinea (PNG) National Weather Service	
		Financial Contribution	N/A
10	**Total Project Amount**	**US$1,650,000**	
11	**Main objective**	This project would provide improved drought monitoring and early warning systems that can foster better decision making for the following sectors: agriculture, disaster management, energy and infrastructure. Other hazards related to droughts such as frost and bush fires would also be indirectly addressed. The project will seek to create end-to-end EWS focused on reducing drought impacts, while at the same time leveraging and providing a foundation for EWS focused on other hazards, and specifically flooding (see associated projects, section 12c). The project would address improved weather observations, climate data management of historical data for the monitoring of drought, climate data rescue, state-of-the-art seasonal forecasting coupled with monitoring and advisories for drought, and a more efficient distribution of alerts and information suitable for decision making at	

		a national and local level. The main focus is on building the capacity of the National Meteorological Service and strengthening its cooperation with key sectoral ministries, departments and other stakeholders working in the above areas to put in place complete systems that deliver warnings and relevant information to end-users. Enhancement of these basic capabilities will be complemented with support for integration of early warnings into national processes. The project will draw on advanced technical expertise from cooperating institutions to ensure access to relevant data, products, tools, training and equipment. The selected sectors addressed by the project will provide showcases for development of additional services subsequently. Several additional on-going or planned projects which the current project complements are identified below.
12	**Initial state of play - project rationale**	
	a. Vulnerability, exposure to risks, disasters impacts (on people and economy)	Papua New Guinea (PNG) is a country in the Southwest Pacific. It has a population of 6.8 million people. PNG is richly endowed with natural resources, but exploitation has been hampered by rugged terrain, land tenure issues, and the high cost of developing infrastructure. The economy has a small formal sector, focused mainly on the export of those natural resources, and an informal sector, employing the majority of the population. Agriculture provides a subsistence livelihood for 85% of the people. PNG has a tropical climate with a landscape of mostly mountains with coastal lowlands and rolling foothills. The main agricultural products are coffee, cocoa, copra, palm kernels, tea, sugar, rubber, sweet potatoes, fruit, vegetables, vanilla; poultry, pork; and shellfish. The main industries are copra crushing, palm oil processing, plywood production, wood chip production; mining (gold, silver, copper); crude oil and petroleum products; construction, tourism. The natural environment already poses significant risks to Papua New Guinea today; hazards like coastal flooding, inland flooding and droughts take a severe toll on the people and the economy. Climate change is predicted to exacerbate some of these hazards and may also introduce new hazard-related impacts due to gradual shifts in climatic conditions – most prominently, increased malaria penetration in the highlands, changed agricultural yields and damaged coral reefs. Throughout the country, natural disasters driven by climatic conditions (i.e., excluding seismic and volcanic activity) as well as gradual shifts in climatic conditions disrupt daily life, cause damage to assets and infrastructure, destroy livelihoods, endanger cultural and ecological treasures, and kill or injure people. The government of Papua New Guinea through the Office of Climate Change and Development has put its emphasis on identifying the specific nine (9) hazards prevalent in Papua New Guinea: 1. Coastal Flooding and Sea Level Rise 2. Inland Flooding 3. Food Insecurity caused by crop failures due to droughts and inland frosts 4. Cities and Climate Change 5. Climate Induced Migration 6. Damage to Coral Reefs 7. Malaria and Vector Borne Diseases 8. Water and Sanitation 9. Landslides

		This project focuses on addressing primarily drought and food security related impacts, while providing benefits in other priority areas, such as mitigating climate induced migration, and water and sanitation impacts of drought.
	b. Status of the EWS, DRM agencies and NHMSs, actors / players present	PNG NMS currently has a monitoring network of 13 weather and climate stations, 7 rain gauge stations and 5 agrometeorological stations. But they need improved control and maintenance procedures and resources. Early warning systems are in place but with limited capacity for providing disaster and food security related warnings to be able to trigger effective action. Weather forecasts are provided to media have lead times of 24 hours whilst seasonal climate predictions are produced at longer lead times of 3 months but limited to site specific locations. There is limited mapping of high-risk areas or centralized information for documenting risks or disasters in a systematic way. There is a need to improve the human resource base to use technical infrastructure and interpret results at NMS and other institutions involved in generating and using risk information and early warning. This need for capacity development limits the use of available data, products and tools for DRR.
	c. Projects and programs dealing with EWS and hydromet under implementation or preparation	Funding partners: Environment and Climate Change Canada (ECCC) Project Title: Building Resilience to High-Impact Hydrometeorological Events through Strengthening Multi-Hazard Early Warning Systems in SIDS and Southeast Asia - Canada CREWS SIDS-SEA Specific objectives: To reduce human and economic losses associated with meteorological, hydrological, and climate-related hazards in Southeast Asia (SEA) and Small Islands States (SIDS), through strengthening weather, water and climate related-impact decision support services to stakeholders, socio-economic sectors, and communities via the development of multi-hazard early warning systems (MHEWS). Beneficiary countries include Cambodia, Lao, Philippines, Thailand, Viet Nam in Southeast Asia and several SIDS countries in the Pacific, African and Caribbean regions to be determined. The targeted hazards are storms and floods and possibly drought and coastal hazards. Budget: USD 7.35 million USD Funding partners: CREWS Project Title: Strengthening Hydro-Meteorological and Early Warning Services in the Pacific - CREWS Pacific SIDS Specific objectives: To strengthen the forecasting capability of the WMO Regional Specialized Meteorological Center (RSMC) in Fiji and to enhance Strengthen RSMC Nadi and enhance Pacific NMHSs capacities for impact-based forecasts. Beneficiary countries include Fiji, Cook Islands, Kiribati, Niue and Tuvalu, some services extending to Samoa and Tonga and to non-WMO Members such as Palau, Nauru, Marshall Islands and Tokelau. The hazards targeted are tropical cyclones, storms, floods, and droughts. Budget: USD 2.5 million USD Funding partners: Bureau of Meteorology – Australia Specific objectives: To install the CliDE Climate Database Management System in 14 countries in the Pacific Basin including Papua New Guinea. 2014 to 2018 Budget: 600,000 AUD (Australian Dollars)

