CREWS PROJECT STATUS REPORT

1.	**Project title**	Weather and Climate Early Warning System for Papua New Guinea	**2.**	**Project reference**	CREWS/CProj/08/Papua New Guinea
3.	**Lead Implementing Partner**	WMO	**4.**	**Other Implementing Partners**	-
5.	**Reporting period**	December 2019 – May 2020			
6.	**Reporting focal point**	Jean-Baptiste Migraine jbmigraine@wmo.int Robert Stefanski rstefanski@wmo.int			
7.	**Project overview**	In Papua New Guinea, CREWS builds the capacity of the national meteorological agency and strengthens its cooperation with key sectoral ministries, departments and other stakeholders for agriculture, disaster management, energy and infrastructure. Other hazards related to droughts such as frost and bush fires are also indirectly addressed. The project puts in place end-to-end EWS focused on reducing drought, flooding and frost impacts, through improved weather observations, climate data management of historical data, climate data rescue, state-of-the-art seasonal and sub-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 draws on advanced technical expertise from cooperating institutions to ensure access to relevant data, products, tools, training and equipment.			
8.	**Progress**	Before the reporting period (since Dec 2018):			

summary	- Letters of Agreement have been signed with the PNG National Weather Service (NWS, 28 Nov 2018) and Bureau of Meteorology (BOM) of Australia.
	- A project backstopping mission was held 22-24 November 2018
	- a PNG representative participated in the Fourth Pacific Island Climate Outlook Forum (PICOF-4) and the Training Session on Social Media and Communication on 10-15 October 2018, Nadi, Fiji
	- The Inception workshop for the CREWS-PNG project took place in Port Moresby, PNG on 18-22 February 2019; engagement with numerous stakeholders from Agriculture & Food Security, Disaster Risk Reduction, Energy, Health, Water and other sectors in PNG was established; users' feedback on the development of operational Climate EWS for drought in PNG was obtained and recommendations were produced;
	- Cooperation of the CREWS-PNG with the WMO Space-based Weather & Climate Extreme Monitoring Demonstration Project (SEMDP) was established and synergies between these two WMO projects were identified; an implementation plan for CREWS-SEMDP collaboration was developed, to fully utilise advantages of complementing the projects' activities;
	- Cooperation of the CREWS-PNG with the PNG Capacity Development Project (PNG-CDP) funded by the Australian Government Department of Foreign Affairs & Trade (DFAT) was established and an implementation plan of collaborative activities on improving observational databases and increasing Numerical Weather Prediction (NWP) capability in the PNG National Weather Service (NWS) was developed;
	- Cooperation of the CREWS-PNG with the Climate & Ocean Support Program in the Pacific (COSPPac) project funded by the DFAT was established and an implementation plan of collaborative activities on improving observational databases and use of sub-seasonal to seasonal forecasts from Global and Regional Centres was developed;
	- Based on outputs of the Inception workshop, two book chapters which describe the CREWS PNG project and its synergies with the WMO SEMDP and the PNG-CDP were drafted and distributed to partner organizations for revision and further input.
	- CREWS_PNG 2nd Stakeholders Consultation Workshop was held in Port Moresby, PNG from 22 to 23 October 2019.

During the reporting period:

- The procurement of computer equipment for climate data rescue was approved and finalized. Purchasing of a computer and scanner will be undertaken in May 2020. Likewise, the process for procuring a vehicle for PNG NWs has started and the delivery of vehicle should occur in June-July.

- The WMO Space-based Weather & Climate Extreme Monitoring Demonstration Project (SEMDP) products for drought detection and monitoring were introduced to stakeholders in PNG. Valuable feedback was obtained on the usefulness of the SEMDP products from key stakeholders from agriculture, DRR, energy, health, water and other sectors. This feedback will help the CREWS-PNG project focus efforts aimed at upgrading the PNG NWS capability to provide drought detection and monitoring products tailored for local user needs.

