World Food Programme

SAVING LIVES
CHANGING LIVES

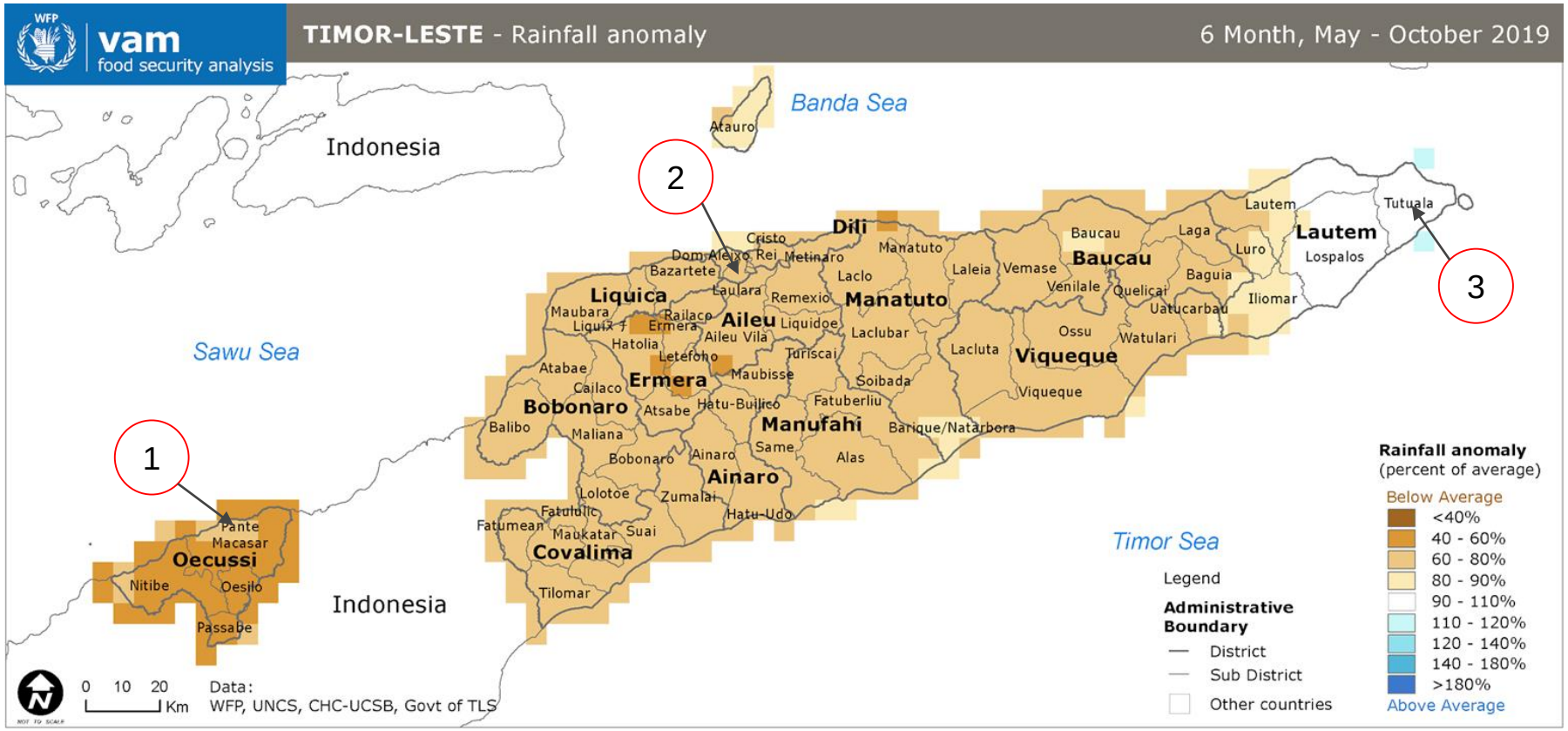
Timor-Leste Dry Season 2019

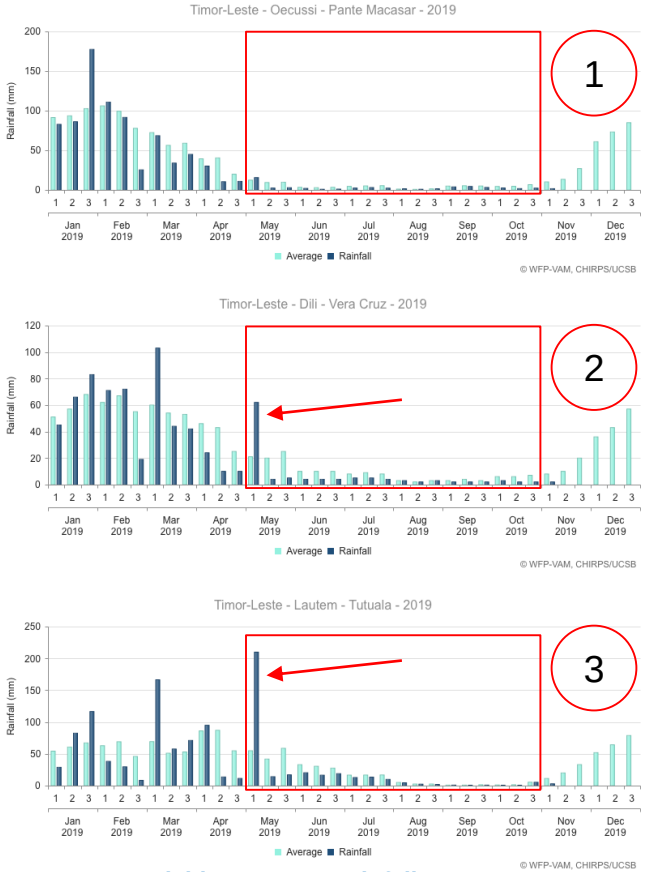
Timor-Leste Country Office and
Bangkok Regional Bureau for Asia and the Pacific

