

SPECIAL FOCUS – December 2019

Shrinking water reservoir levels in Southern Africa

Parts of the region are facing decreasing water reservoir levels due to a late onset of rainfall in October 2019 and below-average rainfall since the beginning of the 2018/19 rainy season, coupled with above-average temperatures for most of the preceding dry season (May-September 2019). Kariba Dam, a critical water resource for both **Zimbabwe and Zambia**, is only at 10% of its full capacity (as of 08/12/2019), a significant drop compared to 55% of its full capacity for the same period in 2018 ([Zambezi River Authority](#)). Both Zimbabwe and Zambia are reliant on hydropower from plants at the Kariba Dam and have experienced power cuts and irrigation problems during the winter season.

In **South Africa**, Vaal Dam (located at the border between Free State, Gauteng and Mpumalanga regions) is operating at 39.2% of its full capacity (as of 09/12/2019), with decreased storage levels as compared to the same period last year, when it was at 77.2% ([Department of Water and Sanitation of South Africa](#)). Since the 4th of December, Gauteng and other inland provinces (Free State, North West) are experiencing heavy rainfall, as a result of a surface high pressure system that pushes southwest-Indian Ocean moisture into eastern, northern and central parts of the country ([South African Weather Service-Media Release](#)).

In **Lesotho**, Katse Dam, a critical water resource as of 09/12/2019 is only at 19.3% of its full capacity ([Department of Water and Sanitation of South Africa](#)), an important drop compared to last year levels (for the same period in 2018 it was at 43.7% of its full capacity). Between October and mid-November, the cumulative rainfall amounts have been around 50-55% below-average and the early season rainfall deficits, coupled with high temperatures, have severely affected water level. According to [Lesotho Times](#), «water levels had only slightly increased in the Katse Dam because of the current water transfer from Mophale to the Katse Reservoir and the little rains received recently (from 10% to 16%)».

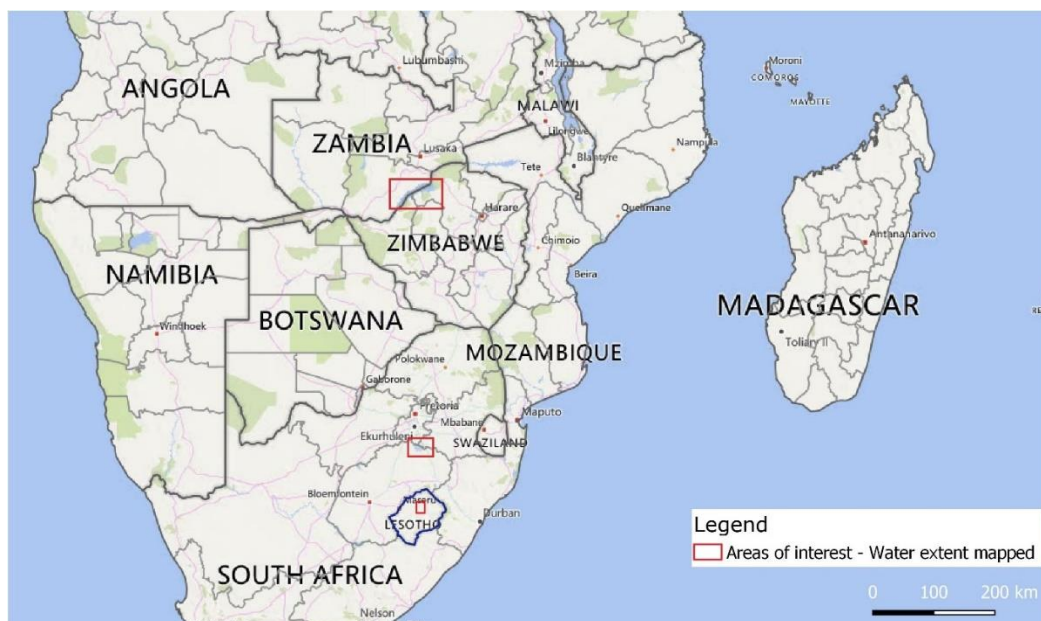


Figure 1. Overview map of Southern Africa, where red rectangles indicate areas with zoomed thematic maps included in this special focus report (Background layer: Bing Road, loaded in ASAP warning explorer).

