Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



Table of Contents

Executive summary	1
Risk of drought impact for agriculture (RDrI-Agri)	2
Precipitation	3
Standardized Precipitation Index (SPI)	4
SPI outlook	6
fAPAR anomaly	6
Soil moisture anomaly	8
Reported impacts	9

Executive summary

- Southern Africa did not recover from the widespread drought persisting since 2018 and throughout 2019. Instead, with a suboptimal start of the ongoing rainy season, the situation further worsened over wide areas of South Africa, Namibia, Angola, Zimbabwe, Zambia and Lesotho.
- Risk for food security is maximum across most of the area, where rural communities rely on rainfed crops and pastures, and is going to persists throughout the incoming wet season. The population exposed amounts to millions. Emergencies may be expected during the next months, since water resources are already strained by multiannual precipitation deficits.
- On top of food security, water availability may be at stake for both cities and reservoirs, depending on the progress of precipitation in the key months up until February. Major damages to the economy of Zambia and Zimbabwe are reported. The low water level at Kariba dam is threatening power supply to both countries.
- The outlook until February is normal or positive for the subcontinental south-west, but negative for Zambia, Zimbabwe and Limpopo (South Africa). Southern Africa has a strong precipitation seasonality, with the majority of annual rainfall falling between November and March. A seasonal failure entails at least a year-long water deficit.

This document builds on the previous reports published in January, March and August 2019¹, please refer to them for more insight on the drought and earlier reported impacts.

¹ https://edo.jrc.ec.europa.eu/gdo/php/index.php?id=2050

Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



Risk of drought impact for agriculture (RDrI-Agri)

The indicator RDrI-Agri shows the risk of having impacts from a drought, by taking into account the exposure and socio-economic vulnerability of the area, with particular focus to the agricultural impacts. Figure 1 illustrates the wide extent of subcontinent exposed to drought risks, notably south-west Zambia, southern Angola, most of Namibia, Lesotho and about half of South Africa, the latter two showing the highest risk level.

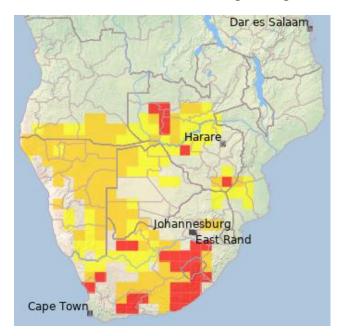




Figure 1: Risk of drought impact for agriculture (RDrl-Agri), over southern Africa from 1st of December until 10th of December 2019.

The population exposed sum up to about 30 million people, considering only moderate and high risk classes (Figure 2). Most rural communities in these areas consist of low-income households, dependent on rainfed crops and pasturelands. Therefore, food security is of primary concern and humanitarian aid reach and promptness is of utmost importance.

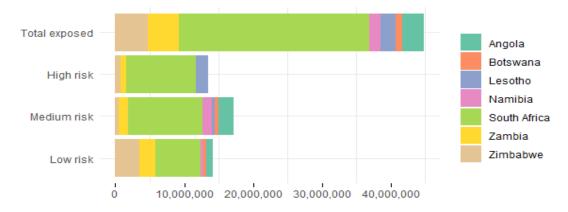


Figure 2: Population exposed to risk of drought impact (RDrI-Agri), by country and risk class.

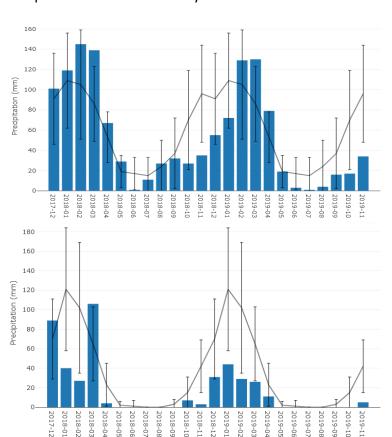
Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



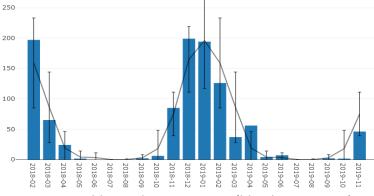
Precipitation

Precipitation includes monthly total of both rainfall and snow.



