Drought Monitoring and Forecasting at NMHSs in WMO Region V: Impact and Value of WMO Space-based Weather and Climate Extreme Monitoring (SWCEM) and Climate Risk and Early Warning Systems (CREWS)

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Outline

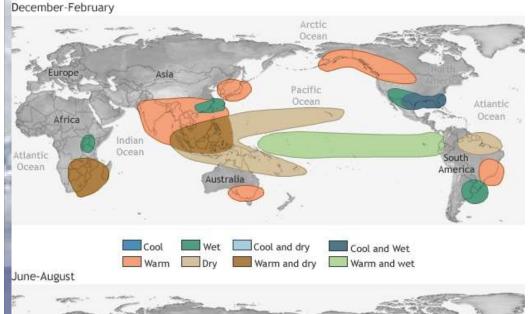
- Climate Drivers / ENSO outlook at the Bureau of Meteorology (BoM)
- WMO SWCEM (Space-based Weather and Climate Extremes Monitoring): Satellite-derived Products
- WMO CREWS (Climate Risk and Early Warning Systems): Drought EWS
- WMO GPC LRFs (Global Producing Centre for Longrange Forecasts) Melbourne: S2S and Satellite Products

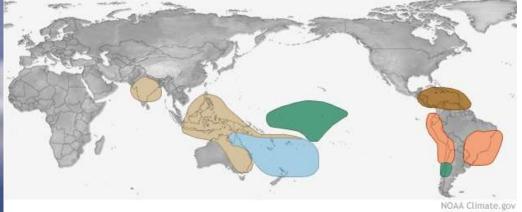




El Niño

EL NIÑO CLIMATE IMPACTS





- Warm and dry: Australia, Indonesia, the Philippines, Malaysia, central Pacific, southeastern Africa and northern Brazil.
- Wetter than normal: the Gulf Coast of the US, Colombia, Ecuador and Peru; southern Brazil to central Argentina.

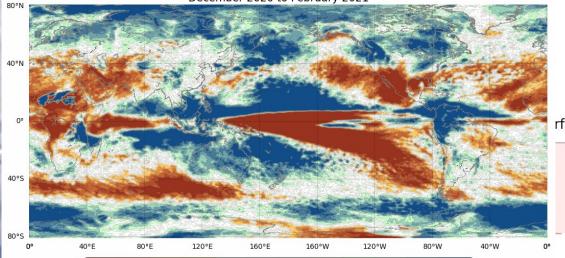
ENSO Update

· 11.	HOME ABOUT MEDIA CONTACTS Enter search terms Search
Australian Government	
-	BoM > Climate > Outlooks > Climate Driver Update Calendar Calendar
313 . 10	How significant was the March rainfall? Monthly sea surface temperature anomalies for NINO3.4 region
Climate	Climate Driver Update
Outlooks & drivers	() Issued 25 May 2021 Next Issue 8 June 2021
Rainfall & temperature outlooks	Overview Pacific Ocean Indian Ocean -1.6
Outlook video	-2.0
Climate driver update	Summary Sea surface -2.8 DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC -2.9 DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Streamfow outlooks	www.bom.gov.au/climate Commonwealth of Australia 2021. Australian Bureau of Meteorology Model run: 22 May 2021 Base period 1990-2012 Large scale climate drivers neutral
Tropical monitoring	The El Niño-Southern Oscillation (ENSO) remains neutral. Climate model outlooks show this neutral
Northern rainfall onset	ENSO state is likely to continue for at least the coming six months.
Tropical cyclone outlook	Oceanic indicators of ENSO are clearly within the neutral range, with sea surface temperatures across almost all the equatorial Pacific Ocean close to the long-term average. Similarly,
Climate model summary	temperatures beneath the surface show no significant shift away from normal. Atmospheric indicators, such as the Southern Oscillation Index (SOI) and cloud patterns, are well within the ENSO-neutral range. Trade winds are generally ENSO neutral, although currently stronger than
News & reports 💦 🗸 🗸	usual in the far western Pacific due to an approaching pulse of the Madden–Julian Oscillation.