- Based on stakeholders' recommendations, a set of selected WMO SEMDP products were produced for PNG NWS to aid in the preparation of operational drought information. The selected WMO SEMDP products include space-based precipitation estimates (weekly, monthly and seasonal totals and anomalies) and derived products such as the Standardised Precipitation Index (SPI), the Normalised Difference Vegetation Index (NDVI) and the Vegetation Health Index (VHI).

- Training activities in using the BoM ACCESS-G (the Australian Community Climate Earth-System Simulator-Global) model products for short-range forecasting for the PNG region were designed in collaboration with the PNG Capacity Development Project (PNG-CDP).

- Papua New Guinea issued its first seasonal forecast incorporating ACCESS-S products thanks to cooperation with the Australian Bureau of Meteorology under the CREWS-PNG project. Continuing validation of ACCESS-S products and evaluation of the model's prediction skill for PNG will be an ongoing task for BoM and the PNG NWS during the following reporting periods, to ensure that the PNG NWS can utilise the products for producing accurate multi-week and seasonal climate outlooks that will improve drought prediction for the country.

- The BoM model ACCESS-S (the Australian Community Climate Earth-System Simulator-Seasonal) sub-seasonal to seasonal (S2S) climate prediction products for the PNG region including forecasts (from 1 week to 3 months) for precipitation, near-surface air temperature, sea surface temperatures (SSTs) and mean sea level pressure (MSLP) were prepared in the form of national maps with borders of all provinces outlined (static maps). The provision of ACCESS-S S2S products to PNG NWS represents a significant step towards the transition of its operational services from issuing seasonal climate outlooks using a statistical model SCOPIC (Seasonal Climate Outlooks for Pacific Island Countries) to using dynamical climate model outputs.

- Implementing the recommendation from the CREWS-PNG 2nd stakeholders' consultation workshop, collaboration with the Australian Centre for International Agricultural Research (ACIAR) was established. An experimental set of BoM ACCESS-S high resolution S2S climate prediction products for the PNG region are now being produced and provided on a weekly basis to the 'Climate Smart Agriculture opportunities for enhanced food production in PNG' project funded by the Australian Government Department of Foreign Affairs and Trade (DFAT) through ACIAR.

- Addressing identified needs for providing PNG NWS with (i) BoM ACCESS-S high resolution S2S prediction products for the PNG region, and (ii) BoM ACCESS-S global S2S prediction products for SSTs to monitor status of the El-Niño – Southern Oscillation (ENSO), a substantial progress has been achieved on enhancing functionality of the WMO Global Producing Centre for Long-range Forecasts (GPC-LRF) Melbourne portal. BoM ACCESS-S high resolution S2S prediction products for the PNG region are now available to the PNG NWS via a WMO GPC-LRF ftp link.

- A paper which described accuracy of the WMO SEMDP satellite precipitation estimates, in the context of CREWS activities, was drafted, submitted for peer-review, revised and accepted for publication.

- Preparatory work was done for organizing the 3rd CREWS-PNG workshop tentatively planned to be held in Port Moresby, PNG on 11-21 May 2020 was done. However, due to impact of the COVID-19 pandemic, the 3rd workshop and subsequent stakeholder consultations and training are now postponed for at least 6 months. In order to maintain project connections and continuity of stakeholder feedback, a fortnightly virtual meeting of project partners has commenced. This meeting, though not originally part of the project plan, has proven to be highly beneficial, and may be continued after travel restrictions will be lifted.

9. Project Performance

Interpretation of color coding			
🟢	**High**	Good progress, on track in most or all aspects of delivery	
🟡	**Medium**	Moderate progress or on track in some aspects of delivery	
🔴	**Low**	Less than moderate or poor progress. Not on track in critical areas of its delivery. Requires remedial attention	

	Rate of expenditure	Rate of delivery	Alignment of Objectives
Coding	🟢	🟢	🟢
Narrative	The disbursement rate is at 29% or USD 478,000 of the approved USD 1,650,000 funding. Additional funds will be disbursed from June to August 2020.	With 2 full-time project support staff and engagement of specialized experts from BoM and PNGNWS, the rate of delivery is now fully satisfactory.	The project remains strongly aligned to the CREWS objectives.

