

January 2026



MONTHLY STATE OF WATER BULLETIN

WATER IS LIFE - SANITATION IS DIGNITY



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



Overview

The South African Weather Services (SAWS) Seasonal Climate Watch February to June 2026 report indicates that the El Niño-Southern Oscillation (ENSO) is in a weak La Niña state and is expected to return to a neutral state around March 2026. The usual effect of La Niña events on South Africa is for an increased likelihood of receiving above-normal rainfall over the north-eastern parts of the country during summer. The predictions further indicate that ENSO will continue towards a neutral state with a possible return to an El Niño state during the Southern Hemisphere spring months.

January 2026 rainfall patterns generally followed climatological expectations across the summer and winter rainfall regions. However, during the first and second 10-day periods of the month, exceptionally heavy rainfall occurred along the far northeastern border, severely affecting Limpopo, Mpumalanga, and parts of Mozambique. In stark contrast to the wet conditions in the northeast, the Western Cape province is experiencing severe drought conditions. The majority of dams in the region recorded alarming declines in surface water storage levels. Although these dams generally replenish during the winter months, their storage volumes by the end of January 2026 were significantly lower than at the same time in the previous year. Four major dams in the Western Cape reported critically low storage levels compared to January 2025, underscoring the urgency of the province's water scarcity challenges.

Despite these regional contrasts, national dam levels stood at 93.1% of Full Supply Capacity (FSC) by the end of January 2026, marking an 11.8% increase from 81.3% at the same time in 2025. The Integrated Vaal River System (IVRS) reached 99.6% of FSC, reflecting a notable recovery of 15.7% from 83.9% the previous year. The Orange System's storage level was at 96.7% of FSC, representing a significant year-on-year increase of 21.4%.

Mpumalanga and Limpopo experienced above-normal rainfall due to a persistent low-pressure system affecting north-eastern South Africa. The prolonged heavy rainfall culminated in January 2026, when severe flooding caused extensive infrastructure damage and resulted in several fatalities. Several dams were operating above their full supply level, this resulted in high spillway activity and sustained water releases into the downstream river systems. A total of 38 flood-related fatalities were reported, 20 in Mpumalanga and 18 in Limpopo. In response to these impacts, the Government of the Republic of South Africa declared a state of National Disaster due to severe flooding, citing widespread loss of life, infrastructure damage, displacement, and major disruptions to schooling, agriculture, and basic services. SAWS issued several severe weather warnings, including Orange Level 9 warnings and Red Level 10 warnings for disruptive rainfall, for the eastern regions of both provinces.

In the water quality segment, the relationship between Electrical Conductivity and Total Dissolved Solids, two closely related parameters commonly used in assessing water quality is examined. These indicators provide valuable insights into salinity, mineralisation, and the overall suitability of water for domestic, agricultural, industrial, and ecological purposes. Understanding the correlation between Electrical Conductivity and Total Dissolved Solids is essential for effective water quality monitoring and interpretation.

Rainfall

SAWS rainfall maps presented in Figure 1 shows that January 2026 rainfall patterns generally followed climatological expectations across the summer- and winter-rainfall regions. However, during the first and second 10-day periods of the month, exceptionally heavy rainfall occurred along the far northeastern border, severely affecting Limpopo, Mpumalanga, and parts of Mozambique. Heavy downpours exceeded 200% of the normal rainfall in the first 10 days and escalated to more than 1000% of normal in the second 10 days. This extreme precipitation produced a major flood event in the region—the most significant since the catastrophic floods of February 2000. Subsequently, the third and final week of January saw a sharp decline in rainfall, dropping to below 25% of normal in the previously flood-affected eastern border areas.

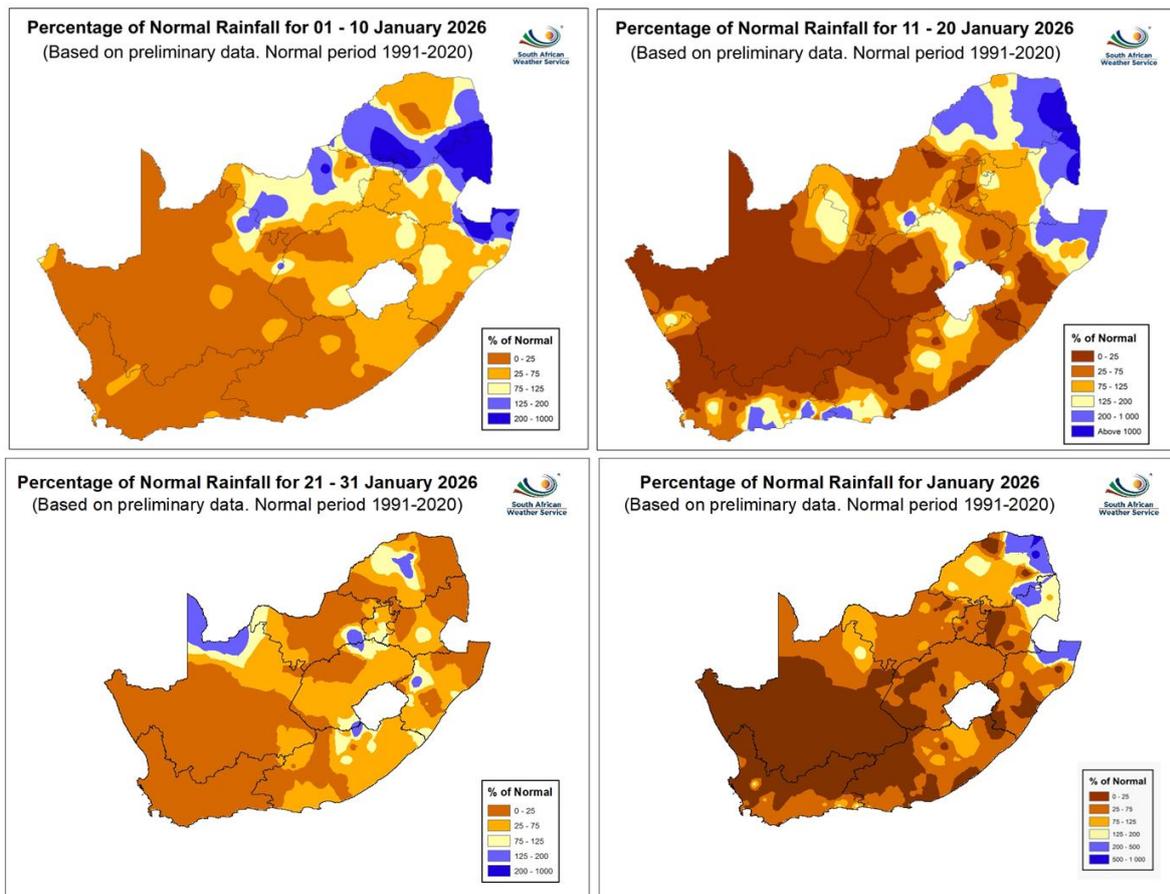


Figure 1: Percentage of normal rainfall distribution for January 2026.