Ver. Nov 24, 2019

Contents

Rainfall performance in the last 6 months

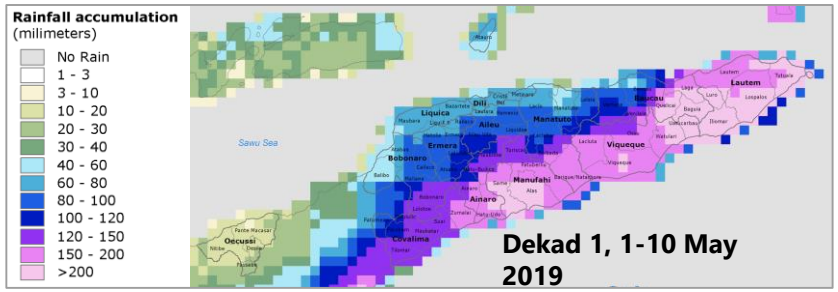


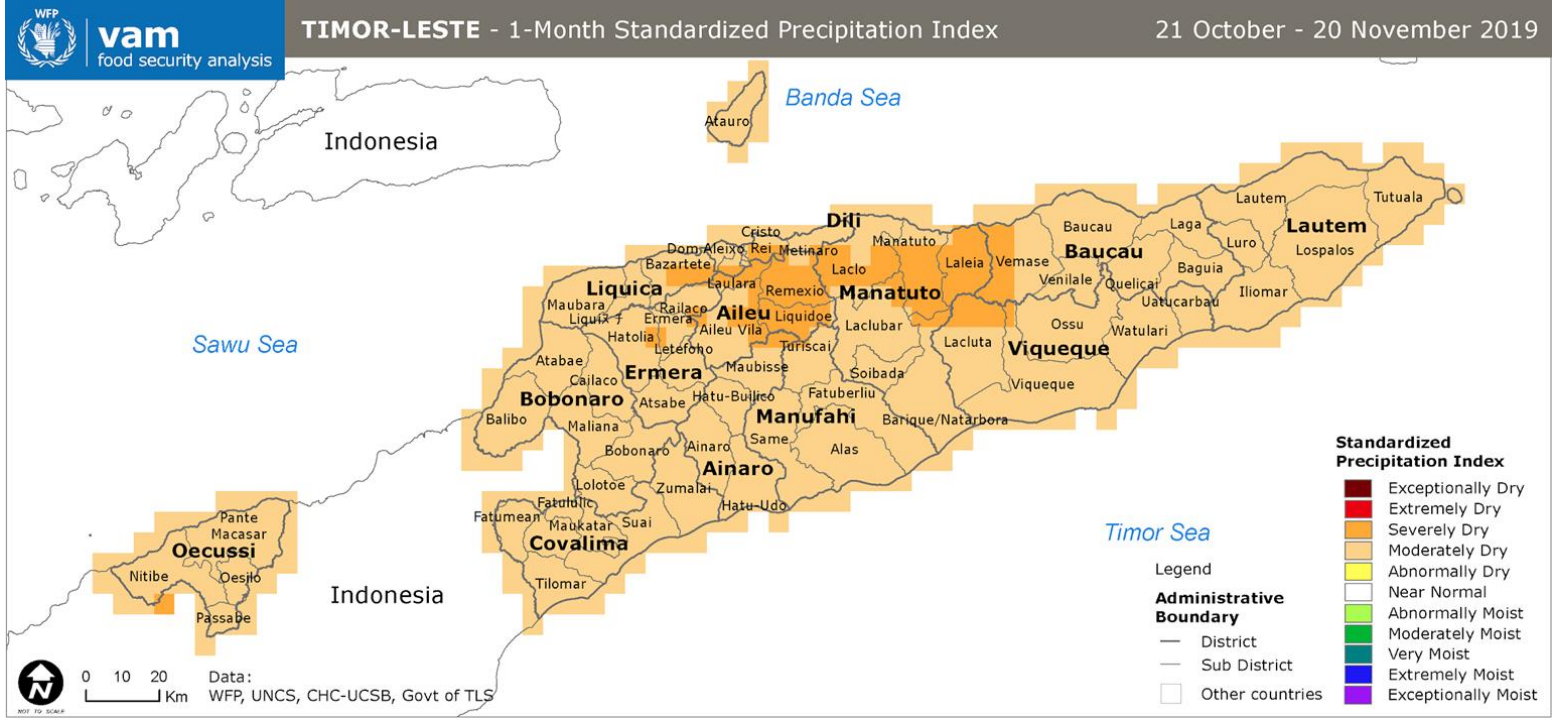


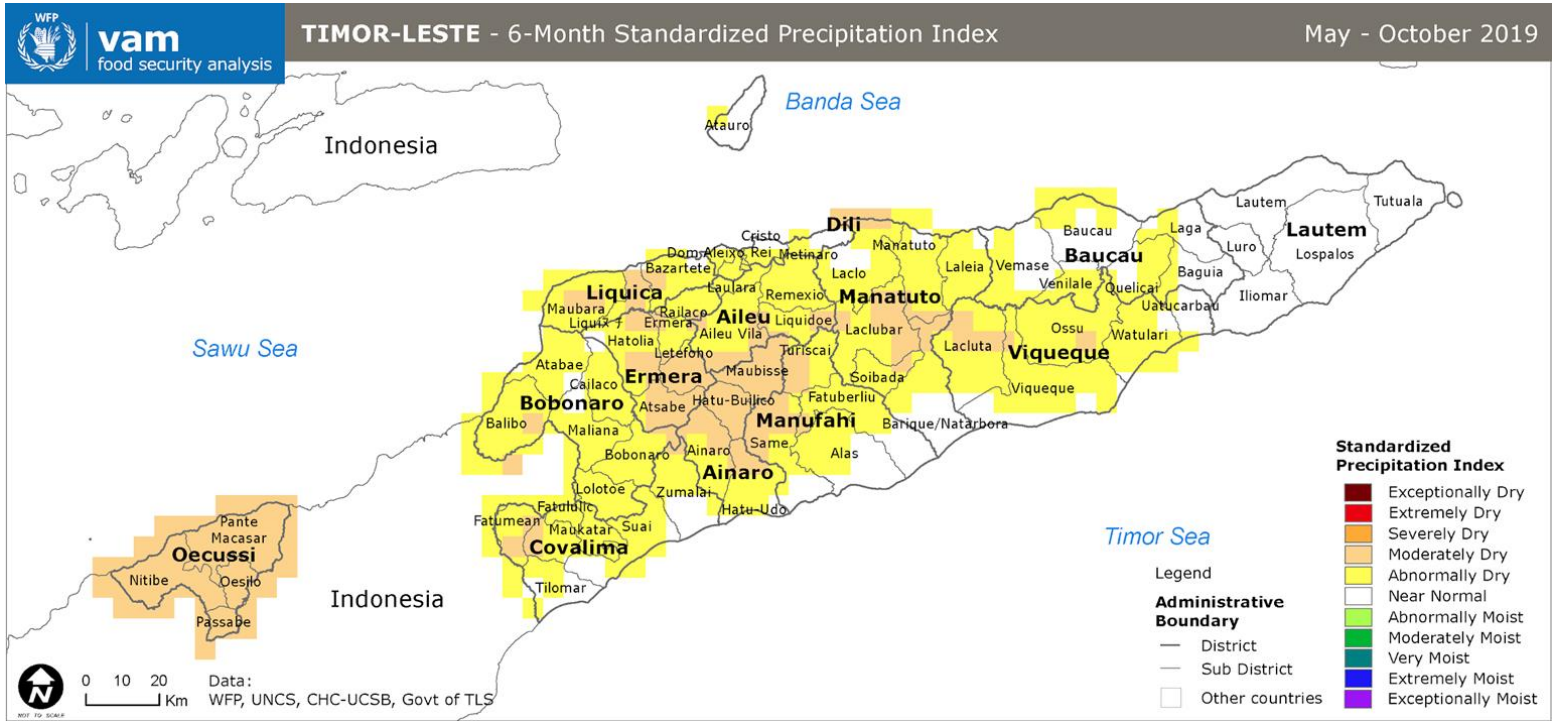
- **Dark blue: current rainfall season**
- **Light blue: long term average (LTA) rainfall**

In the last 6 months from May to October 2019, Timor-Leste in general experienced below normal rainfall, with a number of localized normal rainfall e.g Los Palos and Tutuala and eastern part of Lautem.

Unusually high intensity of rainfall (60-200 mm) occurred in first dekad of May 2019 (right map), when tropical cyclone Lili was approaching the Timor-Leste territory and caused wind damages and flooding in several areas in south and eastern part of the country.