BoM provides fortnightly climate driver update including ENSO

The 2020-21 La Niña – ACCESS-S Outlook

Chance of exceeding the median rainfall for December 2020 to February 2021



Chance of exceeding median rainfall (%)

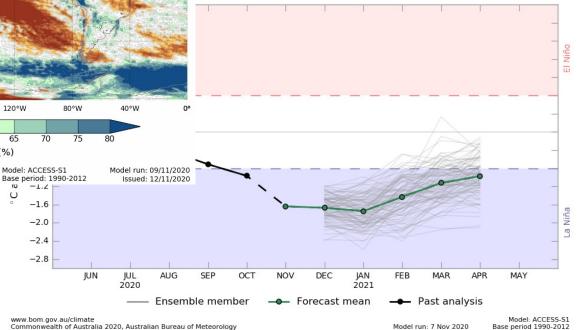
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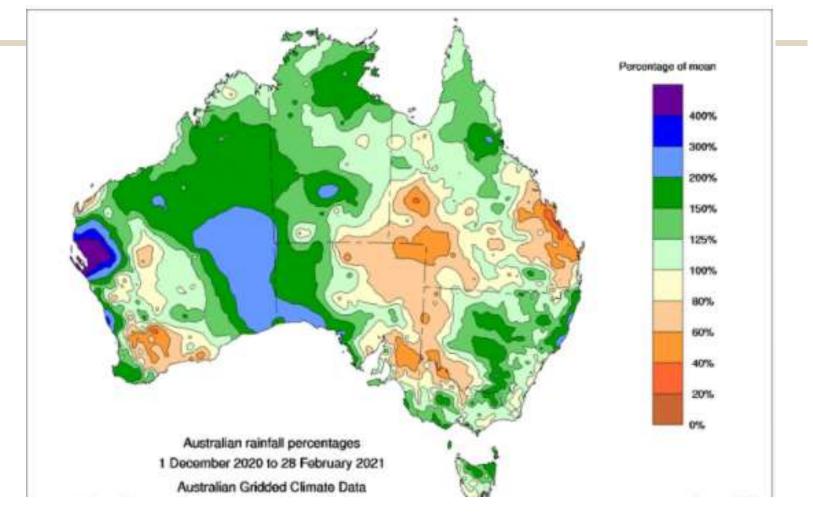
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rface temperature anomalies for NINO3.4 region