In Figures 2 and 3, we can see that in November 2018, Kariba Lake was already below full capacity while Vaal Dam still had a storage capacity classified as “moderately high”. Figures 4, 6 and 8 show the extent of surface water for the above-mentioned reservoirs, derived from high-resolution satellite images for the month of November 2019 and 2018. Additionally, Figures 5, 7 and 9 present the extent of permanent water for comparison purposes ([JRC Yearly Water Classification History](#)). In all three cases, the November 2019 water extent is clearly below that of November 2018 as well as below the median values for permanent water between 2001-2018 according to the JRC Surface Water Explorer. Albeit clearly visible with satellite imagery, the decrease of the water surface is not as striking as the reported level decreases, due to the fact that we are mapping the change in water surface extent, while we do not monitor directly the water content (storage), since the relationship between the two depends on the shape and depth of the basin. Monitoring of storage consists in associating water surface elevation and area after evaluating them independently ([Frappart et al.2006](#)). With the applied method and by using high-resolution satellite data we map quickly and accurately only the water surface extent. Monitoring will remain relevant in the coming weeks to see to what level the ongoing seasonal rainfall will contribute to reservoir replenishment.

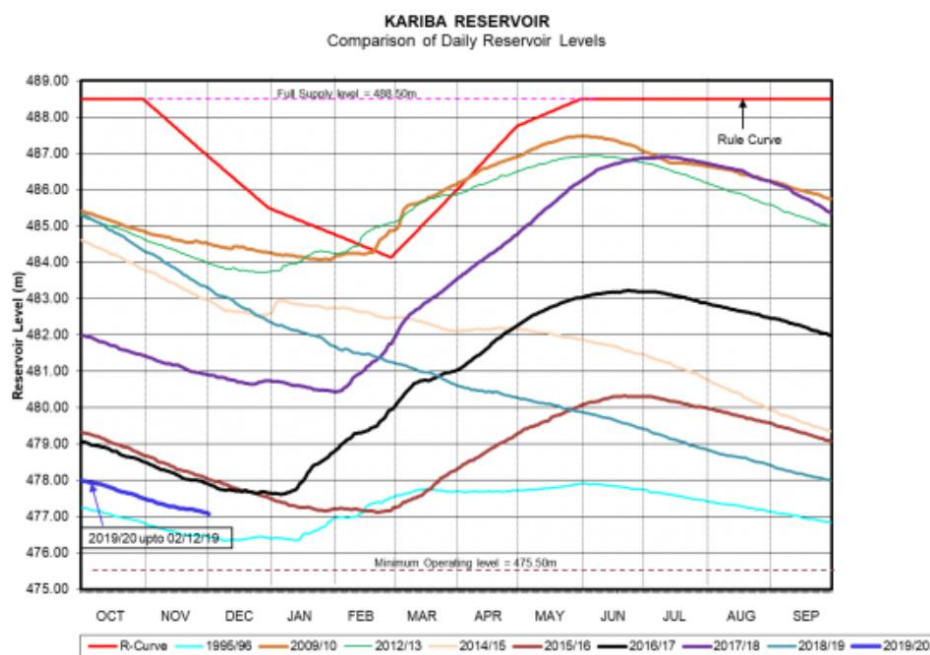


Figure 2. Time series data for Kariba Lake’s reservoir levels (source: [Zambezi River Authority](#)).