10. Risk Management Status

Risk Status	In line with the assessment performed at proposal stage, a risk related to the weak project management capacity in Papua New Guinea National Weather Service (PNGNWS) brings the overall project risk to moderate.
Measures to address	This risk is being mitigated with (i) the hiring of a full time project manager and (ii) support received from BoM and the Government of Australia through the Capacity Development Project (PNGCDP) that aims to increase the reliability of weather observations and to train PNGNWS staff. The PNGCDP project significantly increases the likelihood of success for CREWS PNG project with the provision of one additional full time staff in the country for several months.

11. Contributions to CREWS Outputs

11.1. National Outputs

CREWS Output 1: National Meteorological and Hydrological Services' delivery improved, including the development of long-term service delivery strategies and development plans					
Project Outputs		Overall Project Target	Target for reporting period	Progress by Nov 2019	Progress by May 2020
1.1.	Integration of national meteorological, hydrological and climate observing systems in OSCAR/Surface, the official repository of surface-based observing stations and platforms metadata of WMO Integrated Global Observing System (WIGOS) - *an understanding was reached between the Capacity Development Project (PNG-CDP) funded by the Australian Government (DFAT) to improve wider coverage of observational monitoring stations contributing to improved Numerical Weather Prediction (NWP) capability in the PNG National Weather Service (PNGNWS).*	100%	30%	10%	25%
1.2.	Improved climate databases based on Australia Climate Data for the Environment (CliDE) activities - *new observation data from the third party AWS network available for the period from 2010 to present will be prepared in CliDE format and ingested into CliDE CDMS, to extend archive of historical climate data for PNG. An implementation plan for improving observational databases for PNG was developed, based on optimal use of CLiDEsc developed by NIWA, a web-based tool that allows users to request data and generate products from a range of environmental observations and variables. Furthermore, through the cooperation of CREWS PNG, CDP and COSPPac, new observational datasets from a third party AWS network operating in the country will be ingested into CLiDE database to extend the current archive of historical climate data for PNG. During the reporting period, agreement to obtain free of charge meteorological observation data for 2009 – 2019 from a third part AWS network run by the PNG Remote Sensing*	100%	15%	10%	15%

	Centre was achieved.				
1.3.	Implementation of enhanced climate database and report on climate data rescue status - *With support from the Climate and Oceans Support Program in the Pacific (COSPPac), PNGNWS was able to perform its first ever data rescue activity in 2013. The experience gained from this activity has enabled PNGNWS to start additional data rescue activities based on clear identification of existing gaps and needs in terms of labour, computing infrastructure, archiving space, etc.*	100%	20%	10%	15%
1.4.	Adapt and implement Australian Climate and Weather Extremes Monitoring System to PNG for basic monitoring of drought, heavy rainfall and frost events - *A proposed set of new products for monitoring drought and accumulated heavy precipitation on various timescales to be used in operational Climate Extremes Monitoring was developed. During the reporting period, experimental products for monitoring drought and accumulated heavy precipitation derived from satellite observations made available through NOAA and JAXA were produced and demonstrated at the 2nd CREWS-PNG workshop in Port Moresby on 22-23 October 2019.*	100%	30%	25%	35%
1.5.	Develop NWP products from Global NWP centres including BOM for use in short-range forecasting - *A set of products from the BoM model ACCESS-G (the Australian Community Climate Earth-System Simulator-Global) NWP available for PNG was examined. Availability of new high-quality BoM ACCESS-G operational products complemented by training of staff in products' utilization will contribute to increased NWP capability in the PNG NWS. The selected products were presented at the stakeholders' workshop in October 2019.*	100%	35%	25%	35%
1.6.	Guidance about how to use sub-seasonal and seasonal forecasts (1week to 3 months) from Global Centers - *The need to enhance the availability of sub-seasonal forecast products (from 1 to 4 weeks) and seasonal forecasts (from 1 to 3 months) for PNG was identified, to assist the PNG NWS with ENSO monitoring; During the reporting period, accessibility of BoM ACCESS-S high resolution S2S prediction products for the PNG region through the BoM portal was investigated including forecasts (from 1 week to 3 months) for precipitations, near-surface air temperature, sea surface temperatures (SSTs) and mean sea level*	100%	40%	30%	40%