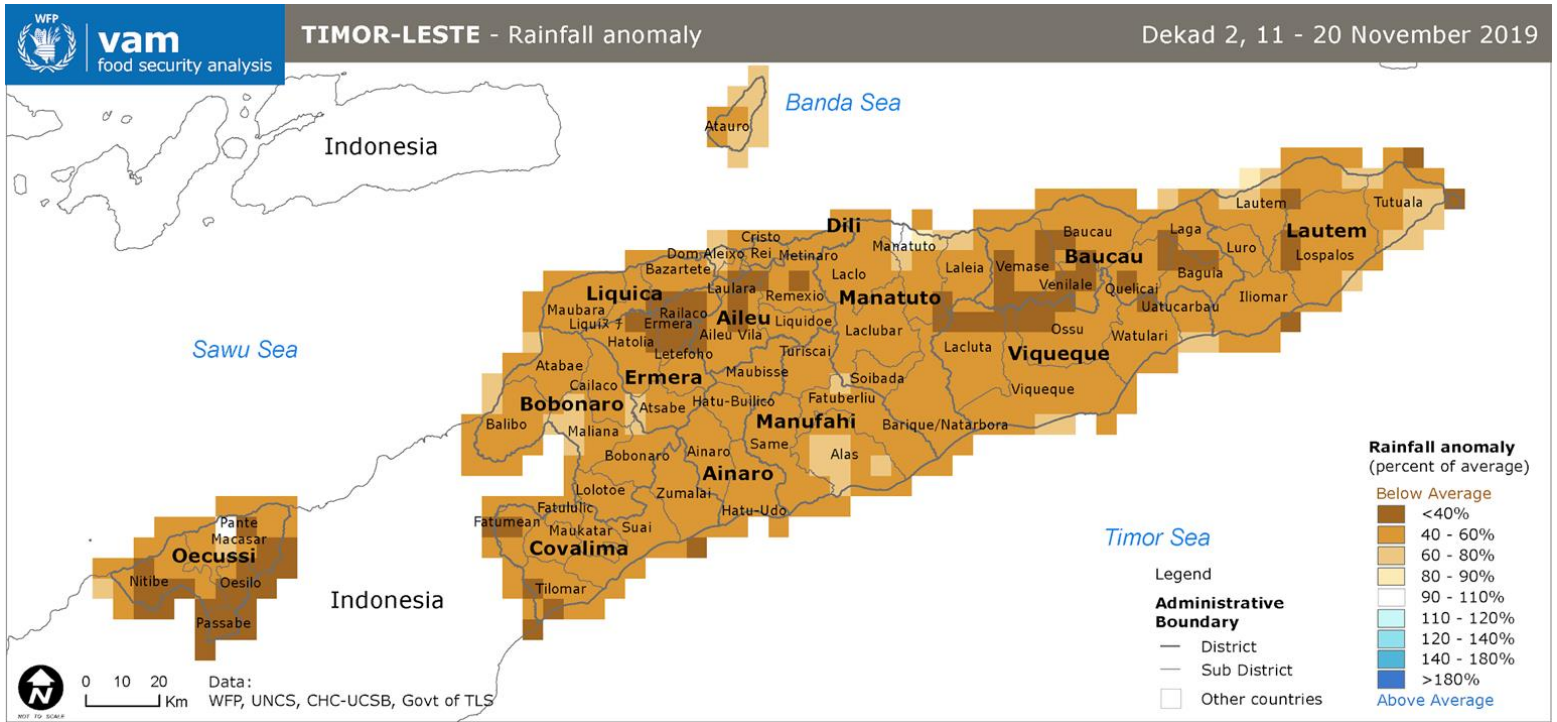
1 and 6 month of Standardized Precipitation Index

On short timescales (**1 month, 21 Oct - 10 Nov 2019**), the standardized precipitation index (SPI) is closely related to soil moisture.

The SPI analysis identifies that on a shorter time scale, most areas of the country experienced moderately dry condition. Severely dry condition occurred in between Laulara in Aileu to Laleia in Manatuto, Few areas in Viqueque laso experience the same condition.

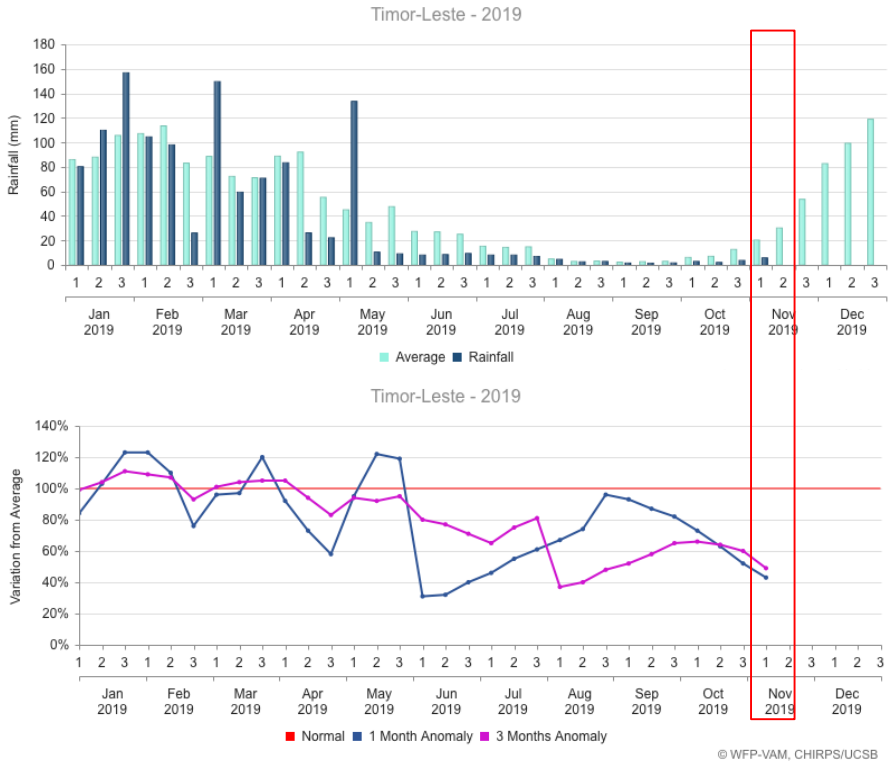
While at longer timescales (**6 month, May - Oct 2019**), the SPI can be related to groundwater and reservoir storage.

On a longer time scale, the
SPI analysis identifies abnormally dry to normal condition occurring in almost all areas in the country and in contrast, more moderately dry condition in highland areas spreading from Atsabe to Maubisse, Laclubar to Lacluta, and all areas in Oecusse.