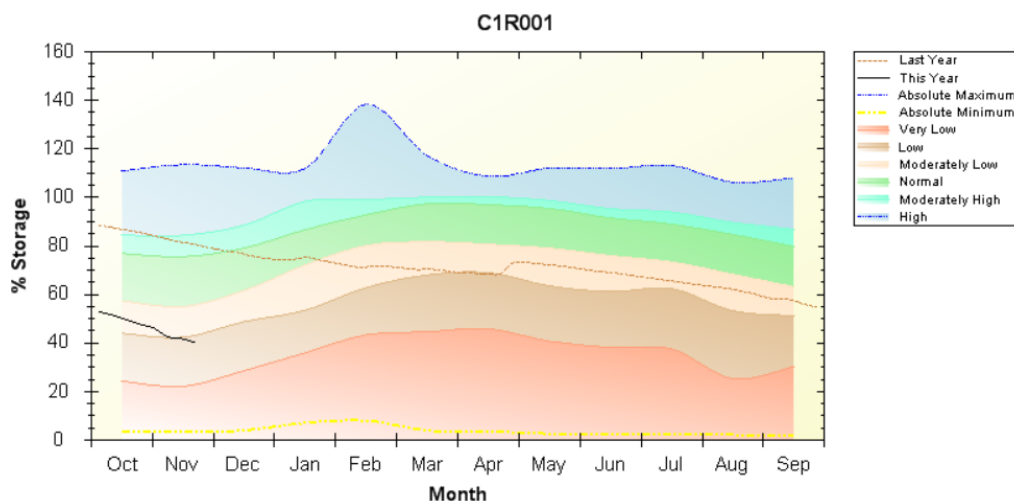


Figure 3. Data for Vaal Dam storage progress (source: [Department of Water and Sanitation of South Africa](#)).

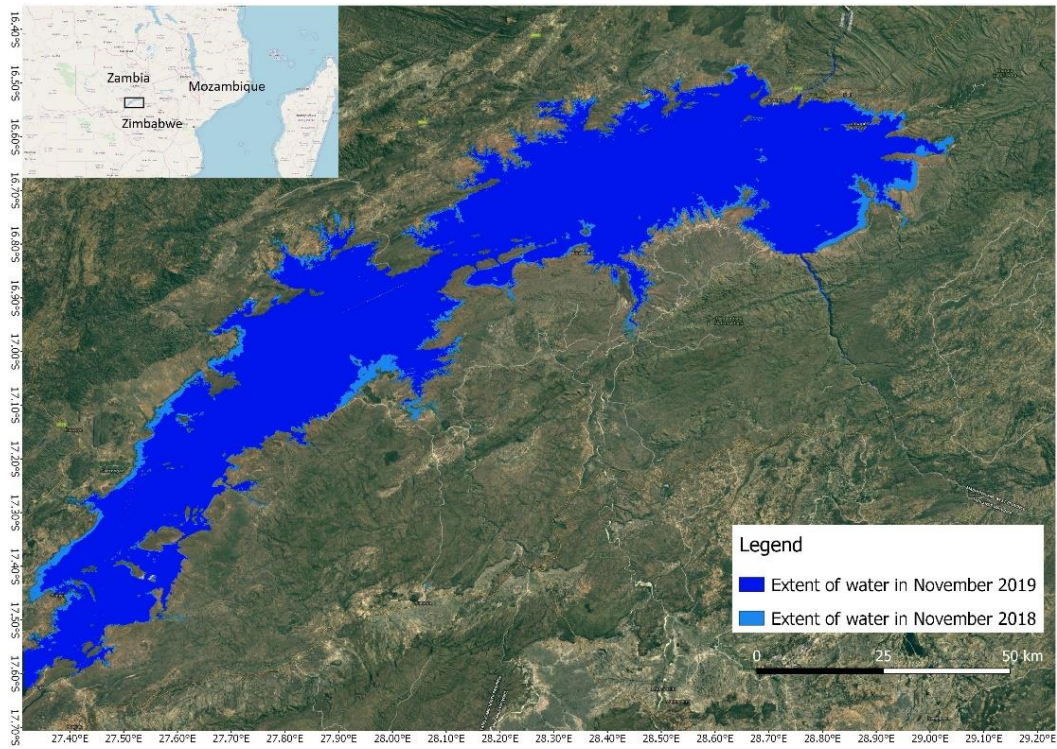


Figure 4. Extent of water in Lake Kariba in November 2019 and November 2018 as estimated from Sentinel 2 images (Background layer: Google Satellite).

