United States Department of Agriculture

Foreign Agricultural Service

September 12, 2019

Commodity Intelligence Report

Severe Drought Curtails Hydropower Production in Zambia and Zimbabwe

The 2019 drought in southern Zambia was the driest rainy season (October through April) since 1981 and it covered most of the Lake Kariba's drainage basin in the southern half of Zambia and northeastern Zimbabwe (Figure 1). The well below-average rainfall during the 2018/19 rainy season did not recharge the Kariba reservoir and current water levels (August 30, 2019) are the lowest since July 1996. Similar low water levels in July occurred during 1993-97, 2005-07, and 2015-16 (Figures 2-3).

The low water levels in Kariba reservoir (478.2 meters) are approaching the minimum operation level of 475.5 meters when hydropower must be suspended (Figure 4). Recent press reports state that the low water levels have introduced power rationing schedules with rotational power outages ranging from 18 hours-per-day in Zimbabwe and 4 hours-per-day in parts of Zambia. Power authorities also have warned that hydropower generation could be suspended by the end of September if stringent power rationing schedules are not followed. Unfortunately, power rationing will probably continue through 2020 because the maximum annual recharge rate during the past 25 years was only 3.6 meters per year during the 2017/18 rainy season (Figure 4).

The 2019 drought caused the greatest annual water level drop of 7.6 meters during the July-to-July period because the 2018/19 rains did not recharge the reservoir and current water levels are not expected to rise until the onset of seasonal rains in November 2019. In general, Lake Kariba water levels decline during the dry season from June through October and the reservoir is recharged during the rainy season from October through April (Figure 4). The Kariba reservoir was created and designed to operate between levels 475.5 and 488.5 meters above mean sea level (amsl) for a total operational range of 13 meters. The lowest water level reached 475.91 meters amsl in December 1992 and the water level projection by the end of December 2019 is 476.8 meters amsl, if a decline of 0.4 meters per month continues for the remainder of the year (Figure 5).

Lake Kariba is the world's largest man-made lake and reservoir by volume, and it was filled from 1958 through 1963 after construction of the Kariba Dam on the Zambezi river was completed in 1958. The Zambezi river forms the entire Zambia and Zimbabwe border and the Kariba Dam and reservoir are located approximately halfway between Zambezi river's source and mouth. The Kariba Dam is a double curvature concrete arch dam and it is outfitted with two power stations with a total hydropower capacity of 2130 megawatts (MW). The North Bank Power Station is operated by ZESCO in Zambia and has an installed capacity of 1,080 MW, while the South Bank Power Station is operated by ZPC in Zimbabwe and it has an installed capacity of 1,050 MW.

The USDA/NASA Global Reservoir and Lake Monitor (G-REALM)

The USDA-NASA Global Reservoir and Lake Monitor (G-REALM) utilizes a series of satellite radar altimeters to measure water level heights every 10-days for nearly 300 inland water bodies with large surface areas (Figure 6). The primary satellite altimeter series with the longest historical record from 1992-present includes the TOPEX/Poseidon (1992-2002); Jason-1 (2002-2008); Jason-2/OSTM (2008-2016) and Jason-3

(2016-present) satellites (Figure 4). The satellite radar altimeter series for the TOPEX/Poseidon through Jason-3 satellites has been operated in cooperation by NASA, the U.S. space agency, and with CNES, the French space agency. The water level time-series data for G-REALM is processed by a team based at NASA-Goddard and the University of Maryland's Earth System Science Interdisciplinary Center (ESSIC).

The current lake water heights for nearly 300 lakes can be viewed and downloaded from the G-REALM web site at: https://ipad.fas.usda.gov/cropexplorer/global_reservoir/. For additional information, please contact Curt Reynolds at Curt.Reynolds@usda.gov

Current area and production estimates for grains and other agricultural commodities are available from:

Production, Supply and Distribution Database (PSD Online)

International Production Assessment Division (IPAD) Home - USDA/FAS/OGA

Crop Explorer

U.S. Department of Agriculture
Foreign Agricultural Service; Office of Global Analysis
International Production Assessment Division
USDA South Building, Ag Box 1051
Washington, DC 20250-1051

