



Dams and evaporation and rainfall

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1. Introduction

The seasonality and uneven distribution of rainfall in South Africa puts our water resources at stress. Department of Water and Sanitation is responsible for management of the Republic's water resources for domestic, industrial and agricultural use. Monitoring of dam storages, evaporation and rainfall is in accordance with National Water Act, (Act No. 36 of 1998) to promote development, conservation, control and management of water resources of the country, thus achieving an optimal and sustainable utilization.

The Directorate Hydrological Services of the Department is responsible for the supply of Hydrological information, based on the water quantity data collected. The information generated in monitoring is used by various stakeholders within and outside the department for water resource planning, research, town planning, etc.

2. Dams

Department of Water and Sanitation monitors water levels for 223 major dams. Data is collected manually (gauge plate reading) and electronically (mechanical recorder and loggers). Mechanical recorders use chart data and loggers use Shaft encoders, pressure transducer and bubbler system.

Electronic loggers record data every day at different time intervals depending on the configuration thereof is unique for each instrument. This data is captured, processed and uploaded onto the regional database where it is promoted into the central database overnight. The head office then checks, verifies, audits, promotes and archives the data onto National Hydstra. The national monitoring network stations are managed by regional offices where data is collected on site in the interval of 3 months' basis on these stations.

In addition, Department of Water and Sanitation reports on dam levels on a weekly basis (reservoir bulletin) where gauge plate readings are collected for monitored dams. The report is processed, published and disseminated to various stakeholders.

The monitored dams have various purposes ranging from water supply of urban and industrial areas; power generation; irrigation; flood prevention; land reclamation such as dykes or levees; water diversion and recreational purposes.



Water Resource Management Planning and SLIM are some of the directorates that uses the dam storage data, especially for monitoring, computing dam restrictions and maps.

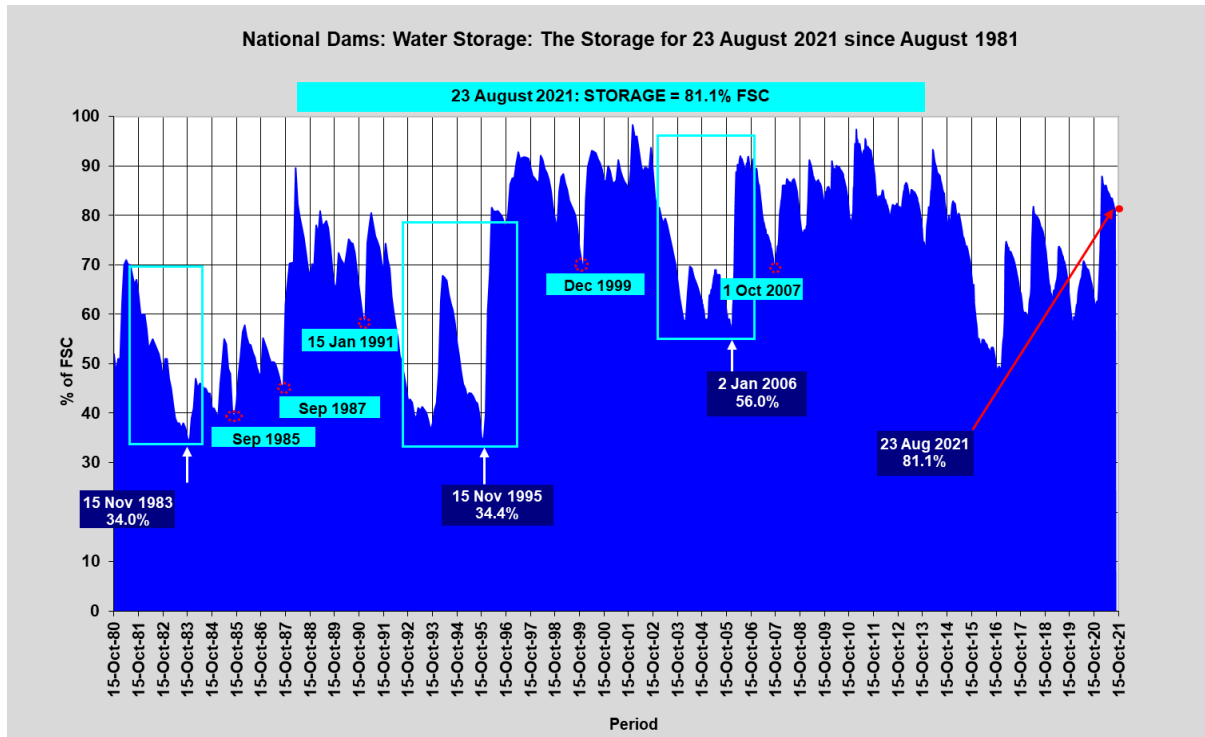


Figure 2.1 National Dam Water Storage (% Full Supply Capacity (FSC))