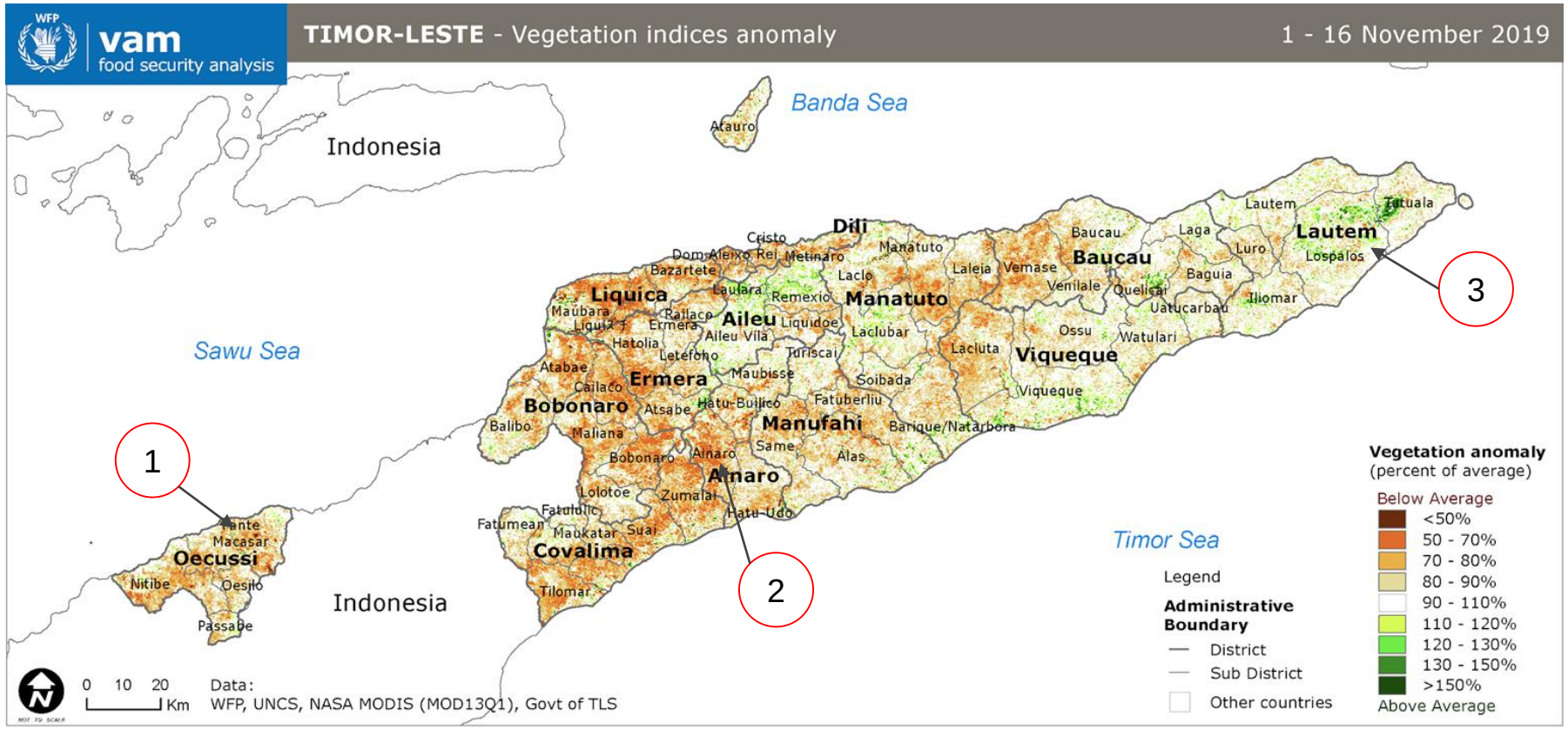


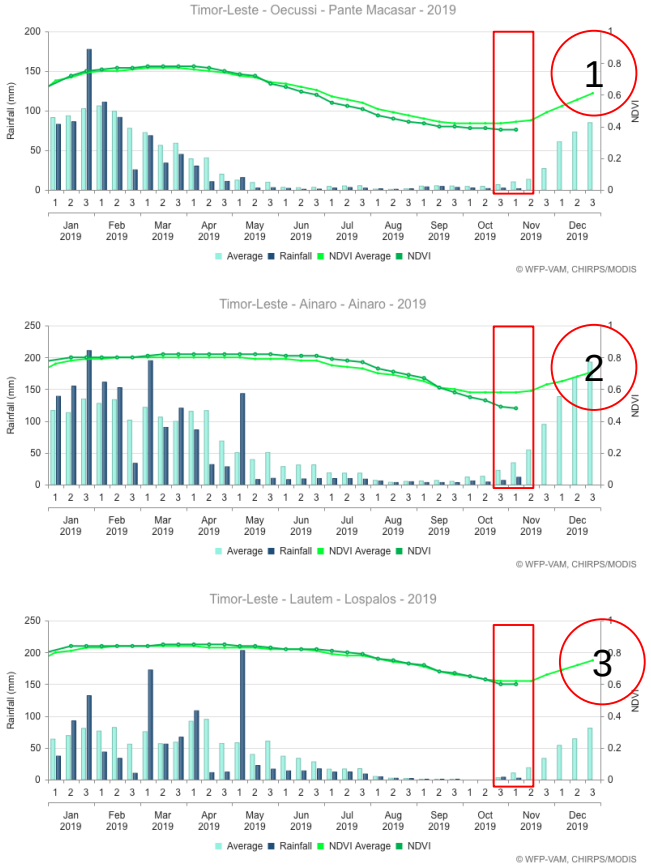
Current situation
Dekad 2, 11-20 Nov 2019

In the 10-days ending 20 Nov 2019, all areas in Timor-Leste experienced below normal rainfall, only received rainfall max 60% than usual. But this does not directly mean that the area completely experienced dry conditions; especially because, some highland areas, e.g. Atsabe in Ermera, Hatu-Builico and Maubisse in Ainaro are experienced rainfall of 10-30 mm in 10 days.