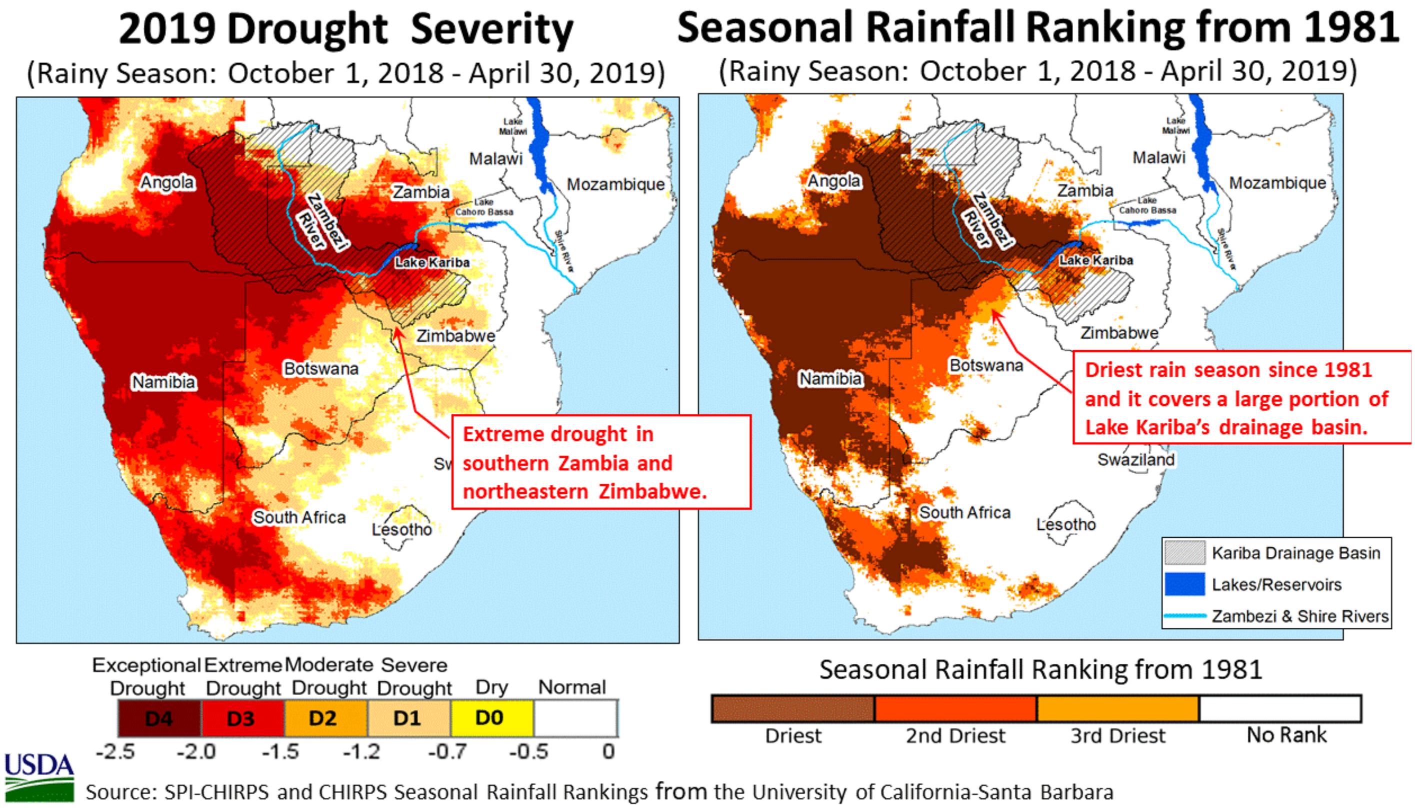