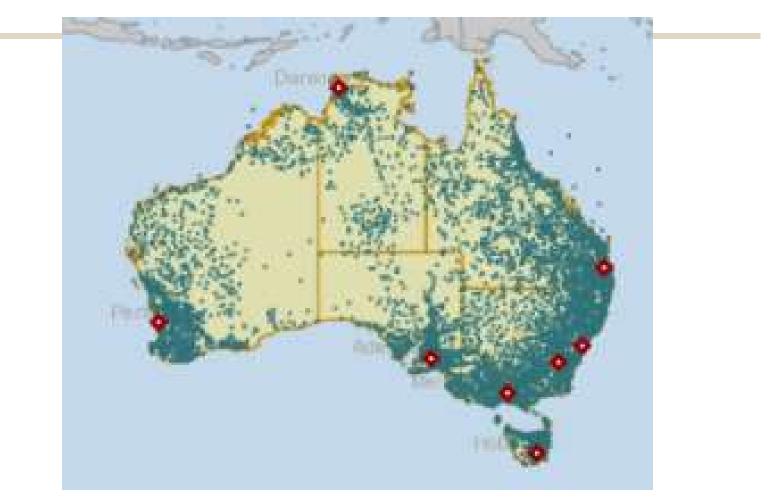


Precipitation Monitoring

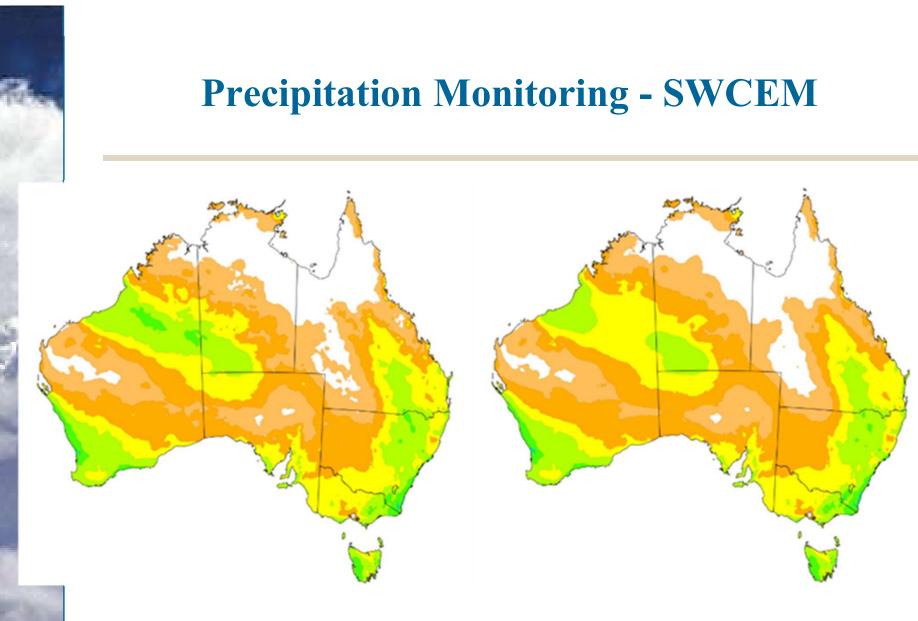


• Rainfall percentages December – February 2021

Precipitation Monitoring



- Over 6,000 rain gauges across Australia
- Data sparse areas in the central parts of the country

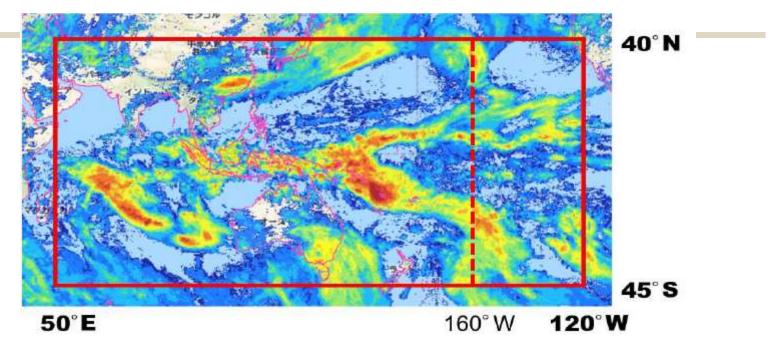


• SWCEM and in situ (AGCD) precipitation, July 2001

WMO SWCEM

Recognizing needs to better utilize and improve monitoring of weather and climate extremes from space, WMO established a new flagship initiative - the Space-based Weather and Climate Extremes Monitoring (SWCEM).

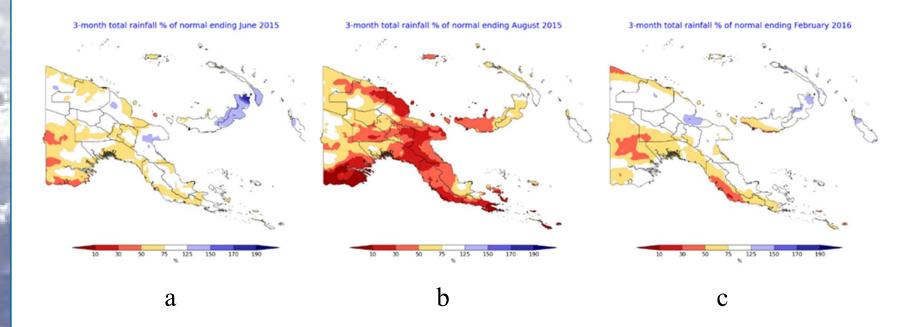
SWCEM Demonstration Project in RA-II and V