		Overall Project Target	Target for reporting period	Progress by Nov 2019	Progress by May 2020
	pressure (MSLP). A set of improved products for PNG has been made available through a specialized portal; in addition, an implementation plan for enhancing the functionality of the WMO GPCLRF Melbourne portal was developed.				
1.7.	Develop an operational climate early warning system for drought - *PNGNWS has been collaborating with NIWA to complement its network of 13 synoptic stations with remote sensing estimates (TRMM, cf www.pngnws.github.io/RainfallMonitoring) and provide enhanced rainfall maps. In consultation with stakeholders, the available WMO SEMDP operational products were examined and a subset of the products including weekly and monthly precipitation estimates, the standardized precipitation index (SPI), the normalized difference vegetation index (NDVI) and the vegetation health index (VHI) was identified as beneficial for the development of operational Climate EWS for drought. During the reporting period, based on input from users from the Department of Agriculture and Livestock, National Agriculture Research Institute, National Disaster Centre, Climate Change Development Authority, Fresh Produce Development Authority, Conservation and Environment Protection Agency, Cocoa and Coconut Research Institute, Coffee Research Institute, recommendations for improvement of the available drought forecasts products were produced. Key recommendations included: maps are preferable rather than station forecasts, monthly updates of forecasts are considered as beneficial, in addition to seasonal (3-months) updates, among others.*	100%	30%	25%	30%
1.8.	Equipment including car, observing stations, data concentration, data management, forecasting and service production hardware, based on needs and assessment	100%	40%	30%	35%

CREWS Output 2: Risk Information to guide early warning systems and climate and weather service developed and accessible					
Project-specific Outputs		**Overall Project Target**	**Target for reporting period**	**Progress by Nov 2019**	**Progress by May 2020**

2.1.	Catalog of maps of flood prone areas and flood causes, some to be addressed by SouthEastern Asia Oceanic FFG (SAOFFG)	100%	10%	10%	10%
2.2.	Introducing impact-based drought forecasts and risk-informed warnings for improved decision making by the users - *During the February 2019 workshop, a concept of impact-based drought forecasts and associated risk-informed warnings was introduced to users, demonstrating how impact-based forecasts could assist with improved decision making. Feedback from stakeholders from agriculture, DRR, energy, health, water and other sectors was collected, and recommendations produced – to include information on likely impacts into drought and frost warnings.*	100%	25%	25%	25%

CREWS Output 3: Information and communication technology, including common alerting protocol, strengthened

Project-specific Outputs	Overall Project Target	Target for reporting period	Progress by Nov 2019	Progress by May 2020
3.1. Enhanced multi-channel weather forecast and warnings communication systems - *this activity is planned for 2020-2021*	100%	0%	0%	0%

CREWS Output 4: Preparedness and response plans with operational procedures that outline early warning dissemination processes strengthened and accessible

Project-specific Outputs	Overall Project Target	Target for reporting period	Progress by Nov 2019	Progress by May 2020
4.1. Pilot testing and evaluation of EWS based on prior stakeholder consultation - *this activity is planned for 2020-2021*	100%	0%	0%	0%

CREWS Output 5: Knowledge products and awareness programmes on early warnings developed

Project-specific Outputs	Overall Project Target	Target for reporting period	Progress by Nov 2019	Progress by May 2020
5.1. Assessment of user needs including PNG NWS and other stakeholders (through a series of 6 stakeholders' workshops)	100%	60%	40%	40%
5.2. Assessment of observation systems (meteo, hydro, climate) for early warning systems and recommendations on improvements	100%	30%	30%	30%
5.3. 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)	100%	30%	30%	30%