		Funding Partner: ADB Specific Objectives: Building Resilience to Climate Change in Papua New Guinea Project with a focus on agriculture and landscape management Budget: 25,000,000 USD Funding Partner: ADB Specific Objectives: Implementation of the Strategic Program for Climate Resilience (SPCR) Budget: 3,900,000 USD Funding Partner: IBRD Specific Objectives: Pacific Resilience Program (PREP) on Coastal zone management Budget: 6,100,000 USD Funding partners: UNESCAP, Indian Government, RIMES and PNG Government Specific Objectives: PNG has signed and is part of the RIMES Cooperation Agreement. It is the sub regional hub for the Pacific region. It will engage in the generation and application of user-relevant early warning information. It is projected that PNG Multi-Hazard Early Warning Center and RIMES Sub Regional Hub for the Pacific has having the following operational units; a) geological services b) ocean, weather and climate services (ocean state, extreme weather events, climate variability and change) c) hydrological services (flash floods, riverine floods, storm surge, rain-induced landslide) d) observation systems e) ICT applications f) societal applications g) program support and administration Funding Partner: Green Climate Fund – in preparation by WMO. Specific objectives: Enhancing Early Warning Systems to build greater resilience to hydro and meteorological hazards in Pacific Small Island Developing States (Fiji, Papua New Guinea, Solomon Islands, Timor-Leste and Vanuatu Budget: In development Funding partner: Green Climate Fund Project (in process) Specific Objectives: Sustainable Climate Information Systems for PNG to provide user focused climate services for the Energy Sector. The main objective of this sub activity is to achieve an improved resilience of the PNG energy industry to the impacts of climate variability, largely driven by El-Nino Southern Oscillation (ENSO), and climate change. This will be achieved through the development of sustainable Climate Information System (CIS) including (i) Climate Data, Monitoring and Advisory System; and (ii) Seasonal and Intra-seasonal Climate Prediction System; which will provide climate data, derived products, seasonal prediction tools and alerts required for energy industry . Funding Partner: Multiple partners (in process) Specific Objectives: Development of a Southeastern Asia-Oceania Flash Flood Guidance System across the countries in the region Budget: In development

		Funding Partner: CSIRO Specific Objectives: Small Research Activity - PNG Highlands case study- Engaging agricultural communities in climate resilience food production adaption. The project will provide a review of the most prospective areas for future research collaboration regarding improving the resilience of highlands farming livelihoods to climate variability and change. Budget: Not known Funding Partner: UNDP, Adaptation Fund (in process) Specific Objectives: Early Warning System for inland and coastal flooding Budget: In development
	d. Positioning of CREWS support: complementarity and synergies with the existing programs	PNG NMS under the authority of the Ministry of Transport and Infrastructure is responsible for the management of the meteorological observation network, collection, processing and archiving of climatological and meteorological data, and the development and dissemination of weather and agro-weather and –climate information. The project will support NMS to improve core capacities which are fundamental to EWS functioning, in areas such as observation network operating procedures, data management, weather and climate forecasting and advanced monitoring tools. The project will provide also a specific EWS products and processes validation in selected sectors. By partnering with the Bureau of Meteorology (BOM) in Australia which has a long history of supporting PNG NMS, WMO will ensure that the measures implemented through the project will be done according to WMO standards. The assistance provided through the current project will assist PNG NMS in ensuring that measures implemented through other projects are compatible and in-sync with WMO standards and practices. BOM will also assist PNG NMS with accessing and making use of global and regional data and products.
13	**Project design**	
	a. Project Outputs*)*	**Component 1. Assessment and User Requirements (US $130K)** The components are envisioned to be an end-to-end project for developing a drought monitoring and early warning system. It will start with user requirements needs and assessment of current drought EWS capabilities to guide improving the observational data networks and databases. These needs and assessments will also determine which kind of specific weather and climate forecast products will be needed to be developed for a drought monitoring and EWS. There will be a detailed assessment of user needs including NMS and other stakeholders. There will be a focus on drought and related hazards (frost and bush fires). User needs will be addressed through consultations with affected stakeholders focusing especially on the agricultural sector. An assessment of the observation systems for drought EWS and other hazards (floods, frost, and bush fires) will be undertaken and recommendations on improvements. **Component 2. Improvement of Observations and Databases (US $190K)** 2a. A review of maintenance, data quality control, technical support needed and periodical upgrades will be conducted on this component, including an update of the WMO OSCAR metadata observation data base. The results of the assessment will be used by the NMS to operate and maintain the enhanced network, and as a basis for on-going WMO technical support. This