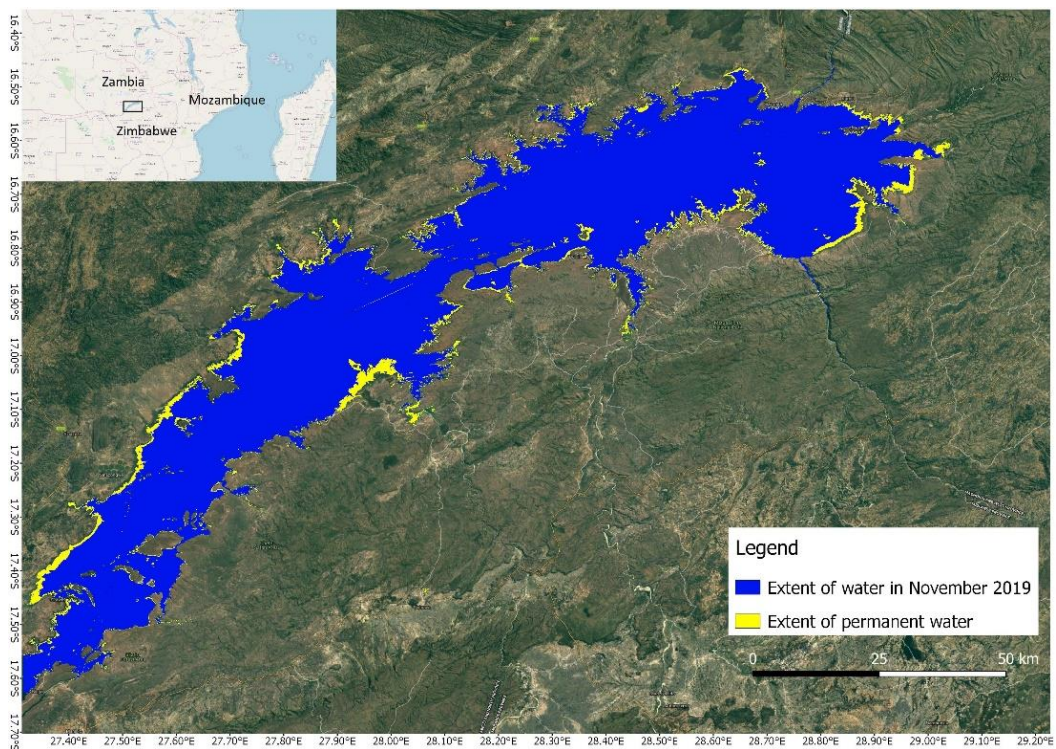


Figure 5. Extent of water in Lake Kariba in November 2019, estimated from Sentinel 2 images and compared with the JRC Yearly Water Classification History layer (median values for permanent water layer between 2001-2018 - Source: EC JRC/Google, Background layer: Google Satellite).