CREWS Output 6: Gender-sensitive training, capacity building programmes provided

Project-specific Outputs	Overall Project Target	Target for reporting period	Progress by Nov 2019	Progress by May 2020
6.1. Training in statistics and basic tools for climate services - *this activity is planned for 2020-2021*	100%	0%	0%	0%
6.2. Training in preparing and interpreting the forecasts	100%	55%	50%	50%
6.3. Training on multi-channel forecast and warnings communication systems	100%	35%	30%	30%
6.4. Training on climate data management and data rescue	100%	55%	50%	50%
6.5. Training on OSCAR/Surface	100%	0%	0%	0%
6.6. Training on climate extremes monitoring and drought forecast	100%	35%	30%	30%

6.7.	Management training	100%	10%	0%	10%
6.8.	Gender analysis to identify opportunities and include specific interventions to promote gender equality in EWS	100%	0%	0%	0%
6.9.	Development and implementation of a gender action plan to ensure gender-specific activities are identified and implemented. The action plan will be discussed at the kick-off meeting and will be integrated into the project work plan.	100%	0%	0%	0%

12. Contributions to CREWS Value Propositions

Gender Sensitive	User requirements have been collected in a gender-disaggregated manner, and a gender action plan is developed to ensure gender-specific activities are identified and implemented.
Multiplier	CREWS is building upon a number of parallel projects including SouthEastern Asia Oceanic FFG (SAOFFG), the Capacity Development Project (PNG-CDP) funded by the Australian Government (DFAT) and the Climate and Ocean Support Program for the Pacific (COSPPac)
People-centred	The project conducts a rolling assessment of users needs (updated at least once a year for each warning application) and ensures a proper tracking of how user requirements are being fulfilled. All early warning stakeholders are involved among the users.
Promote Coherence	The close collaboration with SAOFFG, PNG-CDP and COSPPac ensures capabilities are developed in forecasting, risk assessment, warning dissemination and emergency response with a seamless and integrated approach.
Innovation & Solution-oriented	CREWS supports the development of innovative NWP, climate prediction and agrometeorological services based on weather, sub-seasonal and seasonal prediction (with BoM).
Unique	CREWS provides twinning arrangements between PNG NWS with their counterpart in Australia (BoM), with huge potential to continue knowledge exchange and collaboration beyond the project lifetime. In addition, CREWS innovations have the potential to be scaled-up at the national level with the Australia-funded Capacity Development Project (PNG-CDP).

13. Visibility products

- WMO Space-based Weather and Climate Extremes Monitoring Demonstration Project for East Asia and Western Pacific. In WMO Bulletin, vol. 69(1)-2020: Available from: https://public.wmo.int/en/resources/bulletin/wmo-space-based-weather-and-climate-extremes-monitoring-demonstration-project?utm_source=WMO+Bulletin&utm_campaign=a3e55d17c3-EMAIL_CAMPAIGN_2018_11_20_01_43_COPY_01&utm_medium=email&utm_term=0_46acf39490-a3e55d17c3-

- WMO News: Global effort to strengthen early warning systems expands. Published 13 December 2019. Available from: https://public.wmo.int/en/media/news/global-effort-strengthen-early-warning-systems-expands

- Chua, Z-W., Kuleshov, Y., Watkins, A. 2020: Evaluation of Satellite Precipitation Estimates over Australia, Remote Sensing, 2020, 12(4), 678; https://doi.org/10.3390/rs12040678

14. Key supporting documents (also available in the output matrices)

List and annex to the report any documents providing details on project activities such as reports of training sessions, summaries of high-level discussions etc.
- Report of the 2nd Stakeholder workshop (Oct 2019)
- CREWS_PNG_Implementation_Report_#3_October_2019-March_2020 (BOM)