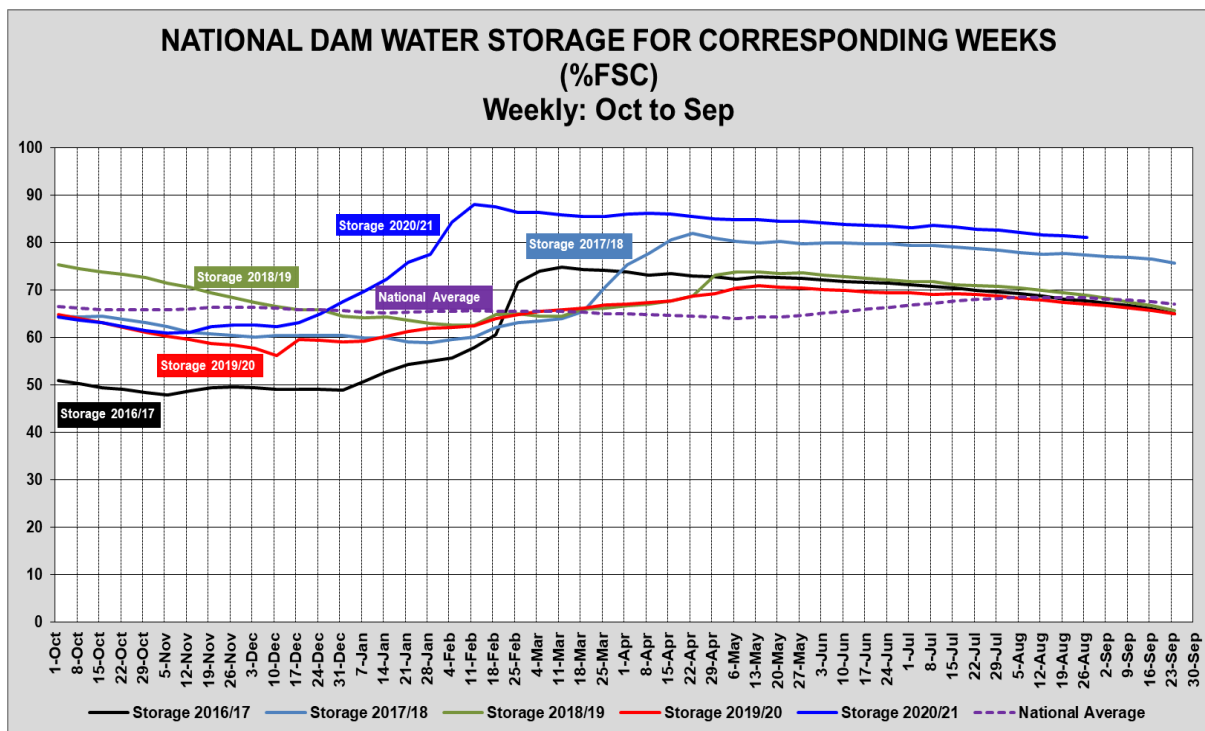


Figure 2.2 National Dam Water Storage (% Full Supply Capacity (FSC))

Figure 2.1 and Figure 2.2 are graphs produced in Water Resource Management Planning. The graphs show weekly trends of percentage Full Supply Capacity (FSC) of national dams in the country for 2016/17 - 2020/21 hydrological years. The dark blue line on Figure 2.2 shows water storage for 2020/21 hydrological year and the purple dotted line shows the national average water storage.

The graphs indicate that national dam levels are higher this year compared to last year when they were at 67.2% during this period. The current national dam levels are above the national average water storage.