		component will support WMO WIS and WIGOS programmes in PNG. 2b. Data base improvement. Review of existing weather and climate based database management systems in the NMS and in other national partner ministries and institutions Implementation of advanced statistical tools for climate analysis and training for NMS staff and cooperating institutions. Also, used needs on climate data rescue will be assessed and if needed, it will be implemented. **Component 3. Weather / Climate Monitoring and Forecasts (US $170K)** The BOM has developed a Climate Extremes Monitor and this will be adapted for used in PNG. Also, there will be an enhanced availability of Numerical Weather Prediction (NWP) products from the Global NWP centres and NWP Limited Area Model Guidance from the WMO Regional Specialised Meteorological Centre (RSMC) for use in short range weather forecast. Development of an objective seasonal forecasting scheme for PNG, with skill measures that will be communicated to users accompanying the forecasts. This will be partly based on the WMO Sub-Seasonal to Seasonal Project to provide daily forecasts for the next 60 to 90 days. National forecasts will add value to, and be based on, outputs from an objective regional forecasting scheme for the region, the development of which will be initiated in parallel including with complementary (non-CREWS) funding. The regional seasonal forecasting model will similarly benefit other countries in the region. Trainings on the preparation and interpretation and use of NWP products and satellite information in weather forecasting and warning services for high-impact weather, in coordination with BOM and other Global NWP centres. **Component 4. Support to Early Warning System development. (US$ 680K).** 4a. Development of Drought EWS Weather and climate information will be translated into drought EW alerts and advisories for various sectors as determined by the periodic stakeholder consultations. Development of an operationalized Drought EWS for PNG with ground truthing and outreach to stakeholders and users. This EWS will develop tailored products. The next step will be to test and evaluate the EWS products based on prior stakeholder consultation. Recommendations and specifications for observing and forecast system improvement and product enhancement. Introduction of impact-based forecasts and risk-informed warnings for improved decision making by the users. Enhancement of multi-channel weather forecast and warnings communication systems. The specific information needs of these stakeholders will be identified through additional consultation undertaken through the project. Drought is a known hazard, due to high inter-annual variability as well as frost and bush fires. 4b. Preliminary Assessments on Flood / Flash Flood Early Warnings One of the objectives of this project is to start the process of the developing a flood EWS in conjunction with other projects. Therefore, there will be a

		Identification of flood prone areas and flood causes done and an assessment of national capabilities on flood / flash flood forecast for urban areas. The National Institute of Water and Atmospheric Research (NIWA) of New Zealand would assist with component since they have links to other projects. However, if resources are not sufficient, these items could be addressed by SouthEastern Asia Oceanic Flash Flood Guidance Project (SAOFFG). **Component 5. Institutional strengthening. (US$ 75K)** Long term development plan for NMS. Short-term, project-level, investments are significantly more effective if they contribute to the incremental development of capacities according to a long term development plan for an NMHS. This component will incorporate activities and results achieved through the implementation of the current project into a long term development plan. **Component 6. Support process (US $240K)** This component includes management and monitoring and evaluation activities. **Component 6a. Management.** The project will finance the following activities: (i) in country project manager; (ii) technical design and integration of project components and (iii) the project steering and implementation committee. The project manager will be locally recruited by NMS and WMO and hosted by NMS. Administrative management, safeguards, quality control and contract management will be the responsibility of WMO. Equipment procurement is currently envisioned to be undertaken by the BOM and PNG. **Component 6b. Monitoring and Evaluation.** This component includes an independent impact assessment of the information flow from the basic systems enhanced by the project to decision makers for the two key sectors addressed: DRR and agriculture/food security. The evaluation will be initiated early in 2019. This independent assessment will be used for final project M&E that will also be covered by this component, following overall CREWS M&E procedures.
	b. Implementing time frame	See **Attachment 1**
	c. Contribution to CREWS Programming Framework	Outputs of Country Projects 1. Assessments of institutional capacities of NMHSs, user needs, on-going and planned programmes and socio-economic benefits of hydromet services and early warning systems. 1.1 Assessment and plan for observing system enhancement and maintenance (as a project output under component 1 and 2a) 1.2 Assessments for implementation of climate and weather data bases (project component 2b) 1.3 Assessments for development and implementation of improved drought forecasts (project component 1c) 1.4 Assessments for implementation of seasonal forecasts according best regional and international practices (project component 3) 2. Risk information and early warning for severe weather/drought and