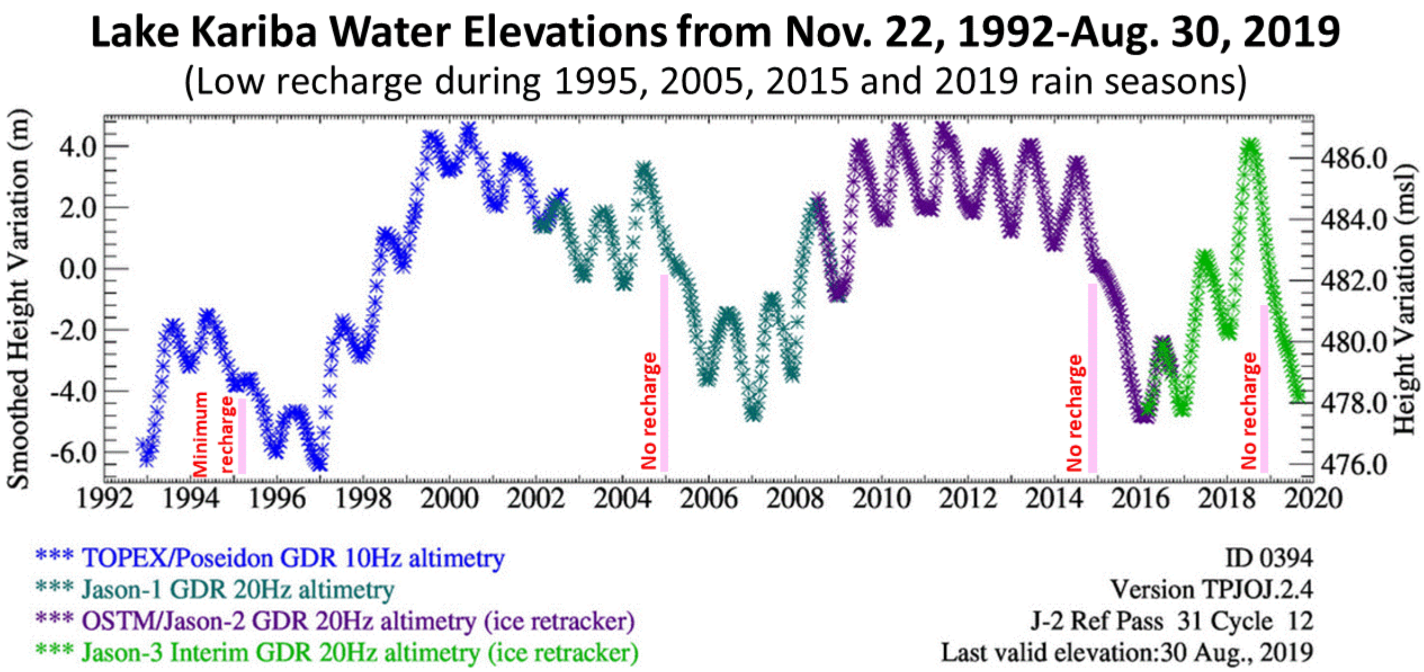