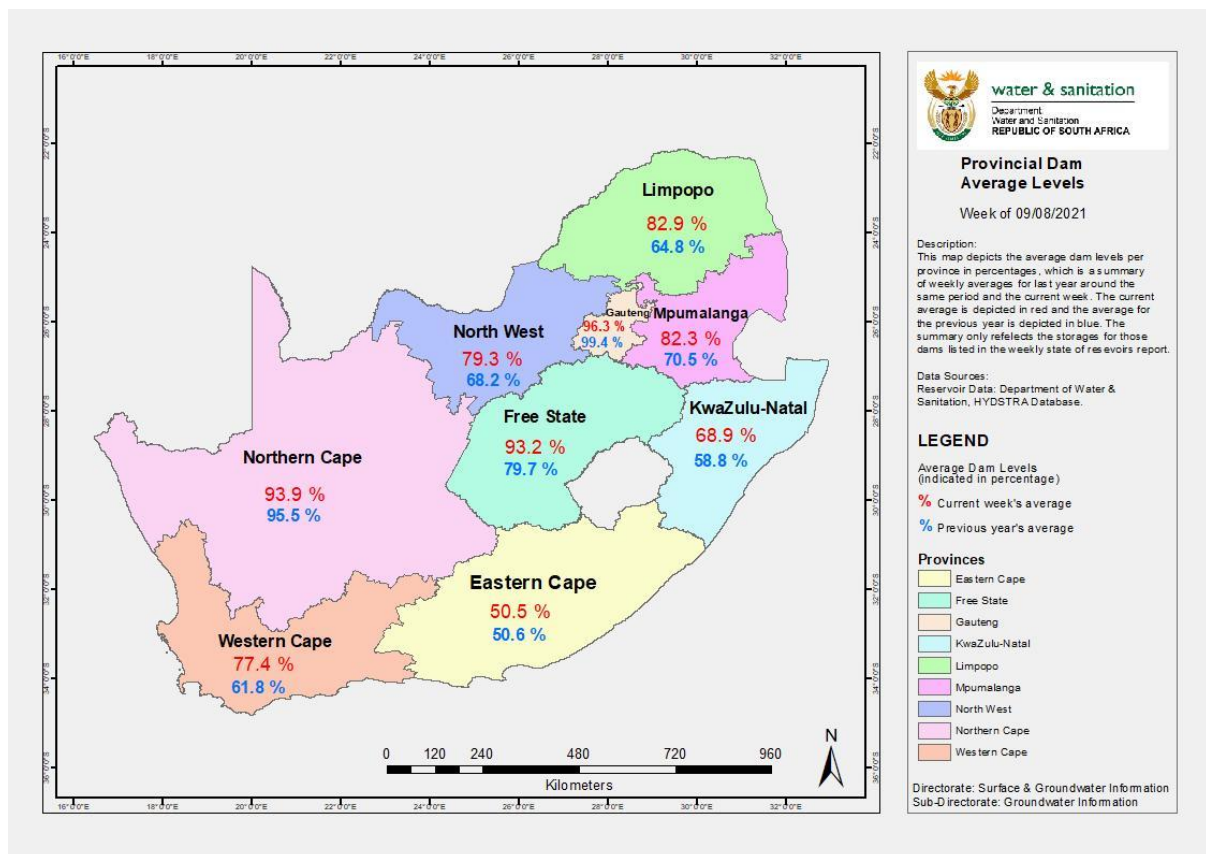


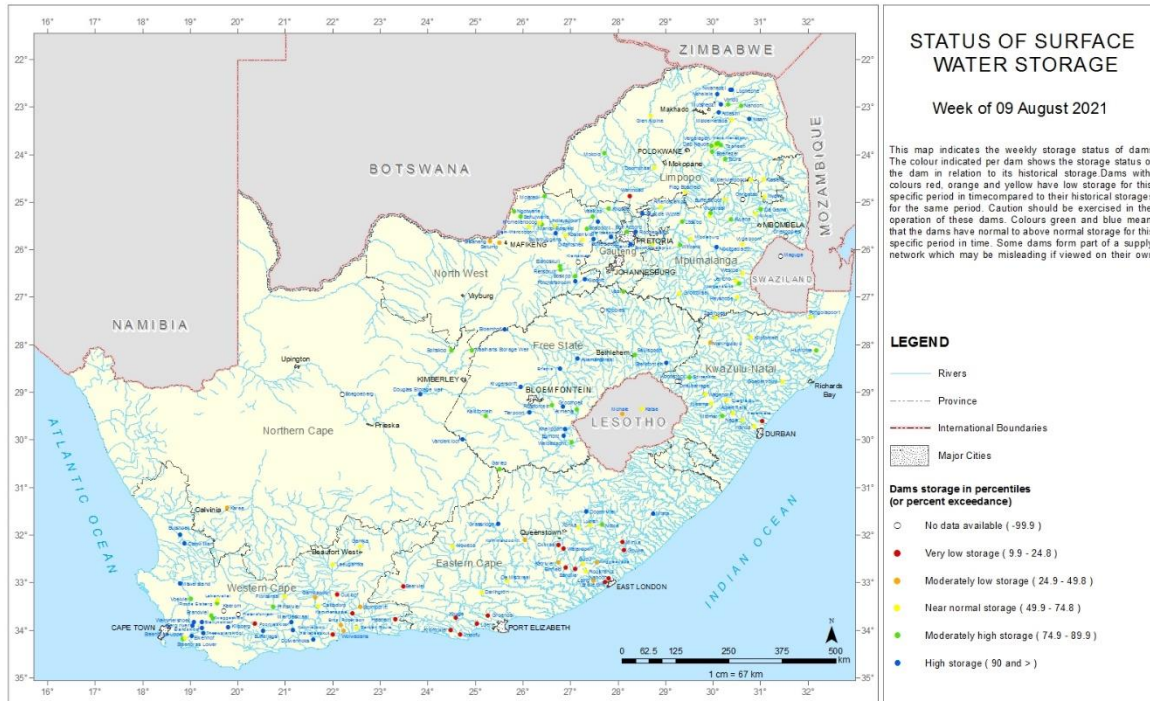
Figure 2.3 Provincial Average Dam levels