Weather Forecast and Early Warning

Weather significantly impacts water resources by altering quantity, quality, and availability through changes in temperature, precipitation, and extreme events. Rising temperatures increase evaporation and reduce water availability, while extreme weather events, such as droughts and floods, exacerbate water scarcity and pollution, respectively.

Changes in precipitation patterns affect water availability. The South African Weather Services (SAWS) Seasonal Climate Watch February to June 2026 report indicates that the El Niño-Southern Oscillation (ENSO) is in a weak La Niña state and is expected to return to a neutral state around March 2026 (SAWS, 2026). The usual effect of La Niña events on South Africa is for an increased likelihood of receiving above-normal rainfall over the north-eastern parts of the country during summer. The predictions further indicate that ENSO will continue towards a neutral state with a possible return to an El Niño state during the Southern Hemisphere spring months.

The SAWS 2026 report also indicated that during the autumn months, most of the areas that receive autumn rainfall are expected to receive above normal rainfall, except some interior regions, which are expected to receive below-normal rainfall during the same time (Figure 2). Early winter rainfall indications show below-normal rainfall for the southwestern and southern coastal areas. Minimum and maximum temperatures are largely expected to be above-normal for most parts of the country during the autumn season (Figure 3).

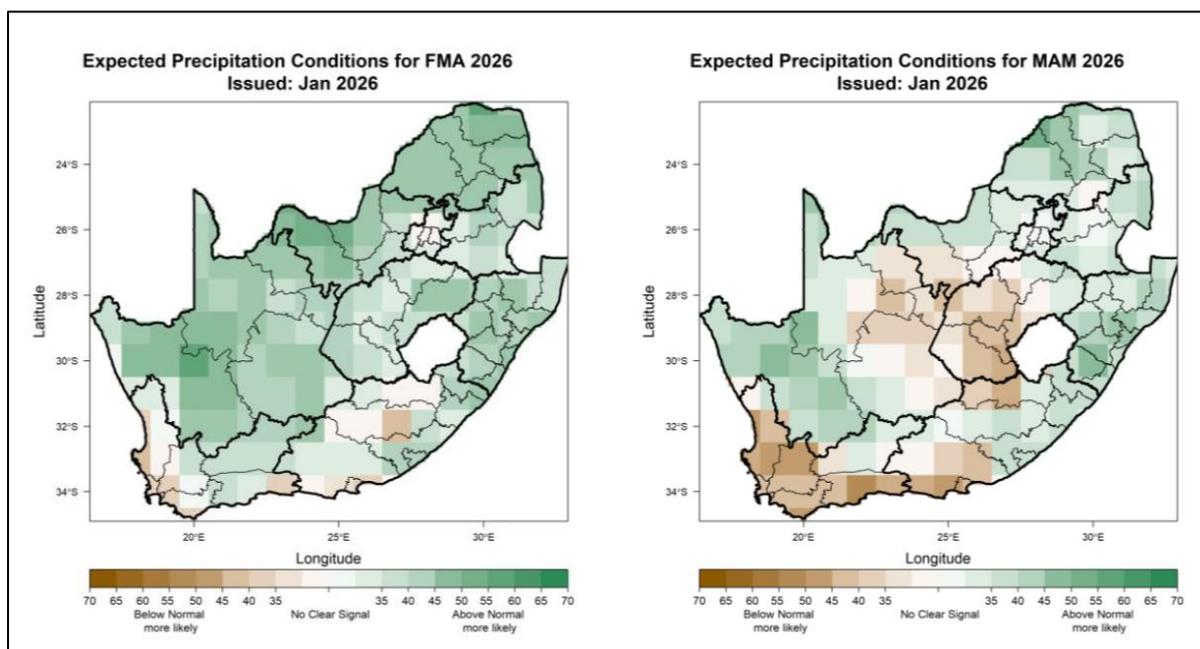


Figure 2: Seasonal precipitation predictions for February-March-April 2026 (FMA; left), March-April-May 2026 (MAM; right), (Source: SAWS, 2026).

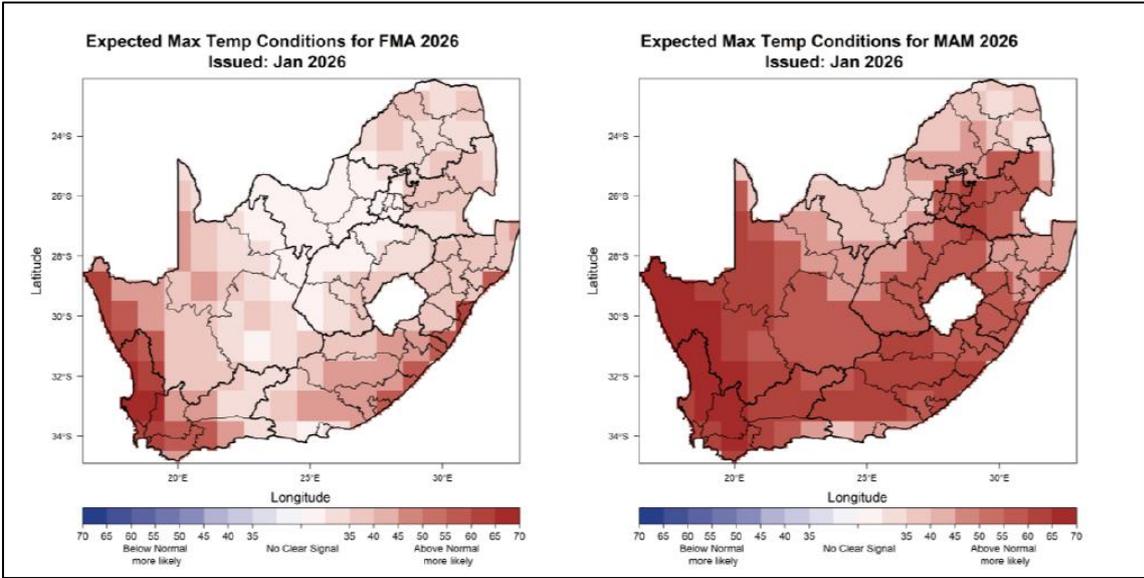


Figure 3: Seasonal maximum temperature predictions for February-March-April 2026 (FMA; left), March-April-May 2026 (MAM; right) (Source: SAWS, 2026).