Figure 1. 2019 Drought Severity and Seasonal Rainfall Ranking since 1981



Source: Water elevation graph from USDA-NASA Global Reservoir and Lake Monitor (G-REALM)
https://ipad.fas.usda.gov/cropexplorer/global_reservoir/

Figure 2. Lake Kariba Water Elevations from Nov. 22, 1992 through Aug. 30, 2019

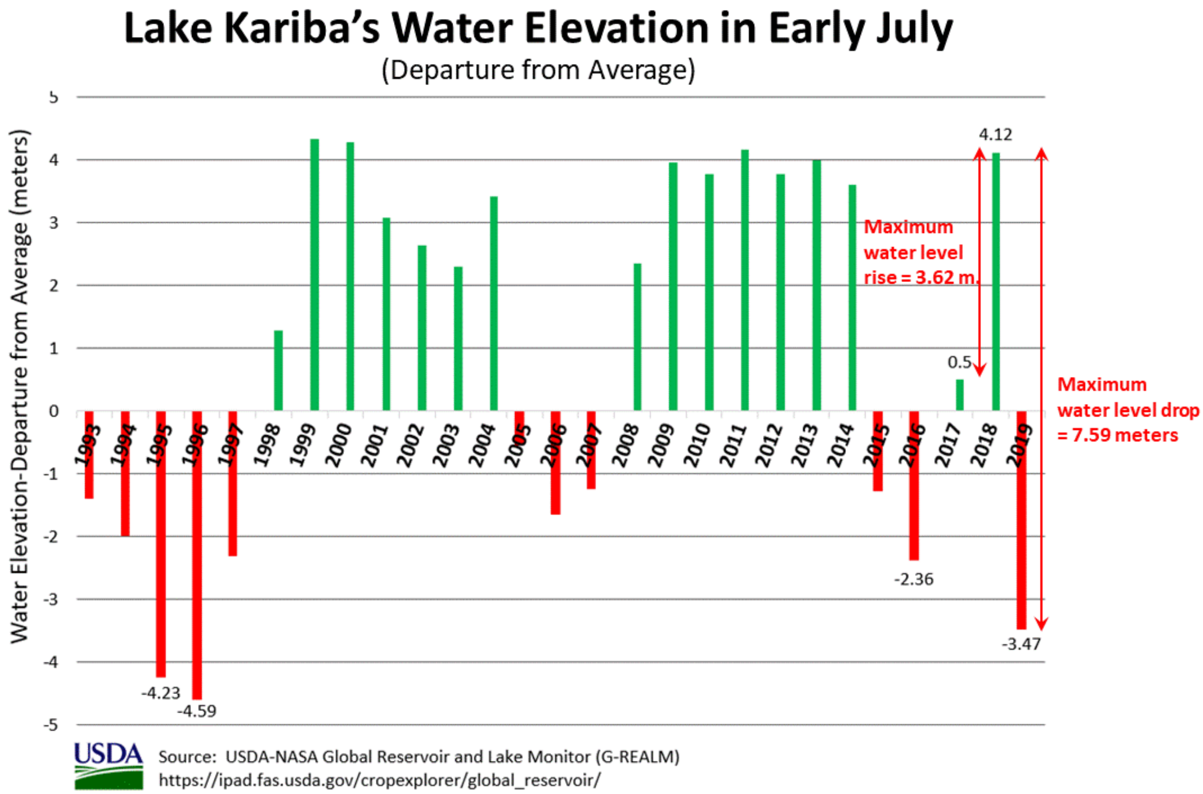


Figure 3. Lake Kariba's Water Elevation in Early July.