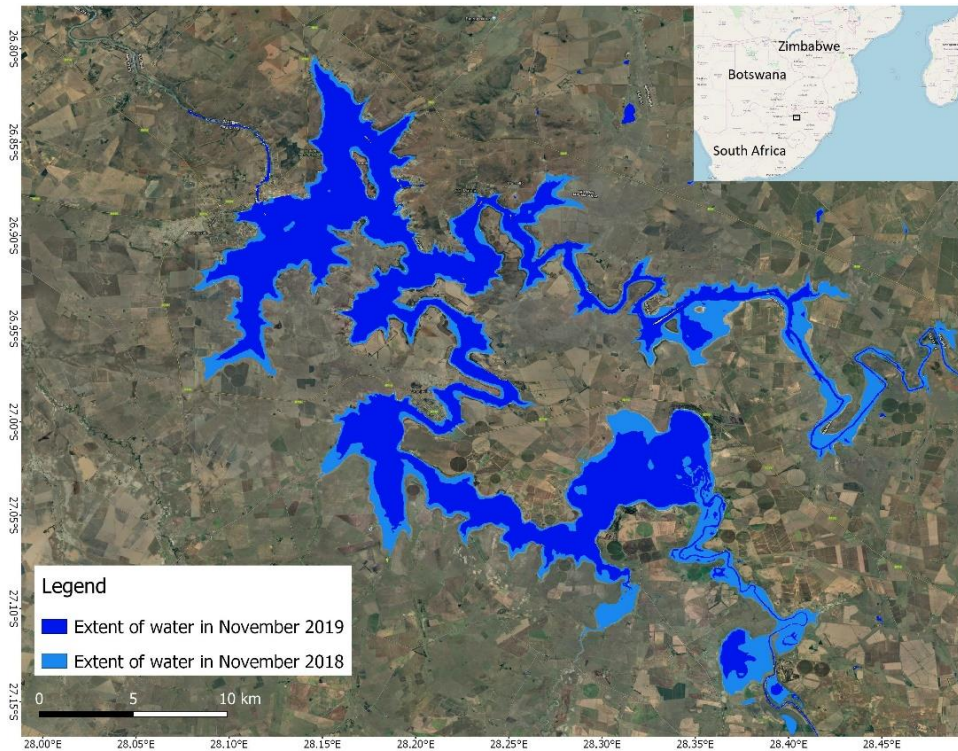


Figure 6. Extent of water in Vaal Dam in November 2019 and November 2018 as estimated from Sentinel 2 images (Background layer: Google Satellite).

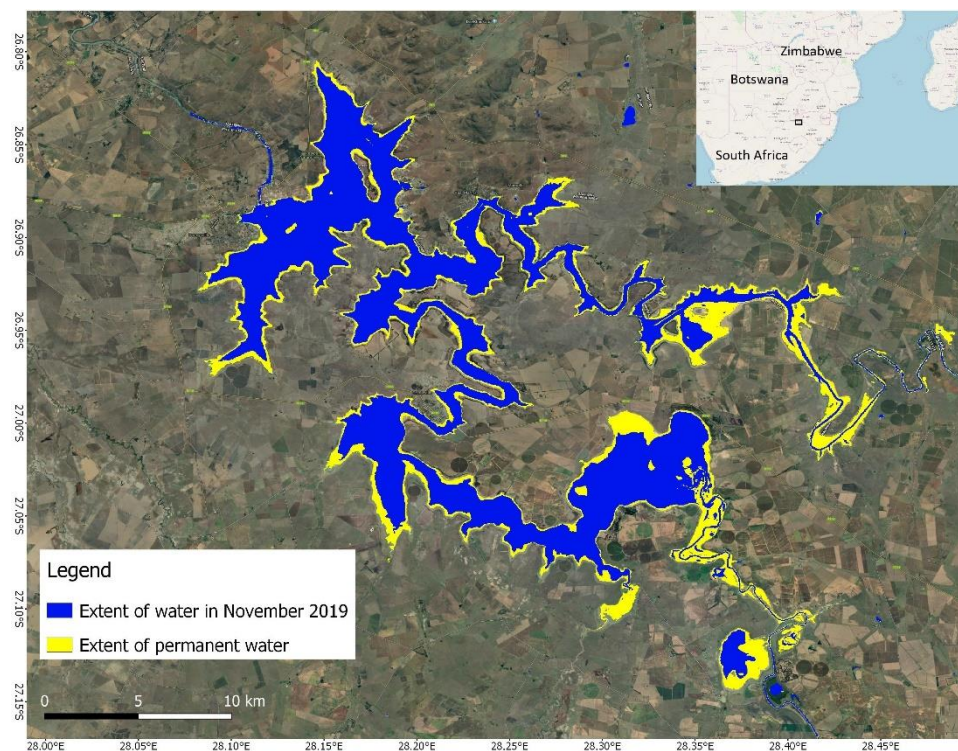


Figure 7. Extent of water in Vaal Dam in November 2019, estimated from Sentinel 2 images and compared with the JRC Yearly Water Classification History layer (median values for permanent water layer between 2001-2018 - Source: EC JRC/Google, Background layer: Google Satellite).