National Dam Storage

The national surface water storage trends for the current hydrological year (2025/26) are compared to those of the past four hydrological years in Figure 4. The graph shows that at the end of January 2026, the national dam levels were 93.1% of Full Supply Capacity (FSC). This level is 11.8% higher than at the same time last year, when the overall storage level was at 81.3% of FSC. The dam levels have been above 90% FSC since April 2025.

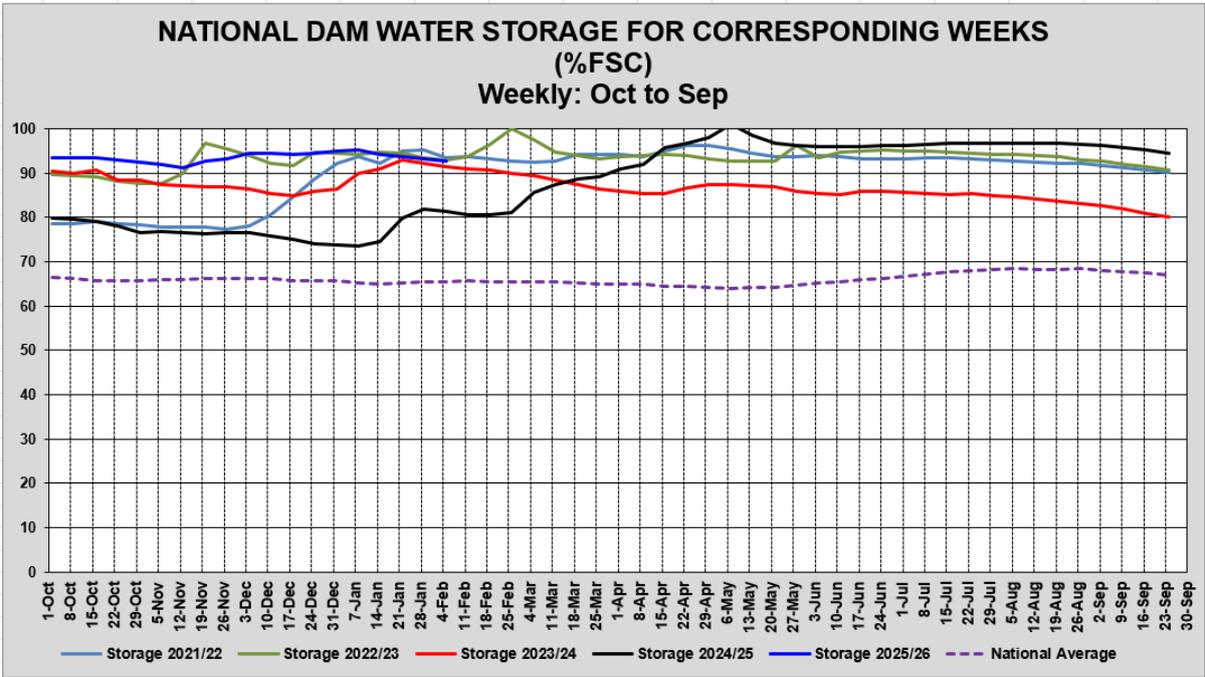


Figure 4: Weekly National Dam Storage at the end of January 2026, for five hydrological years.

Table 1 show a summary of the status of 219 South African dams, together with the three dams from the Kingdoms of Eswatini and Lesotho. Based on dam level data as of 26 January, at least 94 of 222 national dams were above 100% of FSC, while four dams located in the Western Cape were below 10% of FSC (critically low). Dam levels in Gauteng remain above 100% and are 11.9% higher than levels recorded at the same time last year. Figure 5 further shows the spatial distribution of the 222 national dams and their respective Water Supply Systems.

Table 1: National Surface Water Storage –26 January 2026.

Provinces/ Countries sharing Water Resources with RSA	FSC million m ³	Total No. of Dams	Number of Dams per Province/ Country				% of Full capacity		
			<10 (% of FSC)	10% - <50 (% of FSC)	50 - <100 (% of FSC)	≥100%	Last Year	Last Week	This Week
							26/01/2025	19/01/2026	26/01/2026
Kingdom of Eswatini	333.75	1				1	99.9	100.9	100.4 ↓
Eastern Cape	1 727.66	46		9	33	4	80.7	74.1	73.1 ↓
Free State	15 656.90	21		2	15	4	76.2	97.9	97.6 ↓
Gauteng	128.08	5				5	89.8	102.1	101.7 ↓
KwaZulu-Natal	4 909.66	19			6	13	90.0	91.8	90.1 ↓
Kingdom of Lesotho	2 362.63	2			1	1	87.3	99.3	99.0 ↓
Limpopo	1 484.64	29			4	25	84.5	99.7	99.6 ↓
Mpumalanga	2 538.20	22			4	18	94.7	101.5	100.7 ↓
Northern Cape	146.33	5			2	3	63.9	102.3	98.3 ↓
North West	866.23	28			8	20	71.1	96.8	97.8 ↑
Western Cape - Other Rainfall	269.61	22	4	14	4		78.7	30.1	28.8 ↓
Western Cape - Winter Rainfall	1 596.80	22		4	18		75.9	60.5	58.0 ↓
Western Cape - Total	1 866.41	44	4	18	22	0	76.3	56.1	53.8 ↓
Grand Total:	32 020.50	222	4	29	95	94	81.3	93.8	93.1 ↓