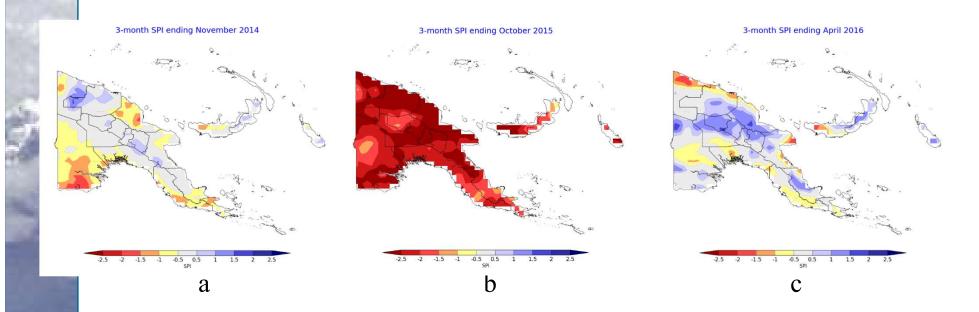
The first SWCEM demonstration project was successfully implemented in WMO Region II (Asia) and Region V (the South-West Pacific) in 2018-2019. The project was focused on monitoring drought and heavy precipitation and implemented in geographical domain which covers the South-East Asia region and the Western Pacific Ocean area from 40°N to 45°S; 50°E to 120°W.

Global Satellite-derived Product Providers

- The Japan Aerospace Exploration Agency (JAXA) and the Climate Prediction Center at the National Oceanic and Atmospheric Administration (NOAA/CPC) provide satellite data and products: GSMaP and CMORPH, respectively.
- SWCEM precipitation products include mean precipitation estimates for hourly, daily, pentad, weekly, 10 days and monthly precipitation. In addition, statistics for daily, pentad and weekly extreme precipitation and percentage of rainy days in a month is provided.
- For drought monitoring, the Standardised Precipitation Index (SPI; 1-, 2- and 3-month) and the Vegetation Health Index (VHI) are provided.

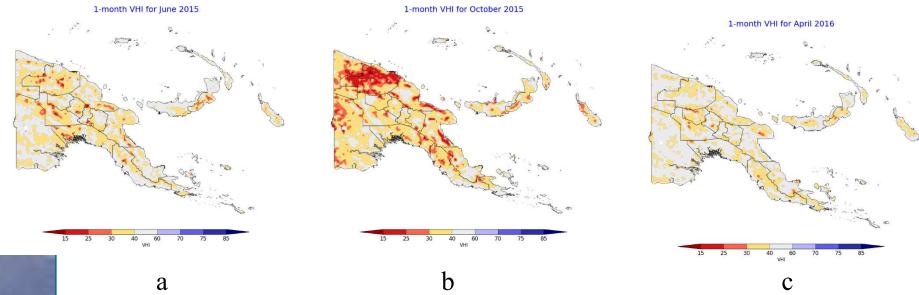


3-month rainfall percentages of normal depicting (a) onset of meteorological drought conditions in PNG in June 2015, (b) peak of drought in August 2015 and (c) easing of drought in February 2016.



3-month SPI showing the progression of drought event in PNG: (a) November 2014 showing initial signs of dry conditions towards the southeast of the mainland; (b) October 2015 showing widespread severely dry conditions; (c) April 2016 showing the easing of dry conditions.





1-month VHI values showing the progression of the 2015-2016 drought event in PNG: (a) June 2015 showing the beginning of below-average vegetation health; (b) October 2015 showing widespread areas of poor vegetation health; (c) April 2016 showing easing of poor vegetation health.



			Ja	e-month beriod nuary to ecember 2020	9-month period April to December 2020	6-mont period Jul Decemb 2020	y to	3-month period October to Decembe 2020	
Γ	Go	oroka							
Γ	Ma	dang							
Γ	W	ewak							
Γ	Na	dzab							
	Va	nimo							
Γ	Ka	vieng							
	Mo	mote							
	Port I	Moresby							
	Mi	sima							
Rain status		Drough	nt	Drought Warning	Drought Watch	Status not available		mal or wetter nan normal	Very