		agriculture and food security. 2.1 Development of risk information and forecast products for drought Early Warning (component 3) 2.2 Development of risk information and forecast products for reducing the impacts of impact weather and climate events (component 4a) 2.3 Development of risk information and forecast products for agriculture and food security (component 4a) 3. NMHSs' service delivery improved including development of impact based capacity and tailored information for risk management. (component 4a) 4. Long-term development plans for NMHSs, including the need for system interoperability at the national and regional levels (component 5). 4.1 Long term development plan for NMS (component 5) 5. High priority and high impact small scale investments, including supply of critical observation and ICT equipment (component 1) 6. Targeted education and public awareness programmes available for warning systems and related public action (leveraged from on-going and planned projects).(components 1, 3, 4a)
	d. Logical framework with indicators	See **Attachment 2.** Budget for each activity listed at the logical framework is provided under independent file
14	**Organization and operating procedure**	
	a. Institutional framework	The project will contribute directly to the development and implementation of PNG's plans for improving its EWS capabilities and the results can be mapped onto the identified priorities for investment defined and endorsed by national stakeholders within this strategic plan. Project Focal Points of the beneficiary and resource institutions will serve as the Project Steering Committee (PSC) of the project. These will include WMO and other international stakeholder representatives as well as NMS representatives and other relevant government departments. Its role is to guide the implementation of the project activities, with support from WMO. The project will be implemented in line with WMO Project Management Procedures and administrative procedures, including contracts, in-country logistics and hospitality arrangements, will be carried out according to established WMO Rules and Procedures. Implementation will require the use of resources for technical assistance, outsourced services through standard letters of agreement with WMO Centers and Services. Management of funds allocated to WMO will be the responsibility of the WMO and will be in accordance to UN Procedures for Financial Management, Audit and Reporting. All activities will be executed by WMO, directly and through contractual agreements. Additional executing partners, in country or abroad, will participate in the project implementation by providing resources for operation, maintenance and investment, providing staff to support project implementation, developing terms of reference and participating in selection

		committees for procurement. To facilitate project implementation a Project Implementation Cell (PIC) will be established within NMS, bringing together the required expertise from across the organization, and strengthening its capacity with consultants, where needed. NMS will perform day-to-day project implementation activities and will also function as a Secretariat for the Steering Committee. The team of the Cell? will comprise of the following main functions: (i) Project Coordinator – the Director General of NMS; (ii) In country Project Manager; (iii) NMS Focal Points ; (iv) Administrative and Financial support staff (to be designated or recruited). The in-country Project Manager recruited to support the project and based in NMS will collaborate with an in-country advisor deployed by the GFCS based in the PNG United Nations office. This collaboration will support and facilitate connections between the NMS and non-meteorological stakeholders as well as between the project and projects being implemented by international organizations. With respect to funds transferred by WMO to the NMS, the main responsibilities of NMS will be to (a) prepare annual implementation plans for the project activities, as well as the annual budget, for Project Steering Committee approval; (b) carry out all work related to local fiduciary functions including procurement, financial management, disbursement, audit, reporting and monitoring and evaluation. NMS will be responsible for local fiduciary management and procurement in compliance with WMO regulations as articulated in standard Letters of Agreement, and with those of the World Bank with respect to matters related to equipment procurement. In addition, NMS will interact with relevant stakeholders, including NGOs and municipalities, to guide them in the implementation process where necessary. NMS will be responsible for organizing all state level training programs involving the concerned state level line ministry, national and international research and development institutions, including NGOs operating in the country.
	b. Monitoring and evaluation system	The Project will make use of the established Monitoring and Evaluation Process used at the WMO, taking into account the CREWS M&E framework. The Project Steering Committee will be meet every six (6) months to evaluate the progress made on the Project as outlined in the LogFrame (attached as Annex 2) and Timeline (attached as Annex 1). Evaluation reports will be made available to all Project Stakeholders, including development partners. With the assistance of the project manager funded by the project, NMS will be responsible for the coordination of M&E activities using funds transferred through standard Letters of Agreement, their consolidation, and the preparation of periodic fiduciary and M&E reporting, including impact and output indicators as well as annual audit of project's financial statements working in close collaboration with its national partners within the National Framework on Climate Services. The project M&E system will be based on the Logical Framework and implementation arrangements described herein. PIC will bear the responsibility of data collection on the ground for each component's agreed indicators following procedures and methods established within each involved Ministry. An independent consultant budgeted under supporting component Monitoring & Evaluation, will help NMS on carrying project impact assessment through identify relevant process on the information flow from observation to final decision making at user level using few test users in the two relevant sectors. That assessment would be conducted in the second half of 2018 and would help to validate project approaches and to suggest