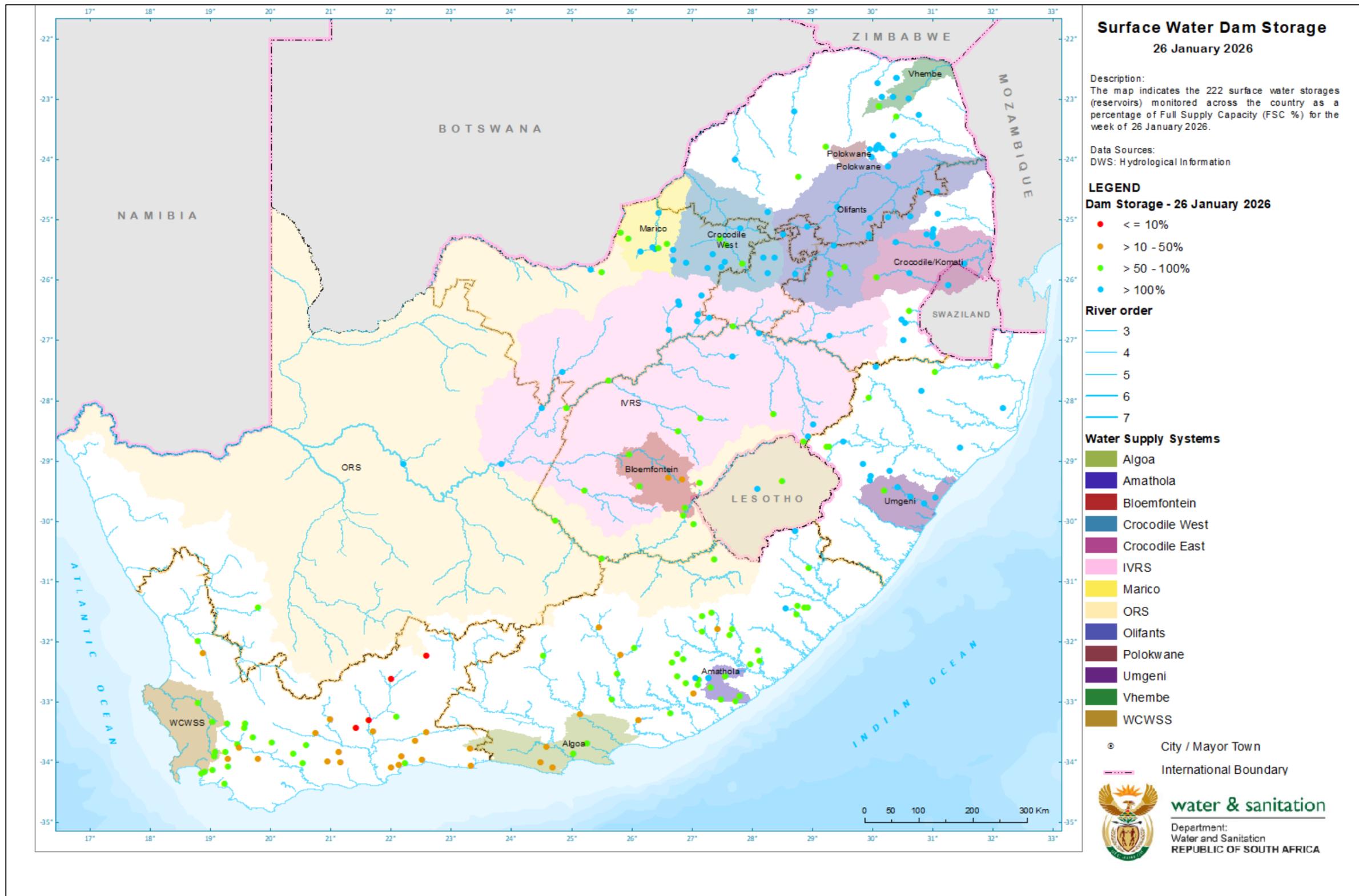


Figure 5: Surface Water Storage Levels – January 2026.

The comparison of the storage levels per province (plus the Kingdoms of Eswatini and Lesotho) for January 2025 and January 2026 is graphically presented in Figure 6. The Northern Cape is showing the most significant increase of 34.4%, year-on-year. The increase in the overall dam storage indicates higher-than-normal stream flows, as a result of above-normal rainfall received during the past hydrological year. The other notable increases were observed in the North West (+26.7%), Free State (+15.1%), and Gauteng (+11.9%) of FSC. The Kingdom of Lesotho also experienced a significant increase of +11.7% during the same time. However, the Western Cape levels have plummeted to 53.8% year-on-year. This indicates the impacts of below-average rainfall received during the region's winter rainfall season.

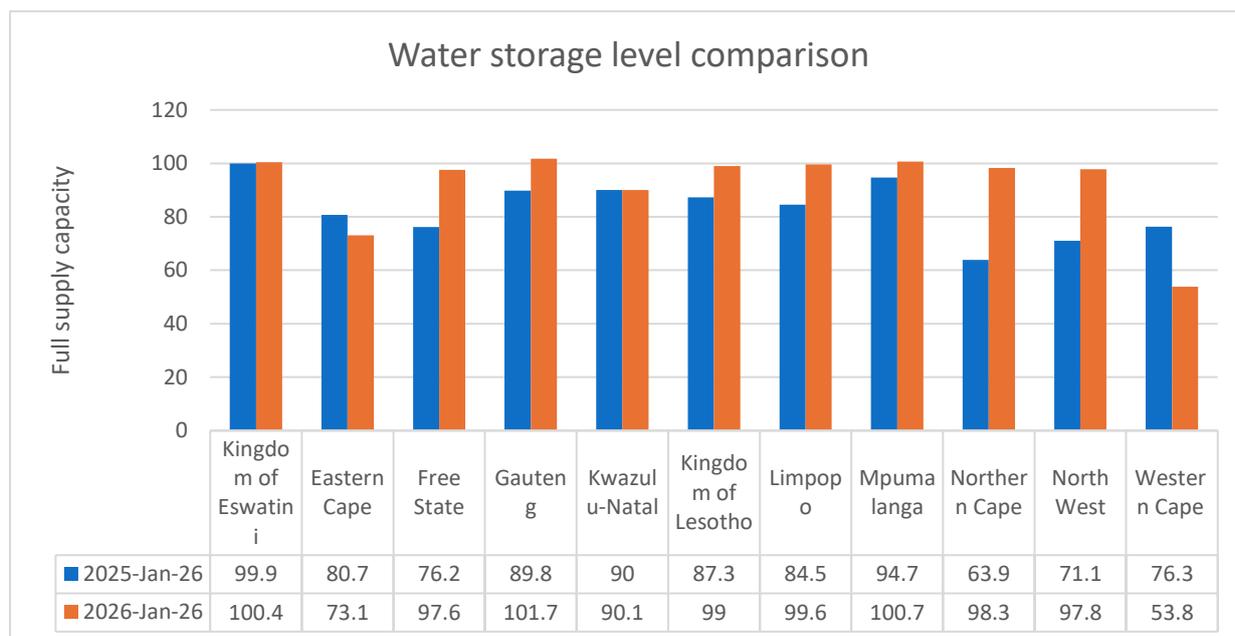


Figure 6: Water Storage Levels January 2025 vs. January 2026.

The comparison between January 2025 and January 2026 of the country's five largest dam storage is presented in Table 2.

Table 2: Storage Levels Comparison for the Five Largest Storage Dams (by volume).