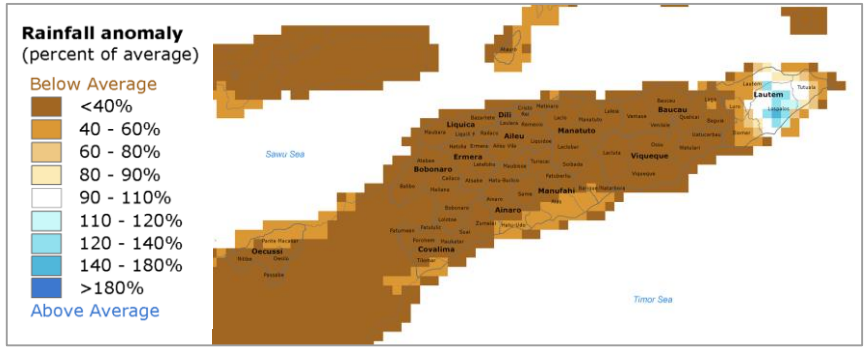


Vegetation status, 1 - 16 Nov 2019



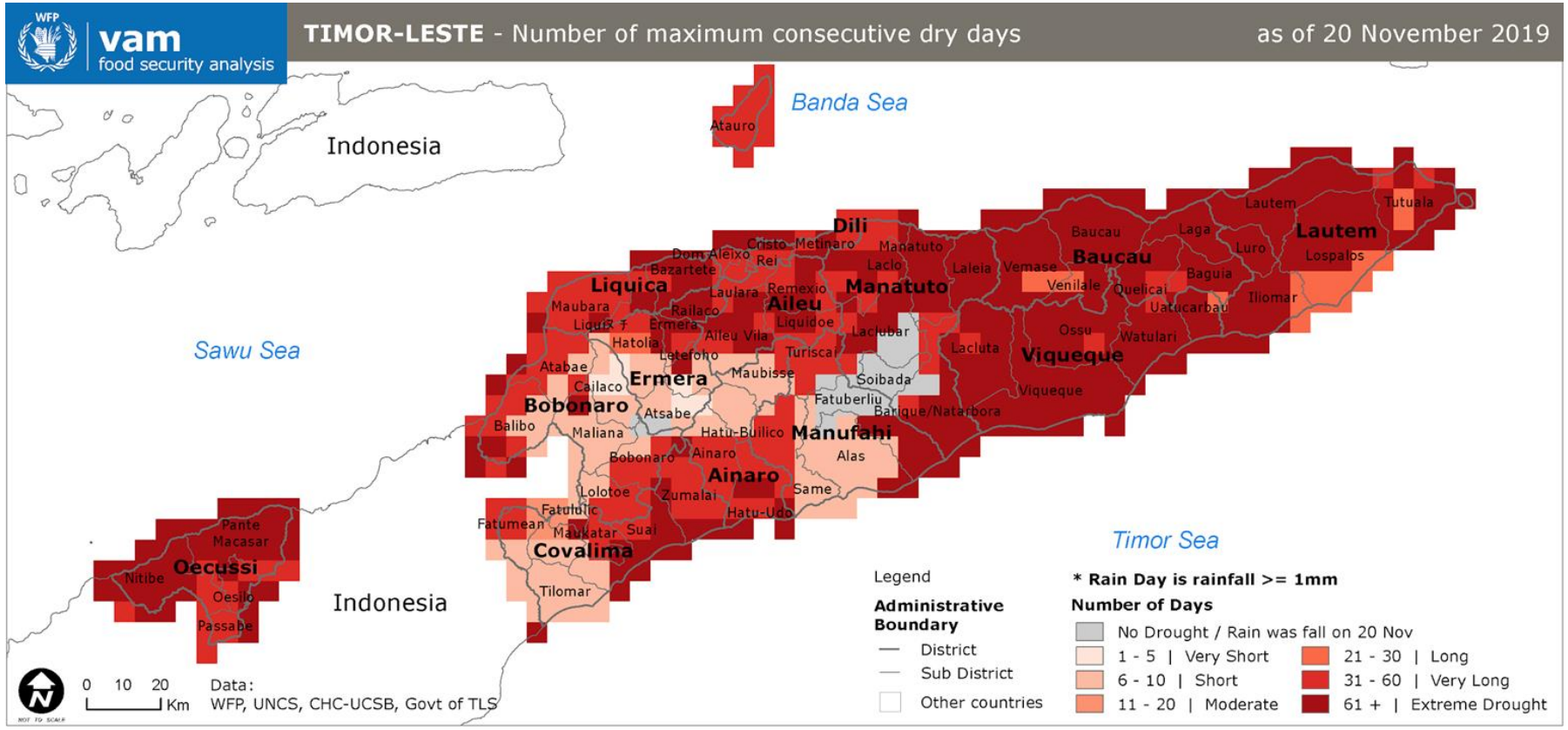


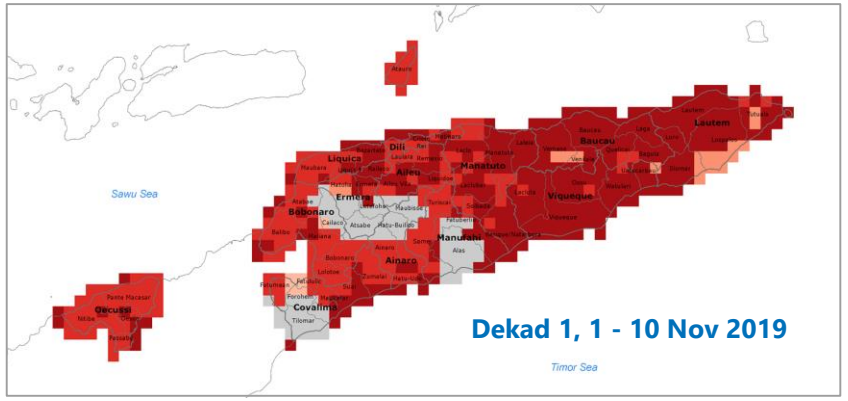
- Low rainfall condition in almost all areas in the country except Lautem in October 2019 (map bottom-right) is clearly reflected in the vegetation response one month later (November 2019 Vegetation indices anomaly - map above). Greenness vegetation is also well captured in Los Palos and Lautem, which experienced above normal rainfall last month.
- Average or normal level of vegetation are maintained in some areas

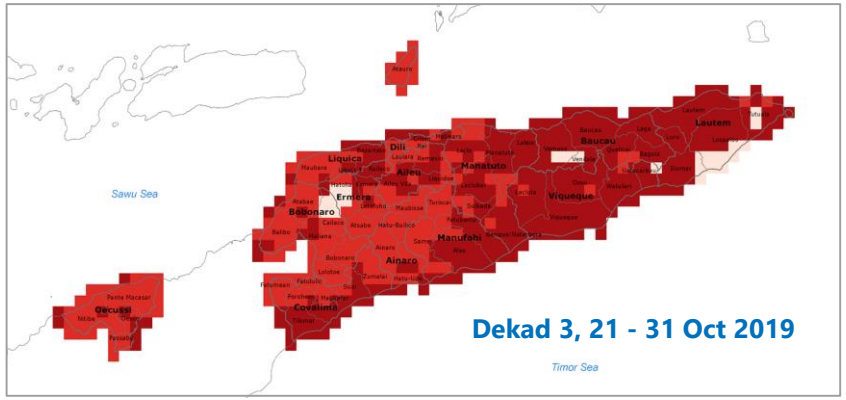


- **Dark blue: current rainfall season**
- **Light blue: long term average (LTA) rainfall**
- **Dark green: current vegetation index**
- **Light green: long term average (LTA) EVI**

Dry-spell, as of 20 Nov 2019







Very long and extreme drought are spotted almost in all areas in the country.

Cumulative dry spells data reveal that nearly **1 million** people in **13 district** experience more than **30 days without rainfall**; a condition categorized as **very long drought**.

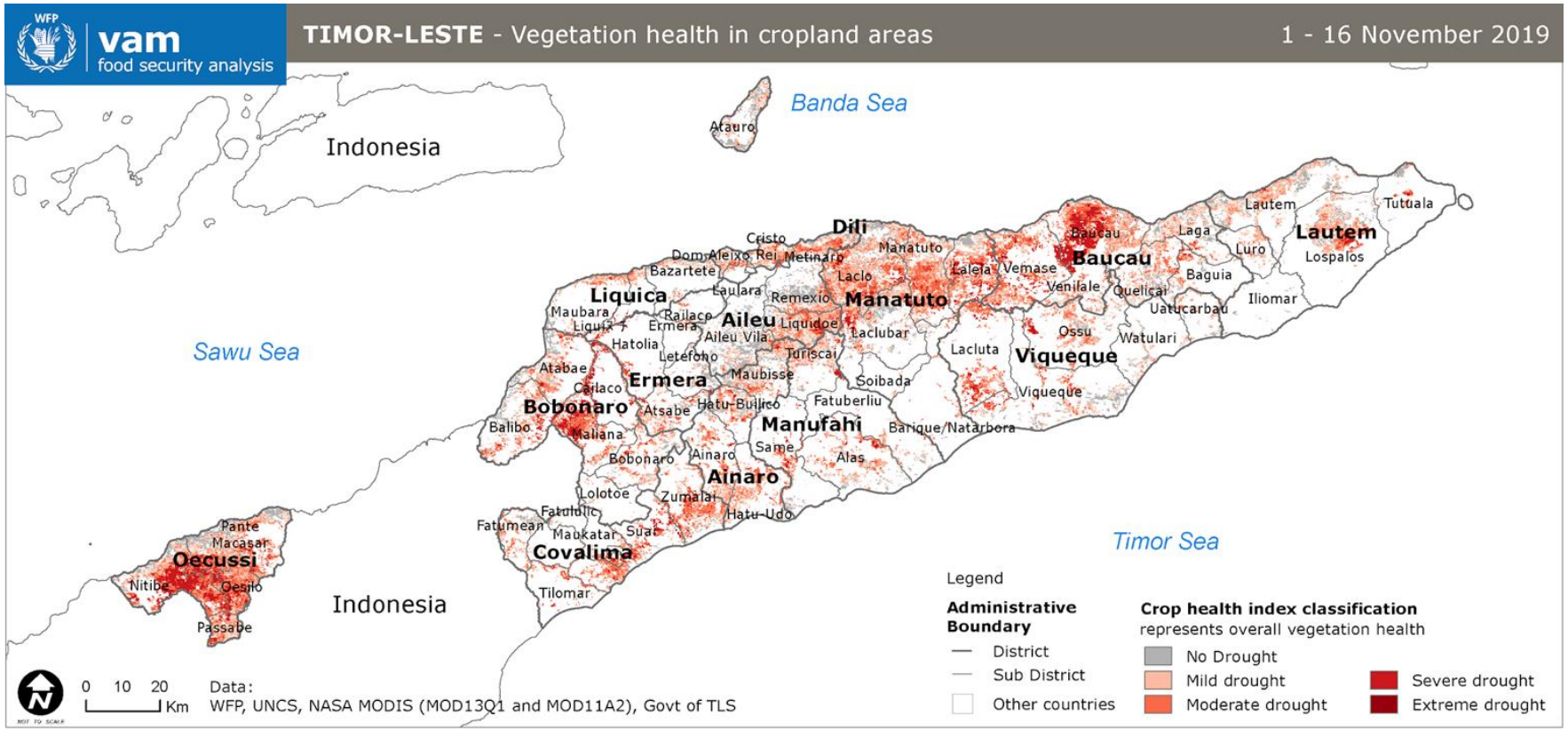
About **50%** of the people in the category above, are further identified to have experienced an **extreme drought** ie. around **500,000** people experienced more than **60 days without rainfall**.