		improvements for the last year of implementation.
15	**Project viability and sustainability**	
	a. Main identified risks	The risks identified below include key policy, institutional, and implementation risks; which include (1) environmental and social safety related risks; (2) lack of adequate institutional capacity for implementation; (3) constraints in financial management capabilities; (4) limited procurement experience and (5) security and vandalism. The overall risk rating for the project is moderate, based on the nature of the proposed activities, the capacity of the implementing entity and the available support through WMO during implementation. Strong mitigation measures will be established to ensure that risks do not compromise the successful implementation of the project. Ongoing dialogue with the government and intermittent workshops as well as training will also be arranged in order to make sure that the project is implemented in a risk-informed manner and meets client demands and needs.
	b. Critical assumptions	The project was prepared under the assumption that some basic services will be provided at a national level (seasonal and daily forecasting, ten-day agro-meteorological reports, etc.). More specialized services (such as drought forecasting systems, personalized agro-meteorological information services, warning reports to anticipate impacts, etc.) will be provided to selected zones to be identified based on the following criteria: (i) presence of specific hydro-meteorological natural hazards; (ii) exposure of populations and critical infrastructures (urban zones, roadblocks, irrigation, transport, hospitals, schools, etc.); and (iii) presence of investment projects, which would allow for an optimal utilization of hydro-meteorological services (notably towards crop producers, livestock herders, fishermen, hydropower generators, aviation and other transport related sectors, extractive industries, local government, micro-insurance and urban planners). For the economic analysis, assumptions include (i) equipment such as computers and tablets would have an average life of 3-4 years, vehicles and hydromet stations would have an average life of 7-10 years, while new buildings would have a life-span in the range of 30-40 years; (ii) Operations and maintenance (O&M) costs are assumed at 15% of project investments and (iii) PNG GDP growth rate will continue at about 5%, therefore a discount rate of 5% is used to calculate the Net Present Value (NPV).
	c. Judgment on the project sustainability	While priority needs within the national services responsible for hydrology, meteorology and early warning were clearly greater than available resources, sustainability considerations including allocation of adequate O&M funds and ability to recruit and retain qualified workforce are the main factors which determined the total amount and composition of the project. Alignment of project activities with PNG's National Action Plan for climate services, and the user interface platform bringing together climate and DRR sectoral experts, will ensure sustainable implementation of project achievements beyond the timeframe of the project.

Annex 1- Time table - Strengthening NMH capacities for EWS Service Delivery in PNG

	2017	2018				2019				2020		
TASK	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Component 1 Assessment and User Requirements												
(i) Detailed assessment of user needs including PNG NMS and other stakeholders (6 stakeholder workshops)	x		x		x		x		x		x	
(ii) Assessment of observation systems for early warning systems. Recommendations on improvements		x	x	x	x							
Component 2a Improvement of Observations												
(i) Increase station network based on needs and assessment based on Component 1						x	x	x	x			
(ii) Integration of national hydrometeorological observing systems in OSCAR/Surface				x	x					x	x	
Component 2b Improvement of Databases												
(i) Assessment of Climate and Hydrological Database Management Systems		x	x	x								
(ii) Assessment of Climate Data Rescue needs			x	x	x							
(iii) Further Implementation of CLiDE activities	x	x	x	x								
(iv) Implementation of other compatible Database systems (agromet, hydrology)					x	x	x					
(v) Implement Climate Data Rescue activities						x	x	x	x			
(vi) Training in statistics and basic tools for climate services			x			x			x		x	
Component 3 Weather / Climate Monitoring and Forecasts												
(i) Adaptation of Climate Extremes Monitor from BOM to PNG		x	x	x								
(ii) Enhancing availability of NWP products from Global NWP centres including BOM for use in short-range forecasting		x	x	x								
(iii) Use Sub-Seasonal to seasonal forecasts (1week to 3 months) from Global Centers							x	x	x			
(iv) Capacity building in preparing and interpreting the forecasts				x		x		x		x		x
Component 4a Development of Drought EWS for PNG												
(i) Assessment of national capabilities on drought forecasts		x	x	x	x							
(ii) Develop on operational Climate EWS for drought					x	x	x	x				

	2017	2018				2019				2020		
TASK	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
(iii) Development of identified products (e.g. drought monitoring and prediction). Development of tailored products							x	x	x	x		
(vi) Pilot testing and evaluation of EWS based on prior stakeholder consultation								x	x	x		
(v) Recommendations and specifications for observing and forecast system improvement and product enhancement									x	x	x	
(vi) Introducing impact-based drought forecasts and risk-informed warnings for improved decision making by the users											x	x
(vii) Enhance multi-channel weather forecast and warnings communication systems					x	x	x	x				
Component 4b Preliminary Assessments on Flood / Flash Flood Early Warnings												
(i) Identification of flood prone areas and flood causes, some to be addressed by SouthEastern Asia Oceanic FFG (SAOFFG)						x	x	x				
(ii) Assessment of national capabilities on flood / flash flood forecast for urban or near-by areas, some to be addressed by SouthEastern Asia Oceanic FFG (SAOFFG)								x	x	x		
Component 5 Institutional strengthening.												
(i)Long term development plan for NMS			x	x	x	x	x	x				
(ii) Management training for PNG staff				x			x				x	
(iii) Ensure Gender aspects is involved in all stages of the project		x	x	x	x	x	x	x	x	x	x	x
Component 6a Support Process - Management												
(i) Set up of Steering Committee	x	x										
(ii) Contract of country project officer and administrative support staff	x	x										
(ii) Management oversight (BOM)	x	x	x	x	x	x	x	x	x	x	x	x
Component 6b Support Process - Monitoring and Evaluation												
(i) Impact assessment – Information flow – Selected users									x	x		
(ii) Intermediate and final reports						x	x				x	x