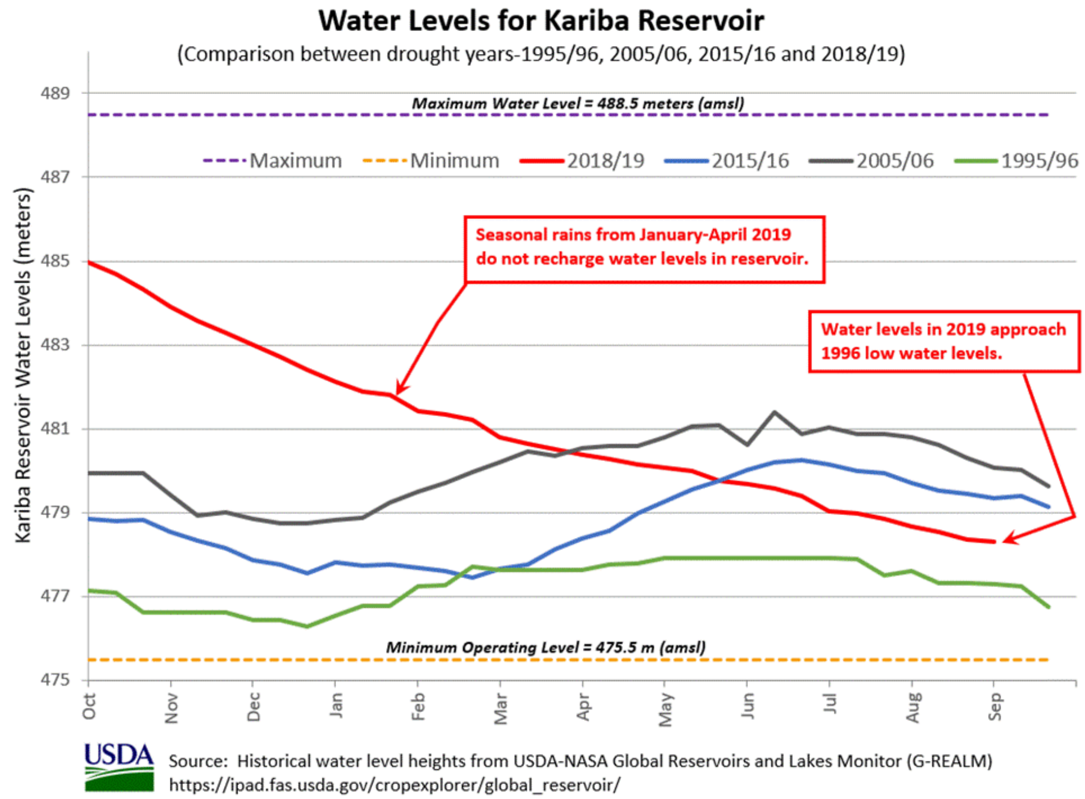


Figure 4. Lake Kariba's Water Elevation during Drought Years

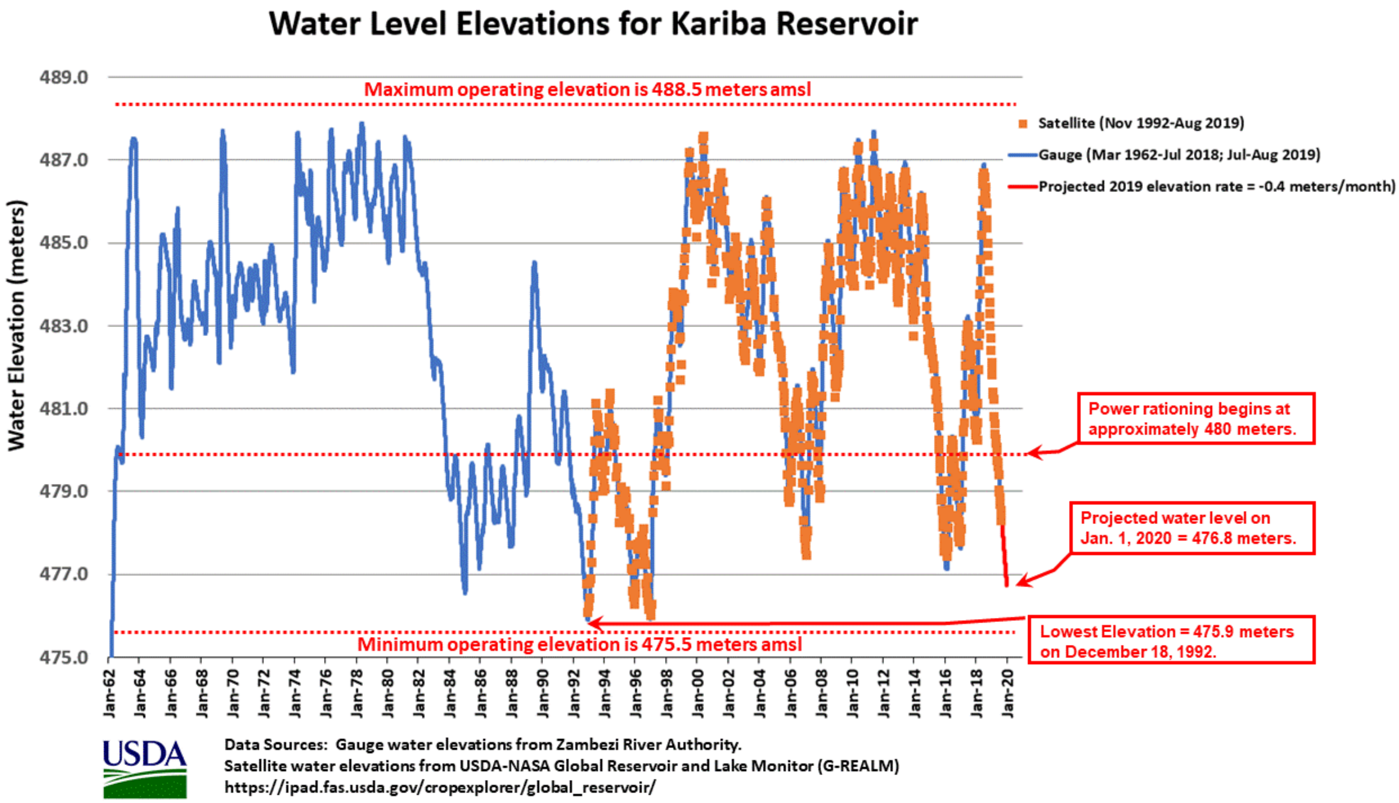


Figure 5. Water Level Elevations for Kariba Reservoir from 1962-2019.