Reservoir	River	Province	Full Supply Capacity (Mm3)	26 January 2025 (% FSC)	26 January 2026 (% FSC)	Difference (%)
Gariep Dam	Orange River	Free State	4 903.45	76.1	96.1	+20
Vanderkloof Dam	Orange River	Free State & Northern Cape	3 136.93	74	97.8	+23.8
Sterkfontein Dam	Nuwejaarspruit River	Free State	2 616.90	98.2	100.1	+1.9
Vaal Dam	Vaal River	Free State	2 560.97	61.6	100.9	+39.3
Pongolapoort Dam	Phongolo River	KwaZulu-Natal	2 395.24	87.9	81.7	-6.2

The surface water storage levels at the five major dams in the country exceed 80%, with Gariep, Vanderkloof and Vaal Dam showing substantial increase of 20%, 23.8% and 39.3%, respectively, compared to the same period in the previous year.

The rate of decline in surface water storage levels in the majority of dams in the Western Cape province is alarming. Despite the fact that dams in this area typically fill up during the winter, they are much lower now than they were at the same time last year. Four dams in the Western Cape had extremely low storage levels by the end of January 2026 when compared to the same time in 2025. Teirkloof Dam, Gamkapoort Dam, Gamka Dam declined sharply by 86.8%, 72.6% and 86.8%, respectively, indicating a significant reduction in storage levels (Table 3).

Table 3: Dam below 10% of FSC compared to last year

Reservoir	River	Province	Full Supply Capacity (Mm ³)	26 January 2025 (% FSC)	26 January 2026 (% FSC)	Difference (%)
Tierkloof Dam	Tributary of Seweweekspoort	Western Cape	0.03	96.3	9.5	-86.8
Gamkapoort Dam	Gamka River	Western Cape	35.72	74.3	1.7	-72.6
Leeugamka Dam	Leeu River	Western Cape	13.41	0.5	0.6	+0.1
Gamka Dam	Gamka River	Western Cape	1.73	42.5	9.5	-86.8

District Municipalities

Figure 7 presents the 24-month Standardised Precipitation Index (SPI) map analysed at the end of December 2025 alongside January 2026 dam levels. The SPI drought map shows that only a small part of the Sarah Baartman DM in the Eastern Cape experienced extreme drought in the last 24 months. Additionally, some parts of Sarah Baartman, Chris Hani, and Alfred Nzo District Municipalities indicated a severe drought status.

The year-on-year comparison of water storage levels per district municipality is presented in Figure 8. Ngaka Modiri Molema DM and Mopani DM experienced the most significant increases (>40%) in dam storage levels in January 2026, followed by Sedibeng DM and Francis Baard DM (>20%). Also noteworthy, the Central Karoo and Garden Route DM experienced a significant annual decline (40%) in dam levels.



Figure 7: 24-Month Standardised Precipitation Index (SPI) – December 2025, including dam levels – January 2026.

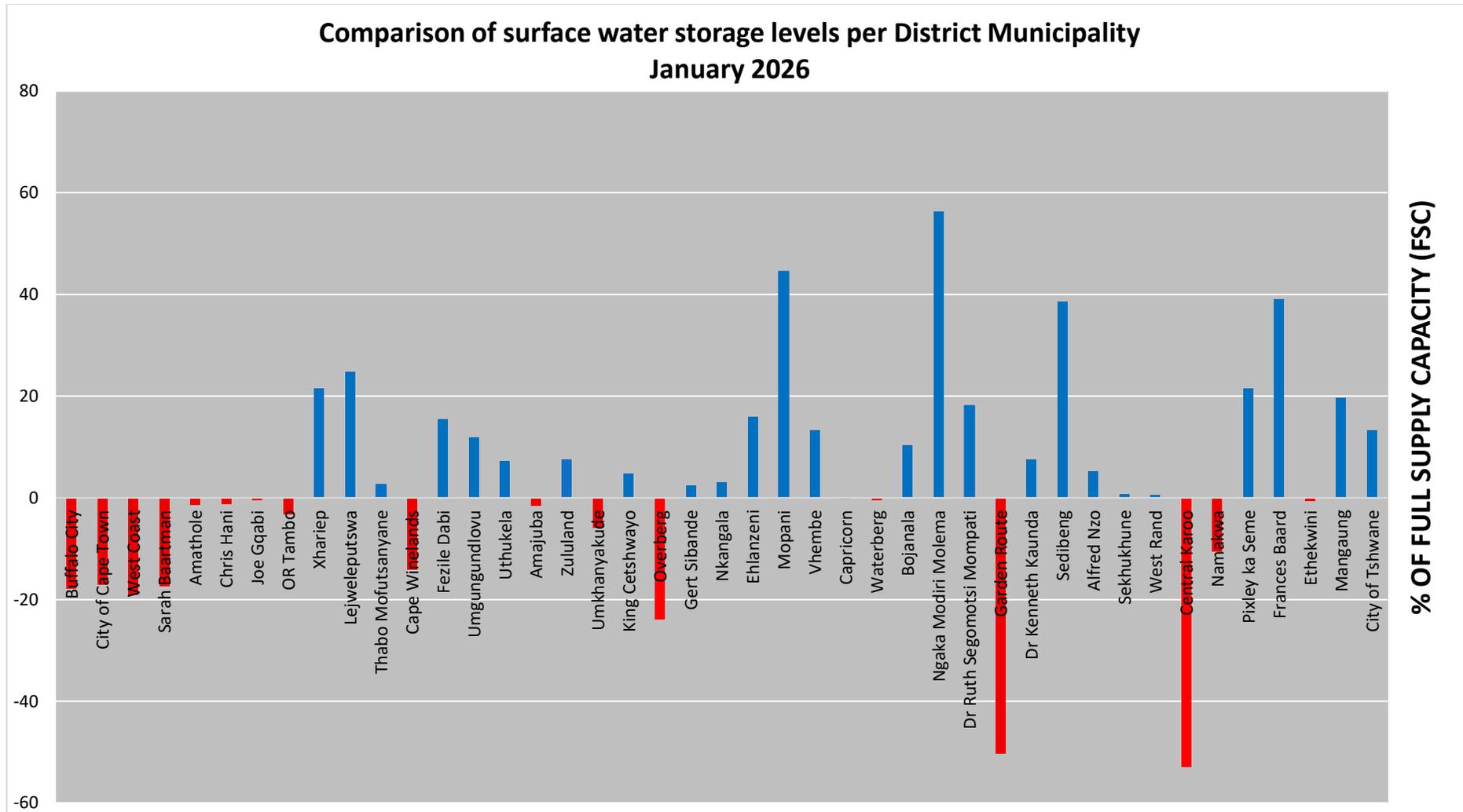


Figure 8: Comparison of water storage levels per District Municipality, January 2025 vs January 2026.