Attachment 2

Annex 2. Concise logical framework

Task	Baseline	Main Outputs	Proposed indicators	Means of Verification	Expected Results
Component 1 ***Assessment and User Requirements***					
(i) Detailed assessment of user needs including PNG NMS and other stakeholders (6 Stakeholder workshops)	PREVIOUS REPORS FROM PNG & BOM	RECOMMENDATIONS DEVELOPED	ASSESSMENTS ARE DELIVERED	APPROVED BY NATIONAL AUTHORITIES	PERIODIC UPDATES OF USERS NEEDS AND FEEDBACK TO GUIDE PROJECT IMPLEMENTATION
(ii) Assessment of observation systems for early warning systems. Recommendations on improvements	REPORTS FROM PNG NWS	NATIONAL WIGOS IMPLEMENTATION PLAN NATIONAL WIS IMPLEMENTATION PLAN	PLANS ARE DELIVERED	APPROVED BY NATIONAL AUTHORITIES	ADDITIONAL STATION LOCATIONS ARE DETERMINED
Component 2a ***Improvement of Observations***					
(i) Increase station network based on needs and assessment based on Component 1	RECOMMENDATIONS FROM COMPONENT 1	IMPLEMENTATION PLAN DEVELOPED	STATIONS AND SENSORS INSTALLED	APPROVED BY NATIONAL AUTHORITIES	ADDITIONAL WEATHER DATA AVAILABLE FOR EWS PRODUCT DEVELOPMENT
(ii) Integration of national hydrometeorological observing systems in OSCAR/Surface	INFORMATION AS IMPORTED FROM WMO VOLUME A	ALL NATIONAL STATIONS REPRESENTED WITH METADATA	OSCAR PNG UPDATED	REGIONAL WIGOS CENTRE	USERS ARE ABLE TO ACCESS OBSERVATIONAL DATA
Component 2b ***improvements of Databases***					
(i) Assessment of Climate and Hydrological Database Management Systems	REPORTS FROM PNG NWS	IMPLEMENTATION PLAN DEVELOPED	PLANS ARE DELIVERED	APPROVED BY NATIONAL AUTHORITIES	WORKPLAN DEVELOPED TO IMPLEMENT CLIMATE AND HYDRO DATABASE
(ii) Assessment of Climate Data Rescue Needs	REPORTS FROM PNG NWS	IMPLEMENTATION PLAN DEVELOPED	PLANS ARE DELIVERED	APPROVED BY NATIONAL AUTHORITIES	WORKPLAN DEVELOPED TO IMPLEMENT CLIMATE DATA RESCUE

(iii) Further Implementation of CLiDE Activities	CLIDE CDMS OPERATIONAL AT HQ	CLIDE CDMS OPERATIONAL AT STATIONS	NUMBER OF OPERATIONAL INSTALLATIONS IN STATIONS	ON SITE ASSESSMENT AND REPORTING	COMPUTERISED ARCHIVING, MANAGEMENT AND USE OF CLIMATE DATA AT HQ AND STATIONS
(iv) Implementation of other compatible database systems (agromet, hydrology)	REPORTS FROM PNG	ADDITIONAL DB MODULES ON AGROMET AND HYDROLOGY ADDED	NUMBER OF OPERATIONAL INSTALLATIONS IN STATIONS	ON SITE ASSESSMENT AND REPORTING	COMPUTERISED ARCHIVING, MANAGEMENT AND USE OF DATA AT HQ AND STATIONS
(v) Implement Climate Data Rescue activities	CLIMATE DATA RESCUE CAPABILITIES OPERATIONAL AT HQ	DIGITIZATION OF PAPER CLIMATE RECORDS	NUMBER OF DATA RECORDS DIGITIZED	APPROVED BY NATIONAL AUTHORITIES	COMPUTERISED ARCHIVING, MANAGEMENT AND USE OF CLIMATE DATA AT HQ AND STATIONS
(vi) Training in statistics and basic tools for climate services	BASIC CLIMATOLOGY KNOWLEDGE	IMPROVED SKILL TO PRODUCE CLIMATE PRODUCTS ACCORDING CCL RECOMMENDATIONS	LIST OF CCL PRODUCTS IMPLEMENTED	ASSESSMENT AND REPORT AT HQ	CLIMATE SERVICES DELIVERED TO USER SECTORS
Component 3 ***Weather / Climate Monitoring and Forecasts***					
(i) Adaptation of Climate Extremes Monitor from BOM to PNG	REPORTS FROM BOM	OPERATIONAL CLIMATE EXTREMES MONITOR	LIST OF PRODUCTS IMPLEMENTED	ASSESSMENT AND REPORT AT HQ	BASIC MONITOR ÎNG OF DROUGHT, HEAVY RAINFALL AND FROST EVENTS
(ii) Enhancing availability of NWP products from Global NWP centres including BOM for use in short-range forecasting	REPORTS FROM PNG NWS AND BOM	IMPROVED BOM NWP PRODUCTS AVAILABLE	ENHANCED NWP PRODUCTS AVAILABLE	ON STE ASSESSMENT AN CONFIRMATION BY NMS	NWP PRODUCTS AND GUIDANCE AVAILABLE FOR NMS FOR IMPROVED WEATHER FORECASTING AND WARNING SERVICES
(iii) Use Sub-Seasonal to seasonal forecasts (1week to 3 months) from Global Centers	REPORTS FROM PNG NWS AND BOM	ENHANCEMENTS FOR PNG IMPROVE BOM NWP PRODUCTS AVAILABLE	ENHANCED NWP PRODUCTS AND GUIDANCE AVAILABLE	ON SITE ASSESSMENT AND CONFIRMATION BY NMS	NWP PRODUCTS AND GUIDANCE ARE AVAILABLE FOR NMS FOR IMPROVED WEATHER FOCASTING AND WARNING SERVICES
(iv) Capacity building in preparing and interpreting the forecasts	CCL AND CBS GUIDANCE	IMPROVED SKILL TO PRODUCE AND INTERPRET WEATHER / CLIMATE PRODUCTS ACCORDING TO CBS AND CCL RECOMMENDATIONS	LIST OF ENHANCED PRODUCTS IMPLEMENTED	ASSESSMENT AND REPORT AT HQ	WEATHER AND CLIMATE SERVICES DELIVERED TO USER SECTORS