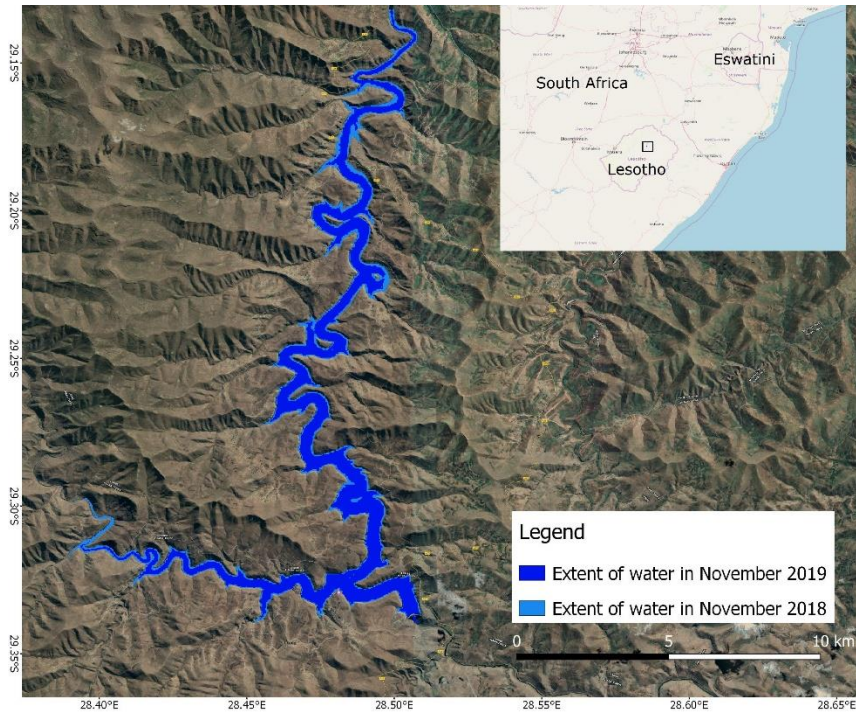


Figure 8. Extent of water in Katse Dam in November 2019 and November 2018 as estimated from Sentinel 2 images (Background layer: Google Satellite).

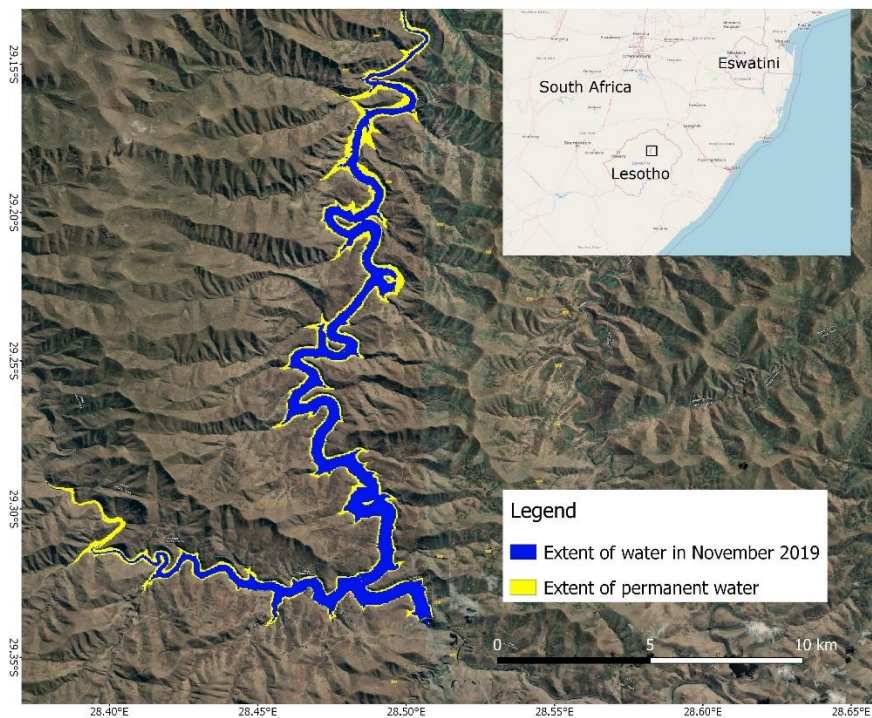


Figure 9. Extent of water in Katse Dam in November 2019, estimated from Sentinel 2 images and compared with the JRC Yearly Water Classification History layer (median values for permanent water layer between 2001-2018 - Source: EC JRC/Google, Background layer: Google Satellite).

For any feedback and questions please write to the address below.

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