Indwe (Eastern Cape, South Africa, coordinates: -31.55 N, 27.6 E), showing a constant monthly deficit since June 2019.

Tsumeb (Oshikoto, Namibia -18.5N, 17.3E) displays two poor rainy seasons in a row and a below-average start for the 2019/2020 season.



Namwala (Southern Zambia -16.4, 26.1E), rainfall monthly records fall within the usual monthly fluctuations.

Figure 3: Monthly total precipitation (blue bars, in mm) in selected locations, with the long-term monthly averages (solid line, period of reference is 1981 to 2010) and one standard deviation (vertical lines).

Drought in southern Africa – December 2019

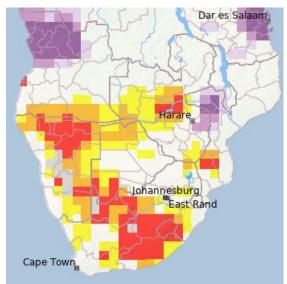
JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



Normal rainfall patterns are similar across most of southern Africa, with a stark succession of wet and dry seasons. The records for the last two years, however, show below average precipitation for most months over the south-west of the region of interest (Figure 3, top and centre). On the contrary, rainfall in the north-east (Zambia, Zimbabwe, Limpopo) does not appear much below the long-term average, at least not consistently (e.g. Figure 3, bottom).

Standardized Precipitation Index (SPI)

The SPI indicator is used to monitor the occurrence of meteorological drought. The lower (i.e. more negative) the SPI, the more intense is the drought. Most of the south-west of the subcontinent shows a strong precipitation deficit for both short and annual terms (Figure 4).



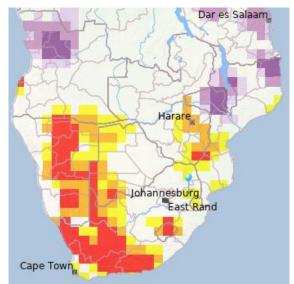
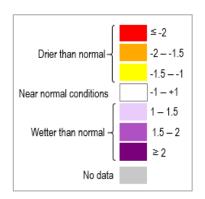


Figure 4: SPI over southern Africa for a cumulative period of 3 months (left, September to November 2019) and 12 months (right, December 2018 to November 2019).

The SPI-3 (Figure 4, left) may not be critical *per se*, since the corresponding trimester is only the beginning of the wet period for most locations, but still implies a possible delay in crop sowing. When coupled with the yearly view however (SPI-12, Figure 4 right), the overall picture is that of a widespread and persistent deficit with little chance of recovery during a single and currently underperforming rainy season. This is especially true for Eastern Cape (South Africa), Lesotho and north-east Namibia. Western South Africa displays a remarkable precipitation gap, which only apparently eased during the last three months.