However the situation in Bobonaro, Ermera, south-west of Covalima and Alas - Manufahi, southern part of Manufahi and central part of Manatuto significantly changes after a rainfall occured on first dekad of Nov 2019.

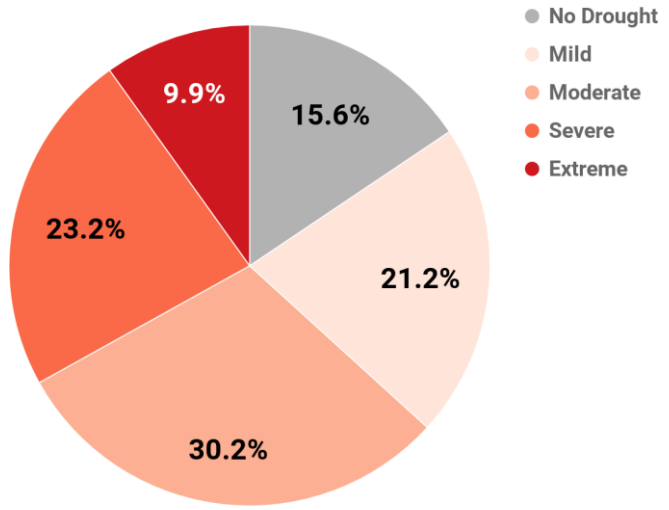
Despite few areas experiencing rainfall, the situation remains dry compared to the last dekad of Oct 2019.

Data: CHIRPS CHG-UCSB and JRC GHSL

Vegetation health in cropland areas, 1 - 16 Nov 2019



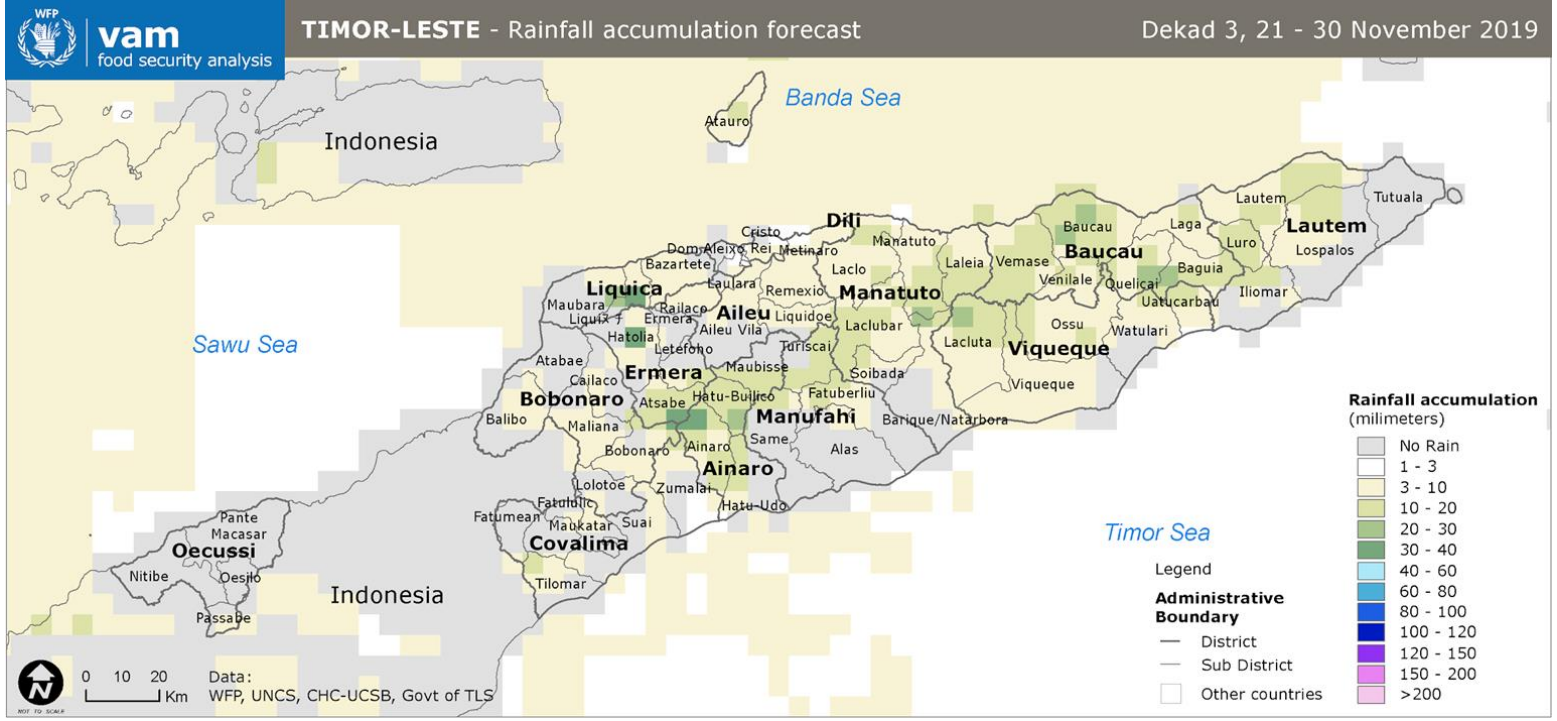
Potential Impact of drought in cropland areas