Component 4a ***Support for Drought Early Warning System for PNG***					
(i) Assessment of national capabilities on drought forecasts	REPORTS FROM PNG NWS	RECOMMENDATIONS DEVELOPED	ASSESSMENTS ARE DELIVERED	APPROVED BY NATIONAL AUTHORITIES	PERIODIC UPDATES OF USERS NEEDS AND FEEDBACK TO GUIDE PROJECT IMPLEMENTATION
(ii) Develop operational Climate EWS for drought	REPORTS FROM PNG NWS AND BOM	WARNINGS DEVELOPED FOR DROUGHT AND FROST	LIST OF WARNINGS	APPROVED BY NATIONAL AUTHORITIES	NEW EARLY WARNINGS FOR DROUGHT AND FROST
(iii) Development of identified products (drought monitoring and prediction). Development of tailored products	REPORTS FROM BOM AND WMO	PRODUCTS REVISED AND IMPROVED NEW PRODUCTS	LIST OF PRODUCTS	STAKEHOLDERS FEEDBACK	NEW PRODUCTS FOR VARIUS SECTORS
(vi) Pilot testing and evaluation of EWS based on prior stakeholder consultation	REPORTS FROM PNG NWS	PRODUCTS VALIDATED	LIST OF IMPROVEMENTS FROM INITIAL STATUS LIST OF NEW PRODUCTS	STAKEHOLDERS FEEDBACK	IMPROVED MANAGEMENT IN USER COMMUNITIES
(v) Recommendations and specifications for observing and forecast system improvement and product enhancement	REPORTS FROM PNG NWS	RECOMMENDATIONS AND SPECIFICATIONS	DOCUMENTS DELIVERED	FINAL DOCUMENT ACCEPTED BY STEERING COMMITTEE	IMPROVED BULLETINS AND ADVISORIES FOR VARIOUS SECTORS
(vi) Introducing impact-based drought forecasts and risk-informed warnings for improved decision making by the users	THRESHOLD BASED WARNING SERVICES	WARNING TO INCLUDE INFORMATION ON LIKELY IMPACTS	ESTIMATION OF AVOIDED LOSSES	NUMBER OF IMPACT-BASED WARNINGS ISSUED TO DISASTER MANAGEMENT AND TO AGRICULTURAL SECTOR	SAFER PUBLIC AND MORE RESILIENT SECTORS
(vii) Enhance multi-channel weather forecast and warnings communication systems	OLD TV STUDIO AT NMS NEED FOR MORE COMMUNICATION CHANNELS	ADOPTING A COMMON ALERTING PROTOCOL(CAP) FOR COMMUNICATION OF WEATHER WARNING IMPROVED TV STUDIO IMPROVED WEB SITE REGULAR DELIVERY OF WARNINGS BY WEATHER WARNING RADIOS	NUMBER OF WARNINGS COMMUNICATED IN CAP FORMAT EXPRESSION OF SATISFACTION WITH QUALITY OF WEATHER BULLETINS BY THE NATIONAL TV BROADCAST AND VIEWERS	ON SITE ASSESSMENT AND REPORTING BY NATIONAL BROADCASTER	WARNINGS AVAILABLE IN CAP FORMAT; WEB SITE CARRIES A WARNINGS PAGE WITH INFORMATION ON ADVISORIES IMPROVED TV AND RADIO WEATHER BULLETINS