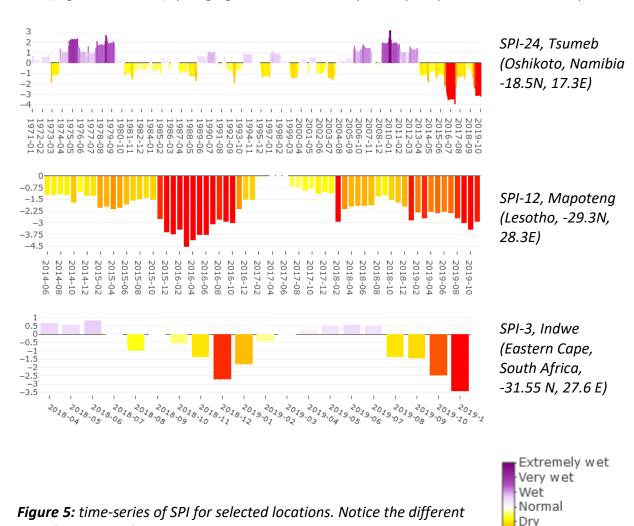


Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



The time-series of SPI for selected locations show the evolution of deficits in time. For southern Angola and northern Namibia, considering a time-span of two years, the meteorological drought so far is the second worst of the last 50 years, following closely the drought of 2015-2016 (Figure 5, top). On a wider time scale, the two events may be considered as a single one, reaching an unprecedented low record, with cumulative precipitation during the last five years down to 60% of the expected. Lesotho, despite slightly different rainfall patterns, displays a very similar sequence of negative SPI anomalies, resulting in the same relative deficit up to date (Figure 5, centre). Northern and Western Cape (South Africa) record an analogous relative deficit over the last three years (not shown). Less enduring, but remarkable, is the lack of precipitation during the last fifteen months over Eastern Cape (South Africa), when at least half of both rainy seasons failed (Figure 5, bottom), plunging down to 65% of expected precipitation over the last year.



Global Drought Observatory: http://edo.jrc.ec.europa.eu/gdo

cumulative periods.

Very dry Extremely dry

Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



SPI outlook

The SPI forecasts are normal or positive for the majority of southern Africa, including those areas currently most affected (Figure 6). The notable exceptions are southern Zambia, Zimbabwe and Limpopo (South Africa), where forecasts are negative for both December (Figure 6, left) and the trimester up to February 2020 (Figure 6, right). There, despite fairly normal or mildly drier precipitation in the last couple of years, the occurrence of drought at the core of an intense but short rainy season may seriously hamper water availability for all uses.

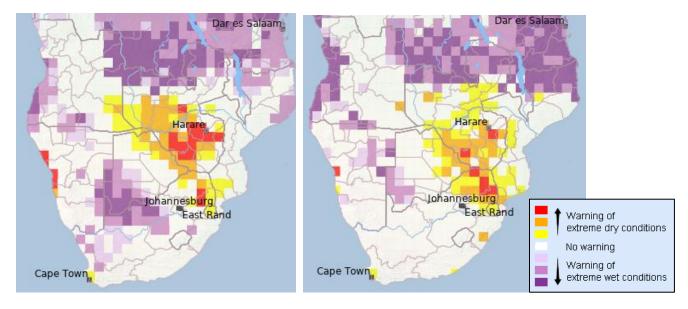


Figure 6: SPI forecast for a cumulative period of one month (left) and three months (right).

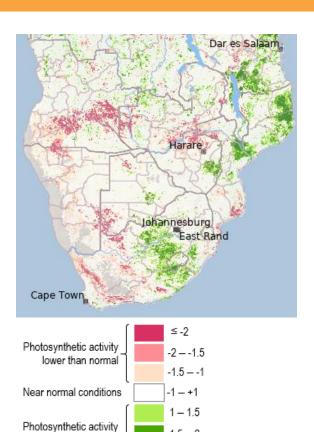
fAPAR anomaly

The fraction of Absorbed Photosynthetically Active Radiation (fAPAR) represents the fraction of the solar energy absorbed by leaves. fAPAR anomalies, specifically the negative deviations from the long term average over the same period, are an indicator of drought impacts on vegetation. Compared to August, when negative anomalies decreased, as expected in the middle of the dry period with generally reduced photosynthetic activity, vegetation appears under relevant stress again at the beginning of December, notably in Eastern Cape (South Africa), Namibia, Zambia and northwards (Figure 7).

Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019





1.5 - 2

≥2

higher than normal

No data

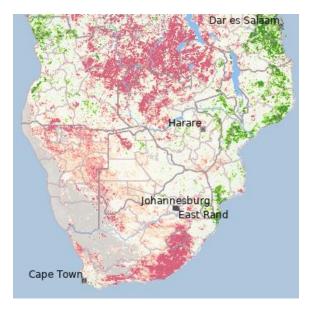


Figure 7: fAPAR anomaly in southern Africa for the period between 1st August and 10th August 2019 (left) and between 1st December and 10th December 2019 (right).

Particularly Namibia and the surroundings of Zambia-Zimbabwe boundary are showing almost uninterrupted negative anomalies since about December 2018 (Figure 8, top and centre). Further south (e.g. Eastern Cape, Figure 8, bottom) a broad relief preceded a quick and intense expansion of vegetation stress while entering the current crop season.

Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



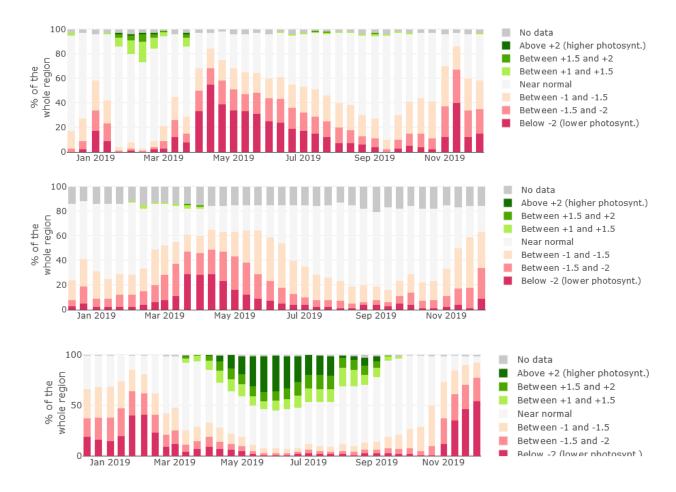


Figure 8: fAPAR anomaly, from top to bottom, evolution over time in southern Zambia, Oshikoto (Namibia) and Eastern Cape (South Africa).

Soil moisture anomaly

This indicator provides an assessment of the top soil water content, which is a direct measure of drought conditions, specifically the difficulty for plants to extract water from the soil.

During the past few months, soil moisture broadly improved compared to the absolute extremes of the first half of 2019 (Figure 9). Whether this improvement in the anomaly is real, or just flattened to the normally dry conditions found at the beginning of the wet season, will become clearer in January, following December precipitation. However, negative anomalies persist in north-east Namibia and south-east Angola, and intensify in South Africa, especially across Eastern Cape province.

Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



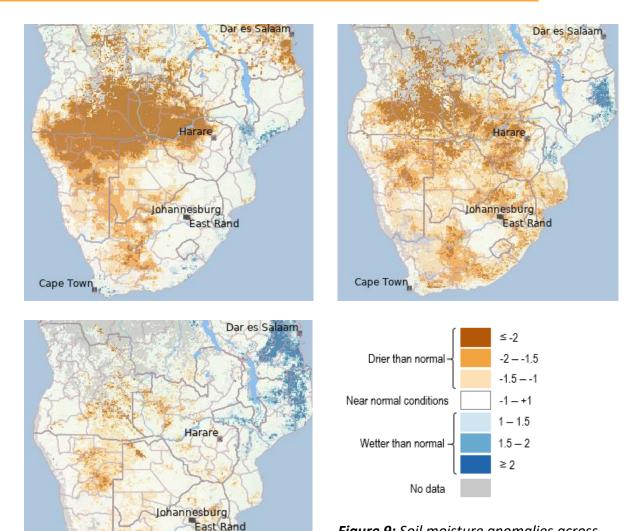


Figure 9: Soil moisture anomalies across southern Africa for March (upper left) July (upper right) and November 2019 (left).

Reported impacts

Cape Town

The following information complements those already provided by previous reports³. The incoming months of January and February are key for staple crops in southern Africa and

All links accessed on 20/12/2019

³ https://edo.jrc.ec.europa.eu/gdo/php/index.php?id=2050

Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



agricultural production is under threat by the ongoing drought⁴. A wider picture about the humanitarian situation and aid needs is provided by IFRC^{5 6}.

The late or below average onset of rainfall is expected to reduce the area planted. Below-average rangeland conditions and poor livestock conditions are reported in Zimbabwe⁷. Both Zambia and Lesotho declared a state of emergency due to drought and food insecurity⁸. Operations to provide aid are active; OCHA released updates on the imminent humanitarian issues for Zambia⁹ and Zimbabwe¹⁰, pointing out, among others, water quality concerns due to drought. About one third of Namibians are reported food insecure and food aid is supplied¹¹. Southern Angolans are receiving assistance as well¹². Botswana is equally affected, with major losses reported in agriculture¹³.