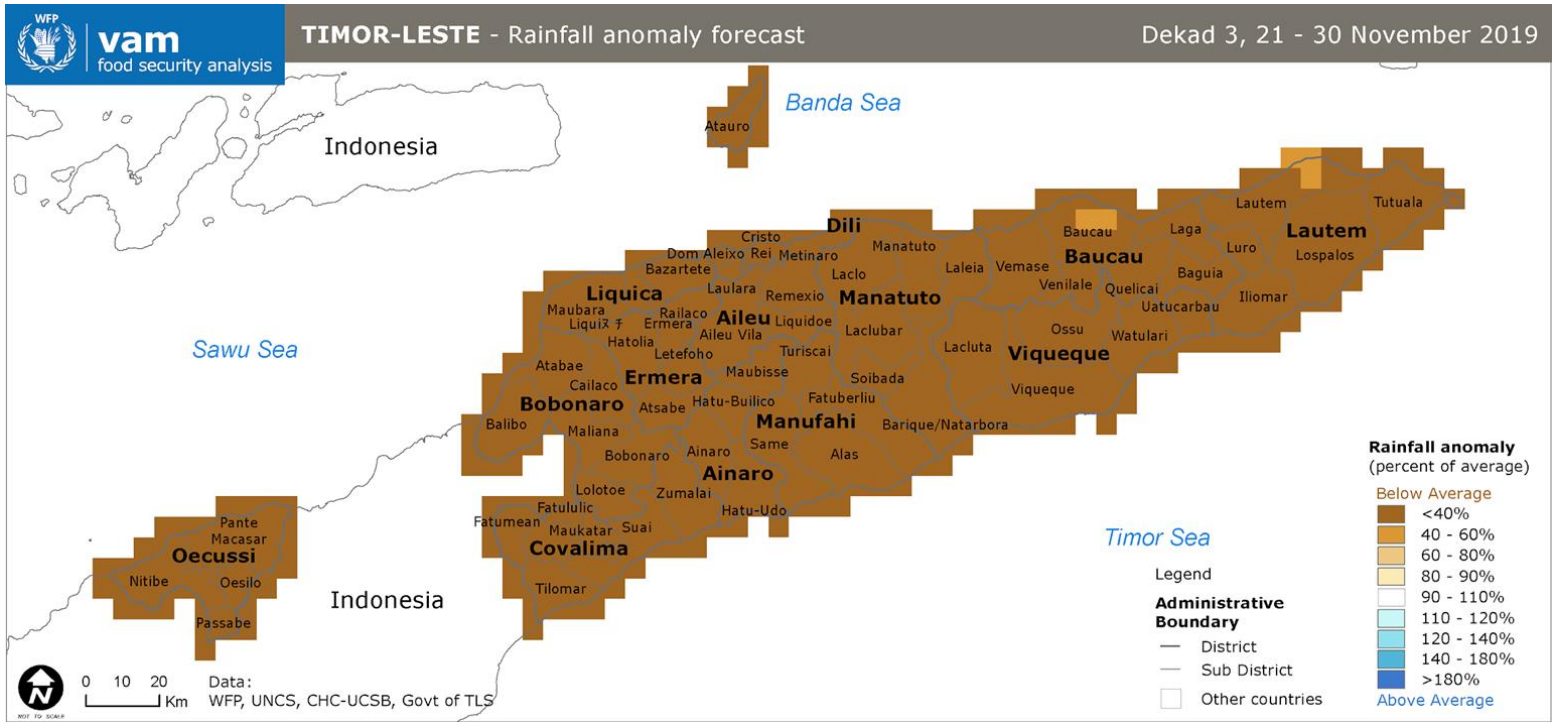


Estimates of hectares and percent of crop areas in drought nation-wide

The above chart displays the national estimates of crop areas in drought. Up to **200,000 hectares** of crop areas are estimated to suffer **extreme** or **severe drought** for the period 1 - 16 November 2019; representing **33%** of all crop areas in **Timor-Leste**.

- While poor vegetation health **does not** necessarily **mean harvest loss**, it shows the **potential impact** of a prolonged drought in **food crop areas**.
- The Vegetation Health Index (VHI) combines two components: deviations in land surface temperature and the extent to which vegetation density varies from normal patterns. The VHI depicts stress on vegetation and can be used to assess potential crops losses. **Data: USGS MODIS, MOD11A2 and MOD13Q1**





Short forecast rainfall Dekad 3, 21- 30 Nov 2019

Timor-Leste is expected to experience dry conditions in the last dekad of November 2019

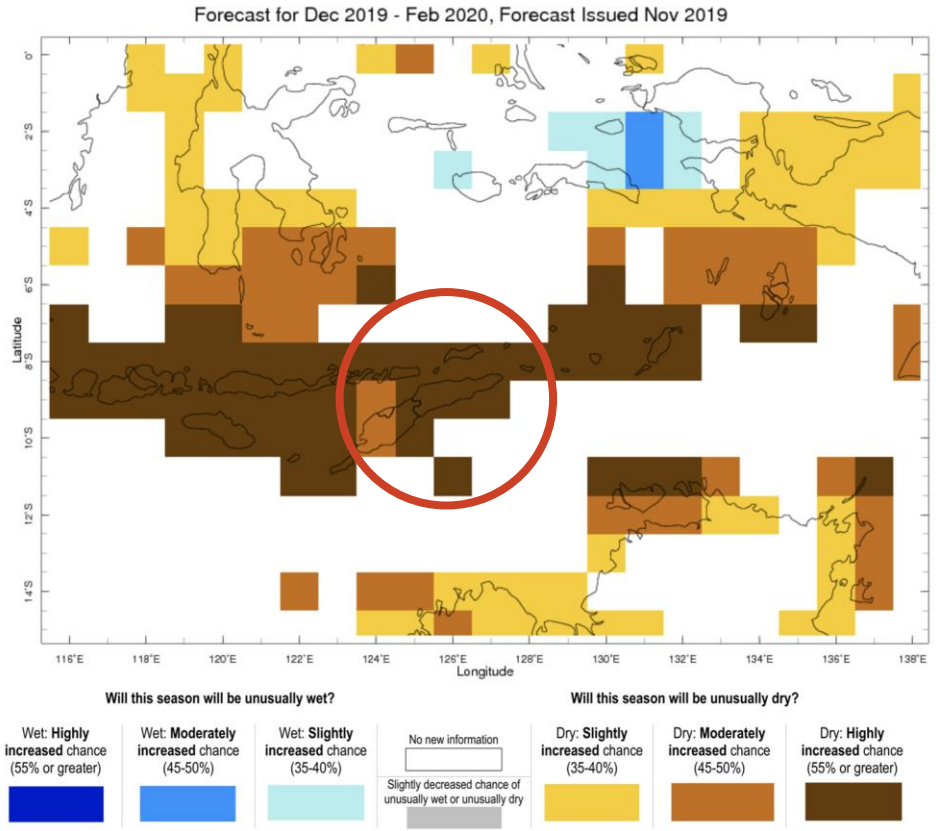
Forecast indicates that almost all area of the country are likely to continue experiencing drier-than-usual conditions.

Many areas e.g Tutuala and Iliomar in Lautem, Same and ALas in Manufahi, Atabae and Cailaco in Bobonaro and all areas in Oecusse ar expected to have no rainfall until end of November.

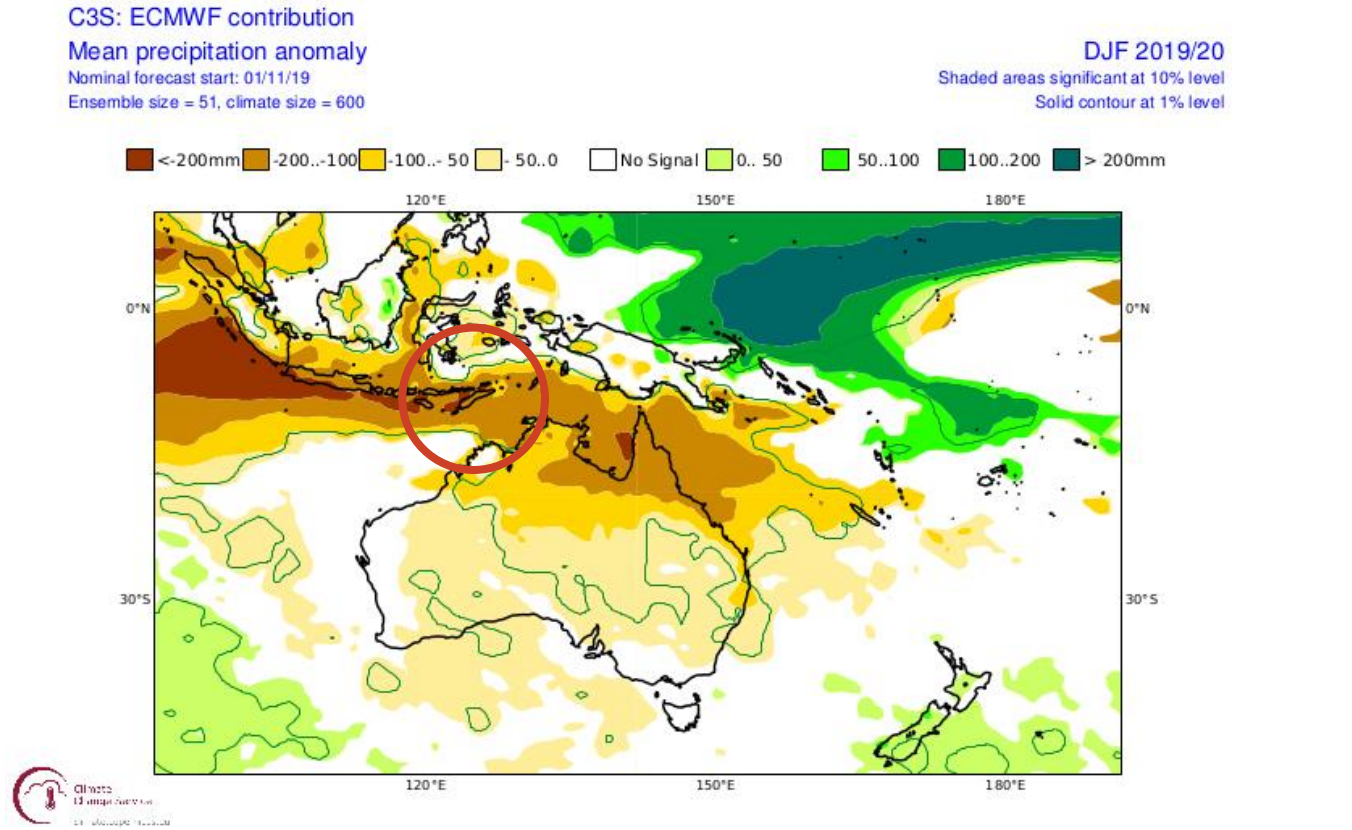
But it does not strictly mean that the entire area suffers dry conditions. Some areas in Liquica, Hatolia and Atsabe in Ermera, most area in Baucau experience rainfall from 20 - 40mm in 10 days.