System Name	Areas	Water Users	% Restrictions	Gazette Information	Next Review
Algoa WSS	Kromme subsystem	NMBM & Kouga LM Irrigation	23% domestic & industrial 43% irrigation	4 July 2025 No. 6392	Nov' 2026
Mangaung WSS	Caledon-Modder	Mangaung Metro	25% domestic & industrial when below 95%	13 Sep' 2024 Gazette no.5200	May 2025
Liebensbergvlei River	Run-off River abstractions Free State towns and irrigation	Towns of Bethlehem, Reitz, Tweeling within Dihlabeng, Mafube and Nketoana Local Municipalities	Irrigation users to abstract water on an alternative day basis Municipalities to use water sparingly	20 Sep' 2024 Gazette no. 5223	Once off until the end of the LHWP tunnel shutdown for the planned maintenance
Middle Letaba/ Nsami	Middle Letaba/ Nsami	Irrigation Mopani Municipality	100% irrigation 25% domestic	28 Jun' 2024	May 2025
Mutshedzi Dam	Mutshedzi Dam	Makhado Municipality	35% domestic		May 2025
Nzhelele	Nzhelele	Nzhelele Government Irrigation Scheme Nzhelele Regional Scheme	20% domestic 20% irrigation	28 Jun' 2024	May 2025
Nwanedi/ Luphephe	Nwanedi/ Luphephe	Mutale Local Municipality Irrigation	20% D&I 45% irrigation	28 Jun' 2024	May 2025
Polokwane Water Supply System Letaba System	Seshego, Mashashane, Houtrivier and Chuniespoort Dams Ebenezer and Groot Letaba System	Capricorn District, Polokwane Local Municipality Groot Letaba Water Users Association, Mopani Municipality	30% domestic & industrial water uses 27% agricultural use	28 Jun' 2024	May 2025

Table 4 presents the dam storage levels for South Africa's national water supply systems. The Integrated Vaal River System (IVRS) is the largest and most economically vital system in the country, consisting of 14 dams with a combined capacity exceeding 10492.91Mm³. At the end of January 2026, the IVRS was at 99.6% of FSC, reflecting a recovery of +15.7% compared to 83.9% at the same time last year. The Orange Water Supply System, the second-largest, comprises only two dams yet holds 8 040.38 Mm³. At the end of January 2026, the storage level of the Orange System was at 96.7% of FSC, marking a significant increase of +21.4% from the previous year. These significant year-on-year improvements in dam levels are largely attributed to the above-average rainfall received earlier this year.

Table 4: Water Supply Systems storage levels January comparisons

Water Supply Systems/ Clusters	Full Supply Capacity in 10 ⁶ m ³	26 January 2025 (% FSC)	19 January 2026 (% FSC)	26 January 2026 (% FSC)	System Description
Algoa System	281.57	78.3	47.3	46.2	Five dams serve the Nelson Mandela Bay Metro, Sarah Baartman (SB) DM, Kouga LM and Gamtoos Irrigation: <ol style="list-style-type: none"> 1. Kromrivier Dam 2. Impofu Dam 3. Kouga Dam 4. Loerie Dam 5. Groendal Dam
Amathole System	240.88	98.5	88	87.1	Six dams serve Bisho & Buffalo City, East London: <ol style="list-style-type: none"> 1. Laing Dam 2. Rooikrans Dam 3. Bridle Drift Dam 4. Nahoon Dam 5. Gubu Dam 6. Wriggleswade Dam
Klipplaat System	57.09	86	93.1	91.9	Three dams serve Queenstown (Chris Hanu DM, Enoch Ngijima LM): <ol style="list-style-type: none"> 1. Boesmanskrantz Dam 2. Waterdown Dam 3. Oxkraal Dam
Butterworth System	14.43	99.8	88.5	87.2	<u>Xilinx Dam and Gcuwa weirs serve Butterworth</u>
Integrated Vaal River System	10492.91	83.9	99.6	99.6	14 dams serve Gauteng, Sasol, and ESKOM: <ol style="list-style-type: none"> 1. Vaal Dam 2. Grootdraai Dam 3. Sterkfontein Dam 4. Bloemhof Dam 5. Katse Dam 6. Mohale Dam 7. Woodstock Dam 8. Zaaihoek Dam 9. Jericho Dam 10. Westoe Dam 11. Morgenstond Dam 12. Heyshope Dam 13. Nooitgedacht Dam 14. Vygeboom Dam
Luvuvhu	224.75	99.1	109.1	103	Three dams serve Thohoyandou: <ol style="list-style-type: none"> 1. Albasini Dam 2. Vondo Dam 3. Nandoni Dam
Bloemfontein	219.6	69.5	78.6	79.6	Four dams serve Bloemfontein, Botshabelo and Thaba Nchu: <ol style="list-style-type: none"> 1. Rustfontein Dam 2. Groothoek Dam 3. Welbedacht Dam 4. Knellpoort Dam

Water Supply Systems/ Clusters	Full Supply Capacity in 10 ⁶ m ³	26 January 2025 (% FSC)	19 January 2026 (% FSC)	26 January 2026 (% FSC)	System Description
Polokwane	254.27	102.2	104.7	103.7	<u>Two dams serve Polokwane</u> <u>1. Flag Boshielo Dam</u> <u>2. Ebenezer Dam</u>
Crocodile West	443.39	89	92.4	94.5	<u>Seven dams serve Tshwane up to Rustenburg:</u> <u>1. Hartbeespoort Dam</u> <u>2. Rietvlei Dam</u> <u>3. Bospoort Dam</u> <u>4. Roodeplaat Dam</u> <u>5. Klipvoor Dam</u> <u>6. Vaalkop Dam</u> <u>7. Roodekopies Dam</u>
uMgeni System	920.9	91.3	100.7	100.2	<u>Five dams serve Ethekwini, iLembe & Msunduzi:</u> <u>1. Midmar Dam</u> <u>2. Nagle Dam</u> <u>3. Albert Falls Dam</u> <u>4. Inanda Dam</u> <u>5. Spring Grove Dam</u>
Cape Town System	889.3	81.8	63.9	61.7	<u>Six dams serve the City of Cape Town:</u> <u>1. Voelvllei Dam</u> <u>2. Wemmershoek Dam</u> <u>3. Berg River Dam</u> <u>4. Steenbras-Lower Dam</u> <u>5. Steenbras-Upper Dam</u> <u>6. Theewaterskloof Dam</u>
Crocodile East	158.65	85.6	102.9	101.6	<u>Kwena Dam supplies Nelspruit, Kanyamazane, Matsulu, Malelane and Komatipoort areas & Surroundings</u>
Orange	8 040.38	75.3	97.2	96.7	<u>Two dams service parts of the Free State, Northern and Eastern Cape Provinces:</u> <u>1. Gariiep Dam</u> <u>2. Vanderkloof Dam</u>
uMhlathuze	301.25	95.4	100.2	100.1	<u>Goedertrouw Dam supplies Richards Bay, Empangeni Towns, small towns, surrounding rural areas, industries and irrigators, supported by lakes and transfer from Thukela River</u>

Extreme Weather Events – January 2026

The provinces of Mpumalanga and Limpopo, bordering Mozambique, have experienced above-normal rainfall since the onset of the rainfall season, largely due to a persistent low-pressure system affecting north-eastern South Africa. This prolonged period of heavy rainfall culminated in January 2026, when severe flooding caused extensive infrastructure damage and resulted in several fatalities.