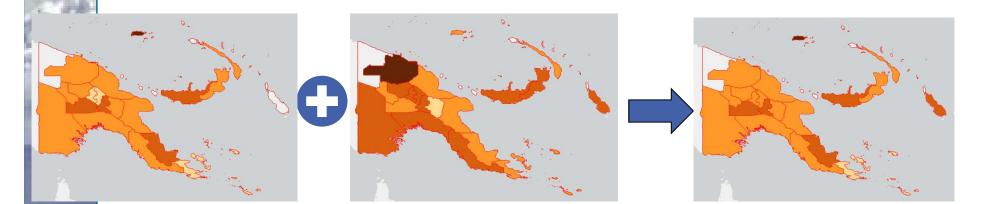
- There are certain limitations of rain gauge network in PNG. Thanks to CREWS, capacity of the PNG NWS has been strengthened; drought monitoring products derived from SWCEM satellite observations are now used operationally.
- Using SWCEM, similar regional and national products for drought monitoring could be produced for countries in other WMO Regions.



CREWS: Drought Risk Assessment

Drought Hazards Index (DHI) Inputs

DHI



WMO SWCEM: SPI

WMO SWCEM: VHI

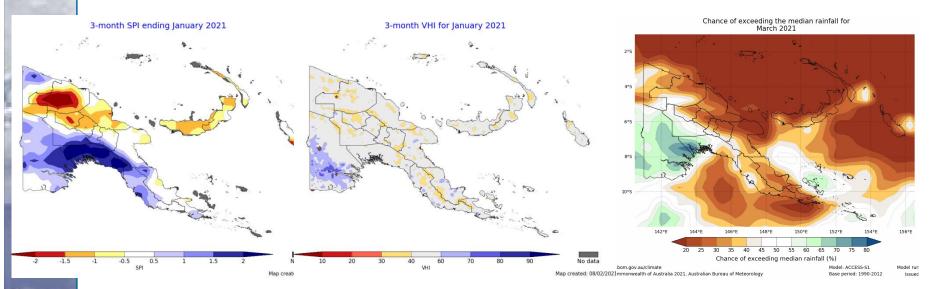
SPI + VHI => DHI

Drought Risk Assessment: WMO SWCEM satellite-derived products – SPI and VHI - are combined using GIS, to produce maps of Drought Hazard Index (DHI) for PNG at the provincial level.

CREWS: Drought EWS

Monitoring Inputs

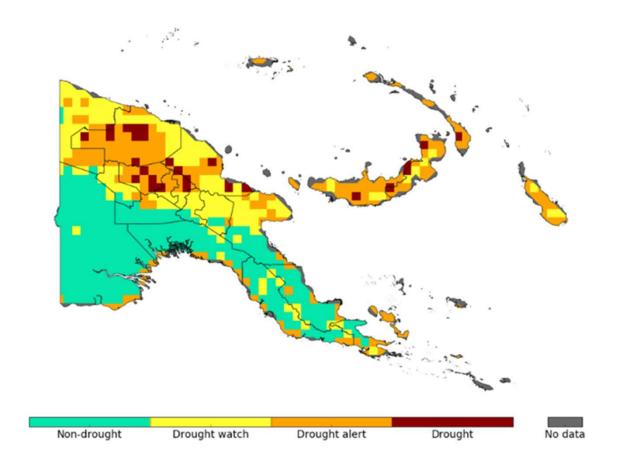
Forecasting Inputs



MO SWCEM: SPI WMO SWCEM: VHI WMO GPC LRFs: Rain Drought EWS: WMO SWCEM satellite-derived products as a monitoring component and ACCESS-S (the Australian Community Climate Earth-System Simulator – Seasonal) S2S products – as a forecasting component



CREWS: Drought EWS



Drought EWS: "DROUGHT WATCH", "DROUGHT ALERT" and "DROUGHT CRITICAL" map for PNG (experimental product)

	- Drovince						20	15											20	16					
	Province		F	Μ	Α	Μ	J	J	Α	S	0	Ν	D	J	F	М	А	М	J	J	Α	S	0	Ν	D
	Bougainville																								
100	Central																								
	Chimbu (Simbu)																								
	East New Britain																								
	East Sepik																								
[Eastern Highlands																								
	Enga																								
	Gulf Province																								
	Hela																								
	Jiwaka																								
	Mandang																								
	Manus																								
1	Milne Bay Province																								
	Morobe																								
R.	New Ireland																								
	Northern (Oro)																								
	Southern Highlands																								
	West New Britain																								
6	West Sepik																								
	(Sandaun)																								
	Western																								
	Western Highlands																								