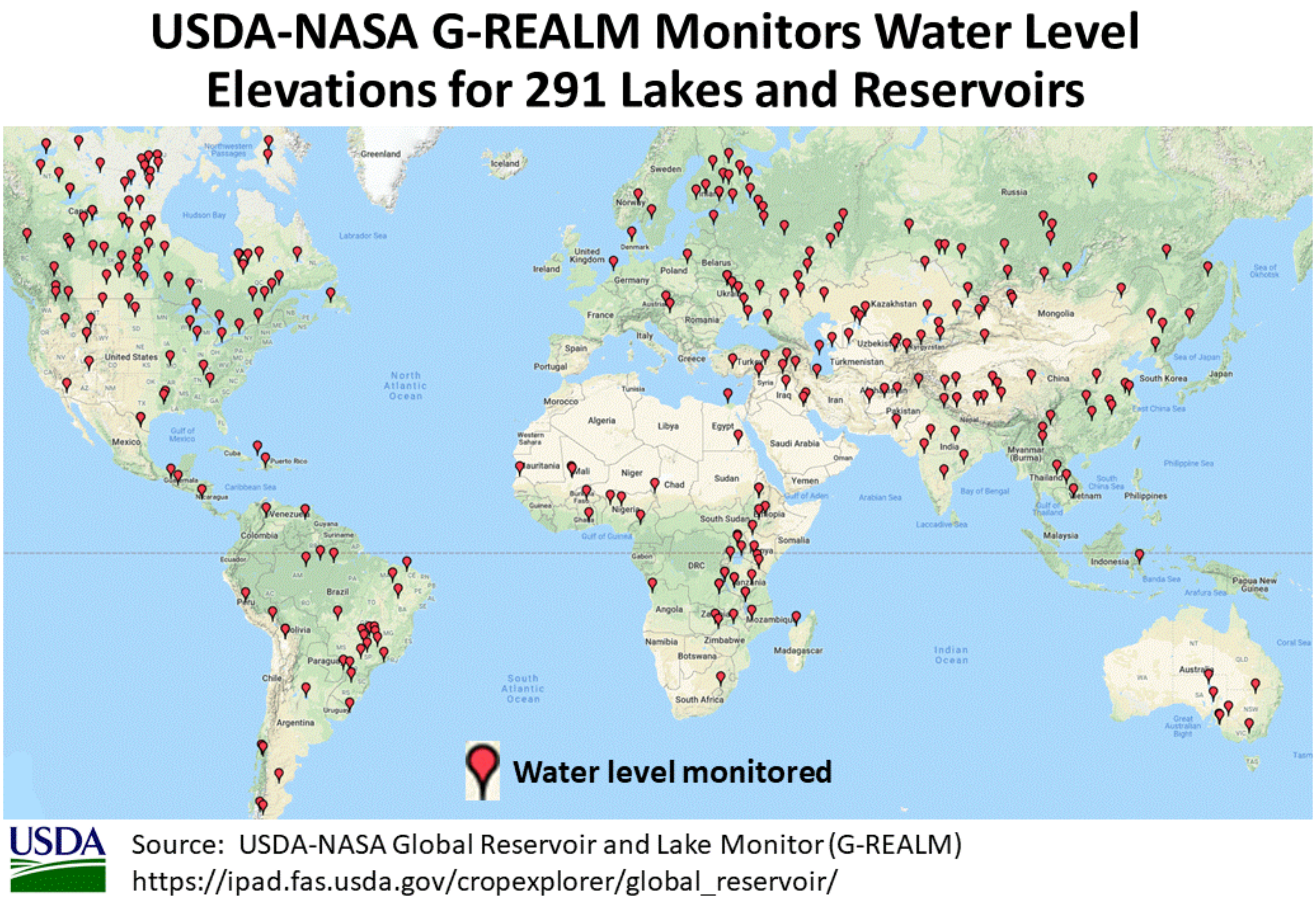


Figure 6. USDA-NASA Global Reservoirs and Lakes Monitor (G-REALM)