On 13 January 2026, SAWS issued several severe weather warnings, including Orange Level 6 and 9 warnings for disruptive rainfall, for the eastern regions of Mpumalanga and Limpopo. The warnings reflected growing concerns about the severe weather impacts as rainfall continued to intensify across the region. Subsequently, some areas of Mpumalanga and Limpopo experienced high amounts of rainfall. On 15 January, after several days of heavy rainfall and with more heavy rain forecasted, SAWS issued a Red Level 10 warning for disruptive rainfall in these provinces, specifically for the high-risk zones of Vhembe, Mopani, and Bushbuckridge (Figure 9). The Red Level 10 warning marked an escalation from the already in-place Orange Level 9 warnings. On January 17, 2026, the South African Government declared a national state of disaster due to severe flooding in the Limpopo and Mpumalanga provinces, marking the escalation of a rapidly deteriorating situation that exceeded the capacity of provincial responses.

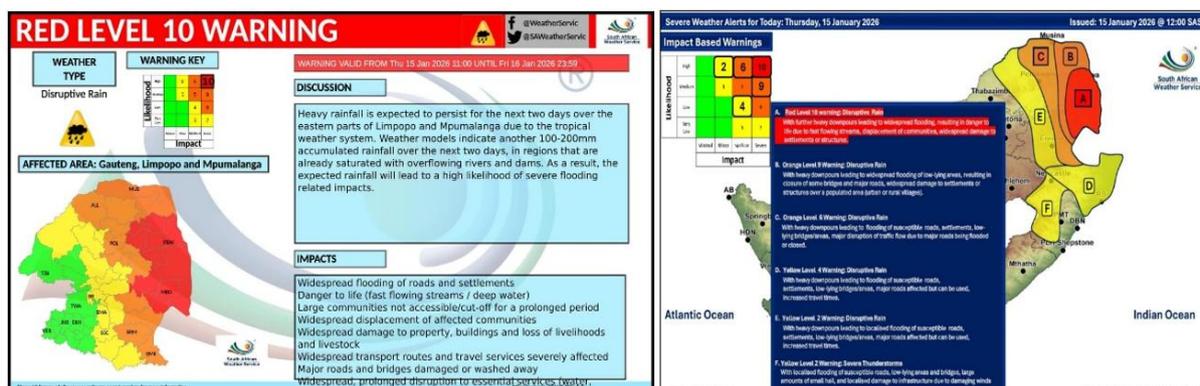


Figure 9: Red Level 10 Warning (SAWS, 2026) Issued 15 January.

Accumulated Rainfall

SAWS reports on accumulated rainfall for 11 to 12 January 2026 indicate that heavy rainfall (100-200 mm) was concentrated mainly over parts of eastern Limpopo and eastern Mpumalanga, including Maruleng, Ba-Phalaborwa, Bushbuckridge, Nkomazi and the City of Mbombela. The extended accumulation period from 11 to 13 January 2026 indicates that a larger portion of the eastern Limpopo and Mpumalanga recorded 100-200 mm, with isolated areas in the far northern parts of Limpopo exceeding 200mm (Figure 10). These high accumulations resulted in significant runoff, leading to widespread flooding across the affected regions, as repeated rainfall impacted the same areas over several days.

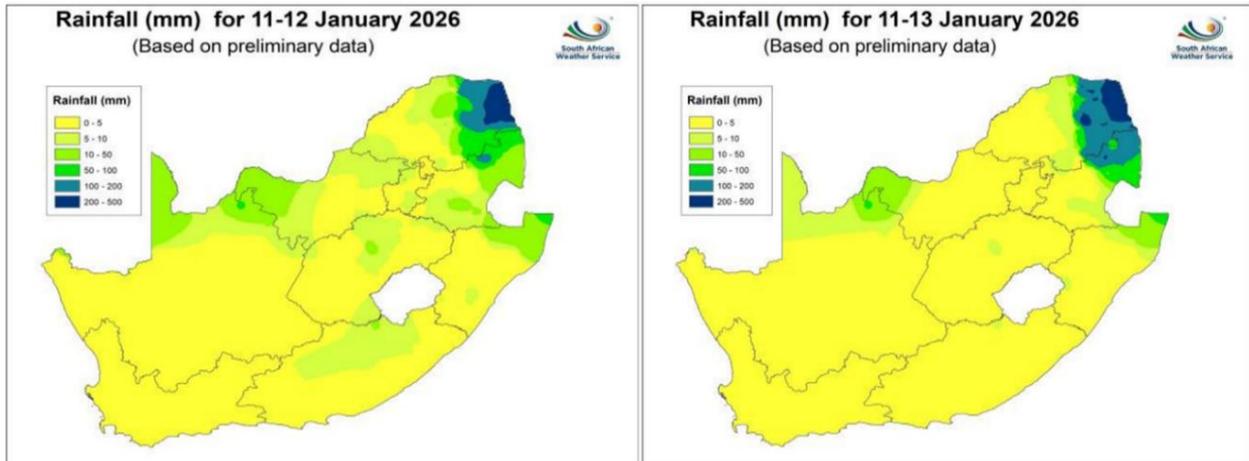


Figure 10: Observed rainfall accumulation maps.

Due to the sustained severe rainfall over the region, on 14 January 2026, several dams within the Letaba, Luvuhu and Limpopo River basin were operating above their full supply levels. This resulted in high spillway activity and sustained water releases into the downstream river systems.