Data: CHIRPS-GEFS, CHG UCSB

Rainfall outlook for Dec 2019 - Feb 2020



IRI Columbia University. Source: http://iridl.ldeo.columbia.edu/maproom/IFRC/FIC/prcp_fcst.html?bbox=bb%3A111.35%3A-20.96%3A141.58%3A8.60%3Abb



ECMWF. Source: https://climate.copernicus.eu/charts/c3s_seasonal/c3s_seasonal_spatial_ecmf_rain_3m?facets=Parameters,precipitation&time=2019110100,720,2019120100&type=ensm&area=area07

In general, IRI and ECMWF are suggesting similar forecasts of rainfall during the period of December 2019 - February 2020. All areas in the country projected to experience below normal rainfall.

This forecast shows only the likelihood of 3-month accumulated rainfall being unusually high or low, and does not indicate chances of individual heavy rainfall events. The forecasts apply over large areas only, and should not be used to forecast local conditions, or as a flood forecast.

Key message and recommendation

- Lower rainfall, which occurs until mid of 4th quarter this year might not provide favorable conditions for crop growing.
- Nearly 1 million people in 13 districts experience more than 30 days without rainfall; a condition categorized as very long drought.
- About 50% of these affected people are further identified to have experienced an extreme drought ie around 500,000 people experience more than 60 days without rainfall.
- In the agriculture sector, 200,000 hectares of crop areas are estimated to have been under extreme or severe drought for the current period; thus representing 33% of all crop areas in Timor-Leste.
- Long periods without rainfall may lead to higher risk of heat stroke, wildfire, low level of drinking water, conflicts over water, etc.
- Data on planting and harvesting would complement better analysis on the impact of rainfall to agriculture in Timor-Leste and for decision making purposes

The analysis is merely based on remote sensing data. Ground check is necessary to ensure if satellite and field situation data are corresponding.

Methodology and Data

Method

The maps in this bulletin are largely based on satellite data which is the processed and used to create various indicators related to climate and vegetation.

Meteorological drought happens when the actual rainfall in an area is significantly less than the climatological mean for that area. Meteorological drought can be monitored using indicators such as:

- Rainfall anomaly - a measure of lack of rainfall in a period compared to the average;
- Standardized Precipitation Index (SPI) - a normalized index representing the probability of occurrence of an observed rainfall amount when compared with the rainfall climatology over a long-term period. Negative SPI values represent rainfall deficit, whereas positive SPI values indicate rainfall surplus. Drought, according to the SPI, starts when the SPI value is equal or below -1.0, and ends when the value becomes positive. Reference: SPI http://www.wamis.org/agm/pubs/SPI/WMO_1090_EN.pdf and SPI classification came from https://droughtmonitor.unl.edu/About/AbouttheData/DroughtClassification.aspx
- The number of consecutive dry and wet days is also calculated as the count of the most recent days since a day had more/less than 1mm of rain. CHIRPS data is then processed to determine the number of days since the last rainfall (were a day with rainfall is noted as one where more than 1 mm of precipitation as observed). Using a standard classification, drought or wet level is then determined.

Agriculture drought is a situation where rainfall and soil moisture are inadequate during the crop growing season to support healthy crop growth to maturity, causing crop stress and wilting. Agriculture drought can be monitored using these indicators:

- Normalized Difference Vegetation Indices (NDVI) and or Enhanced Vegetation Index (EVI) anomaly: a measure of lack of greenness vegetation in a period compared to the average;
- Vegetation health index (VHI): is based on a combination of Vegetation Condition Index (VCI) and Temperature Condition Index (TCI). In Timor-Leste, the VCI is constructed using the Enhanced Vegetation Index (EVI). EVI is used instead of NDVI as it is more sensitive to changes in areas having high biomass, it reduces the influence of atmospheric conditions on vegetation index values, and it corrects for canopy background signals. The VHI is effective enough to be used as proxy data for monitoring vegetation health, drought, moisture, thermal condition, etc.
- The vegetation health also based on MODIS vegetation indices MOD13Q1 and land surface temperature MOD11A2 using the approach from https://journals.ametsoc.org/doi/pdf/10.1175/1520-0477%281997%29078%3C0621%3AGDWFS%3E2.0.CO%3B2

Data

Rainfall

- Daily precipitation from 1981 - now, 0.05deg ~ 5.6km spatial resolution. Source: CHIRPS CHC UC Santa Barbara - https://www.chc.ucsb.edu/data/chirps
- Forecast for Daily 5-day, 10-day, 15-day. 0.05deg ~ 5.6km spatial resolution. Source: CHIRPS-GEFS https://www.chc.ucsb.edu/data/chirps-gefs
- Seasonal (3 month) Forecast. Source: IRI Columbia University http://iridl.ldeo.columbia.edu/maproom/IFRC/FIC/prcp_fcst.html?bbox=bb%3A113.617%3A-15.014%3A133.930%3A-2.991%3Abb and ECMWF Copernicus https://climate.copernicus.eu/charts/c3s_seasonal/c3s_seasonal_spatial_ecmf_rain_3m?facets=Parameters,precipitation&time=2019120100,744,2020010100&type=ensm&area=area07
- Rainfall and vegetation charts for every 10 and 16 days. Source: https://dataviz.vam.wfp.org/seasonal_explorer/rainfall_vegetation/visualizations

Vegetation

- Enhanced Vegetation Index (EVI), MOD13Q1. 16 days temporal resolution from 2000 - now, 250m spatial resolution. Source: MODIS Terra, USGS https://lpdaac.usgs.gov/products/mod13q1v006/

Temperature

- Land Surface Temperature, MOD11A2. 8 days temporal resolution from 2000 - now, 1km spatial resolution. Source: MODIS Terra, USGS https://lpdaac.usgs.gov/products/mod11a2v006/

Cropland extent

- MODIS cropland 2010, 250m spatial resolution. Source: http://www.iwmi.cgiar.org/2016/02/irrigated-africa-and-asia/

Population density and footprint

- Global Human Settlement Layer, 250m spatial resolution. Source: Joint Research Centre - EU https://ghsl.jrc.ec.europa.eu/download.php

WFP Climate and Food Security Analysis

The United Nations World Food Programme (WFP) - saving lives in emergencies and changing lives for millions through sustainable development. WFP works in more than 80 countries around the world, feeding people caught in conflict and disasters, and laying the foundations for a better future. WFP is a committed partner of Timor-Leste in combating all forms of malnutrition and achieving Sustainable Development Goals 2 for Zero Hunger by 2030. WFP has been present in Timor-Leste since 1999.

In the advent of more frequent and intense climate change induced disasters, people's ability to produce, access and consume food could be greatly hampered. Moreover, the rural populations and vulnerable groups; including female-headed households and those with limited access to land, productive assets or education stand the highest risk. Therefore, a profound understanding of the associated impacts of climate change to food security can inform relevant action and enhance the ability of governments and communities to prepare for or adapt to the adverse effects of climate change. It is upon this background that WFP produces this agricultural climate risk analysis for Timor-Leste.

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food security analysis

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