No Data 🗧 Non-drought 🚽 Watch 🚽 Alert 📕 Critical

Drought early warnings (WATCH, ALERT and CRITICAL) for PNG for 2015-2016 (experimental product)



WMO GPC LRFs



World Meteorological Organization Global Producing Centre for Long-Range Forecasts Melbourne

About ACCESS-S | About GPCs

Seasonal and inter-annual climate variability poses a major risk to many parts of our global society, the economy and the environment. The risks are particularly significant for Pacific Island Countries and compounded by human caused climate change which interacts with natural climate variability. This website provides dynamical model based climate outlooks, with an emphasis on the southwest Pacific Region.



Related links

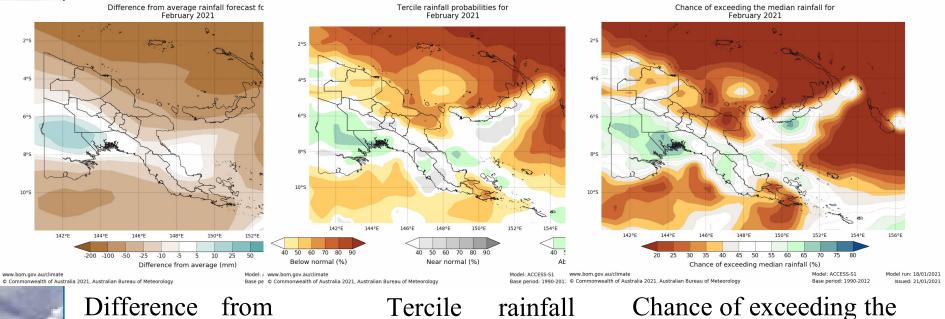
World Meteorological Organization (WMO) Global Producing Centre (GPC) for Long-Range Forecasts

Development supported via DFATfunded COSPPac and WMO-funded CREWS

ACCESS-S and Pacific climate monitoring charts

Category		Domain		Period	Variable			• Dow	nload files
ACCESS-S outlooks		PNG	w.	Week 🔻	Rain	V		• Dow	nload global NetCDF data
PNG CREWS		Forecast		Week Fortnight Month Season	Anomaly				nload guidance documents
	Ι	Week				7	Rain	• BOI	I Climate Driver Update
Store	F	Fortnig	ht				MSL	Р	
100		Month					Tmax	K	
100	S	Season					Tmin	-	

WMO GPC LRFs: National Products WMO RA-V, Papua New Guinea (PNG)



Difference from average rainfall

Tercile raint probabilities

Chance of exceeding the median rainfall

- In addition to global and regional products, WMO GPC LRFs disseminates national S2S climate prediction products.
- Such products are now used by the PNG NWS in operations, e.g., for production of Climate Outlooks etc.
- Similar national products could be generated for countries in other WMO Regions.

Recommendations

Strengthening Observing System

Space-based observations are integral part of the global observing system; they provide valuable information on a global scale and complement *in situ* observations (this is particularly important for SIDS and LDCs). Incorporating space-based observations to enhance precipitation monitoring, including **drought monitoring** is highly recommended to strengthen capacity of NMHSs.

Strengthening Predictive System

Accelerate uptake of sub-seasonal to seasonal (S2S) climate forecasts by operational services – NMHSs and RCCs. This will strengthen capacity of met services in **drought forecasting**.

Recommendations

Early Warning – Early Action

Enhancing capacities of countries in communication and dissemination of early warnings and impact-based forecasts is essential. WMO promotes dissemination of global and reginal climate information via reliable and sustainable channels such as WMO GPC LRFs and RCCs.

Further strengthening links of NMHSs with WMO GPCs LRFs and RCCs is essential, to strengthen capacity of met services in **drought monitoring and prediction**.