Severely Overfull Dams ($\geq 105\%$ FSC)

- Nsami Dam (128.54%)
- Merensky Dam (120.59%)
- Nzhelele Dam (114.47%)
- Tzaneen Dam (108.64%)
- Vergelegen Dam (106.99%)
- Modjadji Dam (105.60%)
- Thabina Dam (105.46%)
- Nandoni Dam (105.25%)
- Magoebaskloof Dam (105.22%)
- Mutshedzi Dam (105.39%)

Dams at or Slightly Above Full Capacity (100–104.9% FSC)

- Glen Alpine Dam (103.72%)
- Luphephe Dam (102.07%)
- Nwanedzi Dam (102.20%)
- Dap Naude Dam (100.00%)
- Ebenezer Dam (103.04%)

Impacts of Flooding in Limpopo and Mpumalanga

Heavy rainfall and flooding affected several districts in Limpopo (Vhembe, Mopani, Sekhukhune, Waterberg, and Capricorn) and Mpumalanga (Nkomazi, Thaba Chweu, Mbombela, and Bushbuckridge), as well as the Kruger National Park, where rest camps and roads were submerged, prompting the evacuation of 631 people, including tourists and staff. In response to these impacts, on 19 January 2026, the Government of the Republic of South Africa declared a state of National Disaster

due to severe flooding, citing widespread loss of life, infrastructure damage, displacement, and major disruptions to schooling, agriculture, and basic services.

By 22 January, 38 flood-related fatalities had been reported, 20 in Mpumalanga and 18 in Limpopo. The floods caused extensive infrastructure damage, with around 1,942 houses affected in Limpopo and 1,808 in Mpumalanga, alongside significant damage to roads and bridges (Figure 11). Overall, the damage to homes, schools, roads, and bridges was estimated at R1.7 billion (South African Government, 2026).



Figure 11: Flooded Areas (source: News 24, 16 January 2026).

The relationship between Electrical Conductivity and Total Dissolved Solids

Electrical Conductivity and Total Dissolved Solids are closely related water quality parameters that reflect the concentration of dissolved ions in water. Both indicators provide valuable insight into salinity, mineralisation, and the overall suitability of water for domestic, agricultural, industrial, and ecological uses.

Electrical Conductivity

Electrical Conductivity (EC) is a measure of water's ability to carry or conduct an electrical current. This ability depends on the presence and concentration of dissolved ions such as sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), sulphate (SO_4^{2-}), bicarbonate (HCO_3^-), and nitrate (NO_3^-). Pure water conducts electricity very poorly; therefore, higher EC values indicate higher concentrations of dissolved ionic species. Temperature directly affects conductivity by increasing the solubility and ionic mobility of salts and minerals. It is for this reason that EC measurements require standardisation to 25 °C for comparison of data sets. The SI (International System of Units) unit of an EC measurement is milliSiemens per metre (mS/m) or microSiemens per centimetre ($\mu\text{S}/\text{cm}$). In water quality management, EC is used as a rapid, cost-effective indicator of salinity, mineral content, and potential pollution from sources such as wastewater discharges, agricultural runoff, industrial effluents, and acid mine drainage.

Total Dissolved Solids

Total Dissolved Solids (TDS) refer to the combined mass of all inorganic and organic substances that are dissolved in water and small enough to pass through a 0.45 μm filter. This includes mineral salts (such as sodium chloride), metals (such as iron and manganese), cations (like calcium, magnesium, sodium, and potassium), anions (including chloride, sulphate, nitrate, carbonate, and bicarbonate), and small amounts of dissolved organic matter (such as pesticides and decomposing vegetation). TDS is typically expressed in milligrams per litre (mg/L) or parts per million (ppm). In laboratory settings, TDS is measured gravimetrically by evaporating a filtered water sample and weighing the remaining residue. However, since this method can be time-consuming, TDS can be estimated from EC using an empirical conversion factor.

The Relationship and Water Quality Significance

The relationship between EC and TDS is based on the fact that dissolved ionic species contribute both to electrical conductivity and to the mass of dissolved solids in water. In general, as the concentration of dissolved ions increases, both EC and TDS increase proportionally. For this reason, EC is often used as a rapid and indirect method to estimate TDS. This linear relationship is represented as:

$$\text{TDS (mg/L)} = k \times \text{EC } (\mu\text{S}/\text{cm})$$

where k is a dimensionless conversion factor (constant of proportionality), typically ranging from 0.5 to 0.9 and is dependent on the type of water being analysed and its chemical constituents. South African water quality guides use an equivalent conversion factor of 6.5 when EC is expressed in mS/m, which corresponds to 0.65 when conductivity is expressed in $\mu\text{S}/\text{cm}$, recognising that this is a widely used approximation for inland natural waters (DWAF, 1996). Conductivity meters and other

measurement options either use a constant of 0.65 or an adjustable EC to TDS factor from 0.50 to 1.00 (ThermFischer Scientific, 2012). The strong correlation between EC and TDS makes EC a valuable and rapid indicator of salinity and mineralisation, while providing an indirect measure of the concentration of dissolved material. Understanding the relationship between EC and TDS is essential for effective water quality monitoring and interpretation.

Alignment with South African Water Quality Guidelines

EC and TDS are key indicators used to assess water suitability for domestic use, irrigation, livestock watering, and aquatic ecosystems. In domestic water supply, elevated TDS and EC may lead to undesirable taste issues, scaling in pipes and appliances, and reduced acceptability among consumers. In irrigation, elevated EC and TDS can negatively affect soil structure, reduce crop productivity, and impair water uptake by plants (Rengasamy, 2018). Additionally, aquatic ecosystems are also sensitive to changes in salinity, with elevated EC and TDS potentially leading to osmotic stress and shifts in species composition (Dildar, 2025). As a result, EC and TDS are routinely monitored in surface and groundwater systems across South Africa. They do not identify specific contaminants, but they provide early warning of changes in water chemistry, salinity intrusion, pollution events, or geochemical influences. As such, they are routinely included in baseline assessments, compliance monitoring, and long-term water resource management programmes. According to the Guidelines for Drinking Water Quality as per SANS 241: 2015: 2, the acceptable limits for EC and TDS are:

- Electrical Conductivity (mS/m at 25 °C): ≤ 170
- Total Dissolved Solids (TDS, mg/L): ≤ 1200

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Glossary

Term	Definition
DM	District Municipality
DWS	Department of Water and Sanitation
EC	Electrical Conductivity
ENSO	El Niño-Southern Oscillation
FSC	Full Storage Capacity
IVRS	Integrated Vaal River System
SAWS	South African Weather Services
SPI	Standardised Precipitation Index. A widely used index to characterise meteorological drought on a range of timescales. On short timescales, the SPI is closely related to soil moisture, while at longer timescales, the SPI can be related to groundwater and reservoir storage
TDS	Total Dissolved Solids
WSS	Water Supply System. A typical town/city water supply system consists of a gravity or pumping-based transmission and distribution system from a local or distant water source, with a needed water treatment system

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