Kariba reservoir, the biggest in the world and upon which relies about half of Zimbabwe's and Zambia's power supply, is significantly lower than usual in this period. At about 10% of its usable capacity, power supply is at high risk¹⁴ ¹⁵. Power output in Zimbabwe has been intermittent for a few months already, due to both the drought and the adverse economic conditions¹⁶. According to reports, the Finance Minister of Zimbabwe, as of October, declared that the drought and consequent power cuts cost a significant percentage of yearly growth (6.5%), while Zambia revised 2019 GDP projections from 4 to 2% for the same reason¹⁷ ¹⁸. Namibia is facing a similar

 $https://reliefweb.int/sites/reliefweb.int/files/resources/ROSEA_20191217_Zambia_Humanitarian_Dashboard_December 2019.pdf$

https://reliefweb.int/sites/reliefweb.int/files/resources/ROSEA_20191209_Zimbabwe_Humanitarian_Dashboard_ October-November 2019.pdf

⁴ https://mars.jrc.ec.europa.eu/asap/;

⁵ https://reliefweb.int/sites/reliefweb.int/files/resources/MDRZA009ea.pdf

⁶ https://www.ifrc.org/docs/Appeals/19/IB19.11.2019 Southern Africa Food Insecurity.pdf

⁷ https://allafrica.com/stories/201911130133.html

⁸ https://reliefweb.int/report/united-republic-tanzania/unicef-regional-multi-country-humanitarian-situation-report-july

¹¹ http://www.xinhuanet.com/english/2019-12/17/c_138638531_2.htm

¹² http://jornaldeangola.sapo.ao/sociedade/vitimas-da-seca-recebem-toneladas-de-alimentos

¹³ https://www.voanews.com/africa/botswana-drought-makes-wasteland-harvests-livestock

¹⁴ http://www.zambezira.org/hydrology/kariba-reservoir-data

¹⁵ https://www.bloomberg.com/news/articles/2019-12-12/world-s-biggest-reservoir-may-stop-producing-power-amid-drought

¹⁶ https://www.businesslive.co.za/bd/world/africa/2019-12-10-eskoms-woes-force-zimbabwe-to-escalate-power-cuts/

¹⁷ https://fr.reuters.com/article/idUSKBN1XA200

¹⁸ https://energymx.co.za/2019/12/10/kariba-dam-water-levels-fall-to-10-raising-risk-to-zambia-zimbabwe-hydroelectric-supply/

Drought in southern Africa – December 2019

JRC Global Drought Observatory (GDO) and ERCC Analytical Team 20/12/2019



situation: dam levels are unusually low, hydropower supply is crippled (below 40% of capacity) and losses of about 1.5% of GDP are forecasted, largely due to drought^{19 20}.

Agricultural and hydrological droughts persist over south-western regions of South Africa²¹.

Tourism sector may be impacted too; for instance, wildlife is suffering losses and the Victoria Falls, one of the major tourist attractions along the Zambezi river, is recording a lower than normal seasonal water flow²².

Distribution: for ERCC and related partners use.

Authors: Masante D.ⁱ, Vogt J.ⁱⁱ, de Jager A.ⁱⁱ, Magni D.ⁱⁱ

Disclaimer and Legal Notice: this report by the Joint Research Centre (JRC) is a product under constant development and may change at any time without notice. It was generated using Copernicus Emergency Management Service information (2019). The views expressed may not be regarded as an official position of the European Commission (EC) in any circumstances. National borders are purely a graphical representation, only intended to be indicative, and do not reflect the official position of the EC. Neither the EC nor any person acting on behalf of the Commission are responsible for the use that might be made of this report.







ⁱ External consultant for the European Commission (Arcadia SIT, Vigevano, Italy)

[&]quot; European Commission, Joint Research Centre, Ispra (VA), Italy

¹⁹ https://ewn.co.za/2019/12/19/namibia-s-power-supply-squeezed-as-drought-hits-hydropower-plant

²⁰ https://www.reuters.com/article/us-namibia-drought/namibia-rushes-to-drill-boreholes-as-worst-drought-in-acentury-bites-idUSKBN1YG2CV

²¹ https://www.westerncape.gov.za/general-publication/latest-western-cape-dam-levels

²² https://weather.com/science/environment/news/2019-11-04-africa-drought-puts-victoria-falls-at-risk