Component 4b ***Preliminary Assessments on Flood / Flash Flood Early Warnings***					
(i) Identification of flood prone areas and flood causes, some to be addressed by SouthEastern Asia Oceanic FFG (SAOFFG)	LOCAL KNOWLEDGE EXISTS	PRIORITIZED LIST OF MAJOR DAMAGE CENTRES REQUIRING FURTHER ATTENTION	ASSESSMENT OF EACH DAMAGE CENTRE AND INDICATION OF BEST APPROACH TO MAP FLOOD RISKS	REPORT EVALUATION BY NATIONAL AUTHORITIES	USERS BETTER UNDERSTAND CAUSES OF FLOODING AND FLOOD RISKS FOR VARIOUS WATER LEVELS
(ii) Assessment of national capabilities on flood / flash flood forecast for urban or near-by areas, some to be addressed by SouthEastern Asia Oceanic FFG (SAOFFG)	RELATIVELY LOW	ASSESSMENT OF STAFF COMPETENCIES AND TRAINING PLAN	ASSESSMENT OF NATIONAL CAPABILITIES	REPORT EVALUATION BY NATIONAL AUTHORITIES	STARTING POINT FOR NATIONAL PROPOSAL ON FLOOD RISK REDUCTION
Component 5 ***Institutional strengthening***					
Long term development plan for NMS	THE NATIONAL PLAN FOR IMPLEMENTATION OF CLIMATE SERVICES, EVALUATION REPORT ON NATIONAL CAPACITY FOR RISK REDUCTION AND EMERGENCY RESPONSE IN PNG	FIVE YEAR STRATEGIC DEVELOPMENT PLAN IMPLEMENTATION PLAN RESOURCE MOBILISATION STRATEGY	QUALITATIVE ASSESSMENT THROUGH COLLECTION OF DATA AND CONSULTATIONS FIRST DRAFT OF STRATEGIC PLAN EVALUATION OF THE STRATEGIC PLAN FIRST DRAFT FINAL DRAFT OF THE STRATEGIC PLAN DEVELOPED, APPROVED AND ACCEPTED	STRATEGIC PLAN COMPLETED ON TIME AND MEETING ESTABLISHED TERMS OF REFERENCE AND APPROVED BY THE DIRECTOR OF NMS	IMPROVED DECISION MAKING PROCESS REGARDING FUTURE GOVERNANCE OF NMS CLEAR STRATEGY OUTLINED FOR 5 YEARS FOR NMS OPPORTUNITY TO TRACK PROGRESS OF ORGANISATIONAL DEVELOPMENT AND APPLY ADEQUATE CORRECTIVE MEASURES
(ii) Management training for PNG staff	RECENT STAFF EVALUATIONS	STAFF NEEDS FOR MANAGEMENT TRAINING	NUMBER OF STAFF TRAINED NUMBER OF STAFF PASSING ADVANCED MANAGEMENT REQUIREMENTS	DIRECTOR OF NMS	IMPROVED PROJECT MANAGEMENT INCREASED NUMBER OF PROJECTS SUCCESSFULLY COMPLETED MORE EFFICIENT STAFF AND LESS STRESS
(iii) Ensure Gender aspects is involved in all stages of the project	REPORTS FROM NATIONAL AUTHORITIES / NGOS	IMPLEMENTATION PLANS OF GENDER ISSUES	NUMBER OF STAFF TRAINED IN GENDER ISSUES	NATIONAL AUTHORITIES	MORE PARTICIPATION OF WOMEN IN NMS PROJECTS

Component 6a ***Support Process: Management***					
(i) Set up of Steering Committee	PARTICIPATING STAKEHOLDERS	FOCAL POINTS FROM PARTICIPATING INSTITUTIONS	DOCUMENTED TERMS OF REFERENCE NO. OF FOCAL POINTS IN PLACE	RECORD OF FIRST MEETING	COMMITTEE SET UP TO GUIDE THE IMPLEMENTATION OF THE PROJECT ACTIVITIES
(ii) Contract in country project officer and administrative support staff	LOCAL STAFF	1 IN-COUNTRY PROJECT MANAGER 1 ADMINISTRATIVE SUPPORT STAFF	DOCUMENTED TERMS OF REFERENCE NO. OF STAFF IN PLACE WORKING ON THE PROJECT QUALITY OF SERVICE	NMS STAFFING RECORDS	APPROPRIATELY SKILLED AND MOTIVATED STAFF RECRUITED TO MANAGE AND ADMINISTER THE PROJECT
(iii) Management oversight (BOM)	BOM STAFF	SUPPORT TO BOM PROJECT MANAGEMENT	DOCUMENTED TERMS OF REFERENCE	BOM STAFFING RECORDS PERIODIC REPORTS TO PNG AND WMO	ADJUSTMENT OF PROJECT ACTIVITIES IF NEEDED
Component 6b ***Support Process: Monitoring and Evaluation***					
(i) Impact assessment – Information flow – Selected users	BASELINE STATISTICS ON INFORMATION FLOW FOR THE SELECTED USERS FROM NMS AND RELEVANT IN-COUNTRY MINISTRIES AND STAKEHOLDERS	IMPACT ASSESSMENT REPORT WITH KEY RESULTS ON CHANGES OF INFORMATION FLOW FOR SELECTED USERS	PERCENT INCREASE OF INFORMATION FLOW	USER ASSESSMENT SURVEY	IMPACT ASSESSMENT REPORT WILL HELP TO VALIDATE PROJECT APPROACHES AND TO SUGGEST IMPROVEMENTS FOR THE LAST YEAR OF IMPLEMENTATION
(ii) Intermediate and final reports	PROJECT DOCUMENT	THE INTERMEDIATE AND FINAL REPORTS PREPARED AND SUBMITTED TO PROJECT STEERING COMMITTEE	REPORTS COMPLETED ON TIME AND MEETING THE ESTABLISHED QUALITY CRITERIA	FINAL DOCUMENTS ENDORSED BY THE PROJECT STEERING COMMITTEE AND ACCEPTED BY THE CREWS STEERING COMMITTEE	REPORTS MEET REQUIRED QUALITY CRITERIA, PROVIDE CLEAR AND USEFUL INFORMATION ON OUTCOMES, ACHIEVEMENTS, BEST PRACTICES, LESSONS LEARNED AND RECOMMENDATIONS FOR FOLLOW UP PROJECT ACTIVITIES