Figure 2.3 is a map produced in SLIM using dam storage data. The map shows the average dam levels per province in percentages. It also compares the current week and the week of the past year of around the same time of the year.



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Figure 2.4 Status of dam storages

Figure 2.4 is one of the other maps produced in the SLIM directorate using dam storage data. The map shows the status of surface water storage using historical and most recent data. Using the dam storage data, the dams can be identified as being low, moderate low, near normal, moderately high and high storage.



3. EVAPORATION AND RAINFALL

Evaporation and rainfall data is mainly used for dam balance calculations at the head office. Therefore, these sites are situated in the vicinity of the dam. DWS monitors 500 sites for evaporation and rainfall in the country.

The South African Weather Services (SAWS) is the custodian of meteorological data, which includes rainfall in South Africa. Memoranda of Understanding (MoUs) was signed which included one with the State-Owned Entity (SOE) Umgeni Water and one between SAWS, the Agricultural Research Council (ARC) and the Department of Water and Sanitation (DWS) for the purpose of the agreement to enable the routine provision of relevant climate change and drought indicators data.

Evaporation is measured using tanks (Symons tank and American tank) and is of extreme importance to calculate the evaporation losses at dams. An evaporation station comprises of a rain gauge and one or two evaporation tanks. Monitoring network stations are managed by regional offices where data is collected from various stations by taking the readings everyday around the same time. The returns are uploaded and processed by the regional offices and then the head office audits and promotes the data on a monthly basis on Hydstra.

3.1 Evaporation



Figure 3.1 The Symons tank (station N2E001)

The tank is a square, galvanised iron tank placed 0.540m deep in the ground. It is 1.830m long by 0.610m deep, with a ruler that measures up to 500 units.

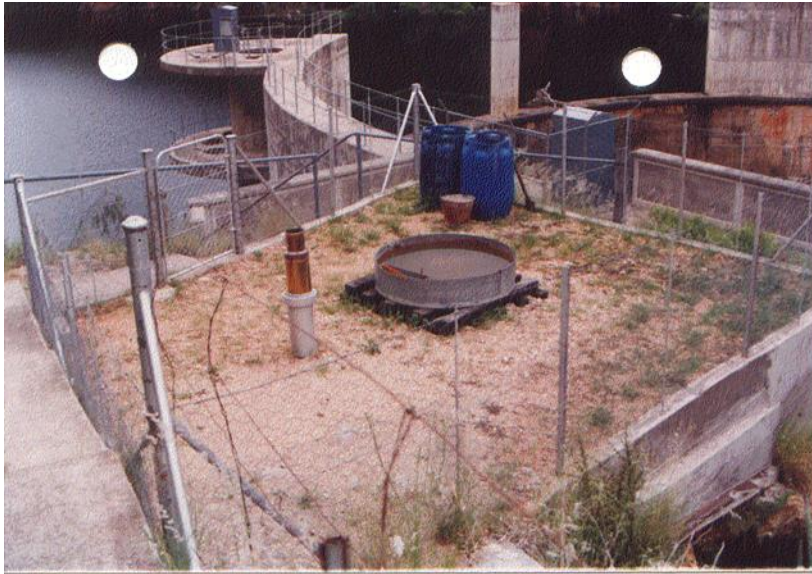


Figure 3.2 The American tank (station M1E001)

The tank is a 0.250m deep circular tank with a diameter of 1.18m. Its ruler measures up to 150 units. The tank is placed on a wooden platform, 0.150m from the ground.

3.2 Rainfall

The types of rain gauges available vary from simple containers with vertical sides to sophisticated tipping bucket, electronic and weighing type rain gauges.



Figure 3.2 standard 172 rain gauge



PLUVIO weighing type rain gauge





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The standard rain gauge is used by Hydrological Services and is one of the simplest rain gauges and consists of four parts which together form the gauge: catchment funnel, bucket, bucket holder and measuring glass