December 2025

MONTHLY STATE OF WATER BULLETIN

WATER IS LIFE - SANITATION IS DIGNITY

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

Overview

The South African Weather Services (SAWS) Seasonal Climate Watch December 2025 report indicates that the El Niño-Southern Oscillation (ENSO) is transitioning from a neutral state into a weak La Niña state (SAWS, 2025). SAWS prediction further indicates that we are moving towards a weak La Niña event during the summer season. The weak La Niña will be short-lived during mid- and late summer. The typical effect of the predicted La Niña state on South Africa during summer is an increased likelihood of above-normal rainfall over the northeastern parts of the country.

December 2025 rainfall patterns generally aligned with climatological expectations across the summer rainfall region. The first 10 days of December 2025 were relatively dry nationwide, following heavy rainfall during the last 10 days of November 2025. Evidently, the second 10-day period of December showed a marked increase in rainfall percentage of normal rainfall across the country, extending even to the Western Cape. Large areas of the Northern Cape and Eastern Cape.

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 5. The graph shows that at the end of December 2025, the national dam levels were 95% of Full Supply Capacity (FSC). This level is 21.5% higher than at the same time last year, when the overall storage level was at 73.5% of FSC. At the end of December 2025, the IVRS was at 100.8% of FSC, reflecting a substantial recovery of +30.7% compared to 70.1% at the same time last year. Meanwhile, the storage level of the Orange System was at 100.7% of FSC, marking a +25.8% increase 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.

The SPI drought map shows that only a small part of the Sarah Baartman District Municipality (DM) in the Eastern Cape experienced extreme drought in the last 24 months. Additionally, some parts of Sarah Baartman, Chris Hani, and Ehlanzeni District Municipalities indicated a severe drought status.

Gauteng experienced intense and fast-developing thunderstorms in December 2025, driven by strong convective activity typical of the summer rainfall belt. Severe storms produced large hailstones across the East Rand and Pretoria North, causing widespread damage to vehicles, homes, and infrastructure. The South African Weather Service issued multiple Level 4 warnings as unstable atmospheric conditions intensified hail, flooding, and strong winds. Storm activity persisted throughout mid-December, extending its impacts into neighbouring provinces.

In the Water Quality segment, we explore Radioactivity and its significance in water quality. Radioactivity in water resources originates from natural minerals in rocks and soils as well as human activities such as mining, nuclear energy production and medical radioisotope use. South Africa's geology and historic mining make its water resources particularly vulnerable to radioactive contamination. Exposure to radionuclides over time can lead to health risks, including cancer, kidney damage and genetic effects. Monitoring relies on testing for gross alpha and beta activity, radon and specific radionuclides according to national and international standards. Technologies such as reverse osmosis, ion exchange, coagulation–filtration and aeration are used to remove radioactive pollutants and protect water quality.

Rainfall

In the previous report, SAWS Seasonal Forecasts projected that over two-thirds of South Africa would receive above-normal rainfall in December 2025, January, and February 2026.

Figure 1 shows that December 2025 rainfall patterns generally aligned with climatological expectations across the summer rainfall region. The first 10 days of December 2025 were relatively dry nationwide, following very heavy rainfall during the last 10 days of November 2025. Evidently, the second 10-day period of December showed a marked increase in rainfall percentage of normal rainfall across the country, extending even to the Western Cape. Large areas of the Northern Cape and Eastern Cape. The monthly rainfall percentage of normal rainfall for December 2025, shows that a significant part of the Northern Cape received over 200% more rainfall than normal.

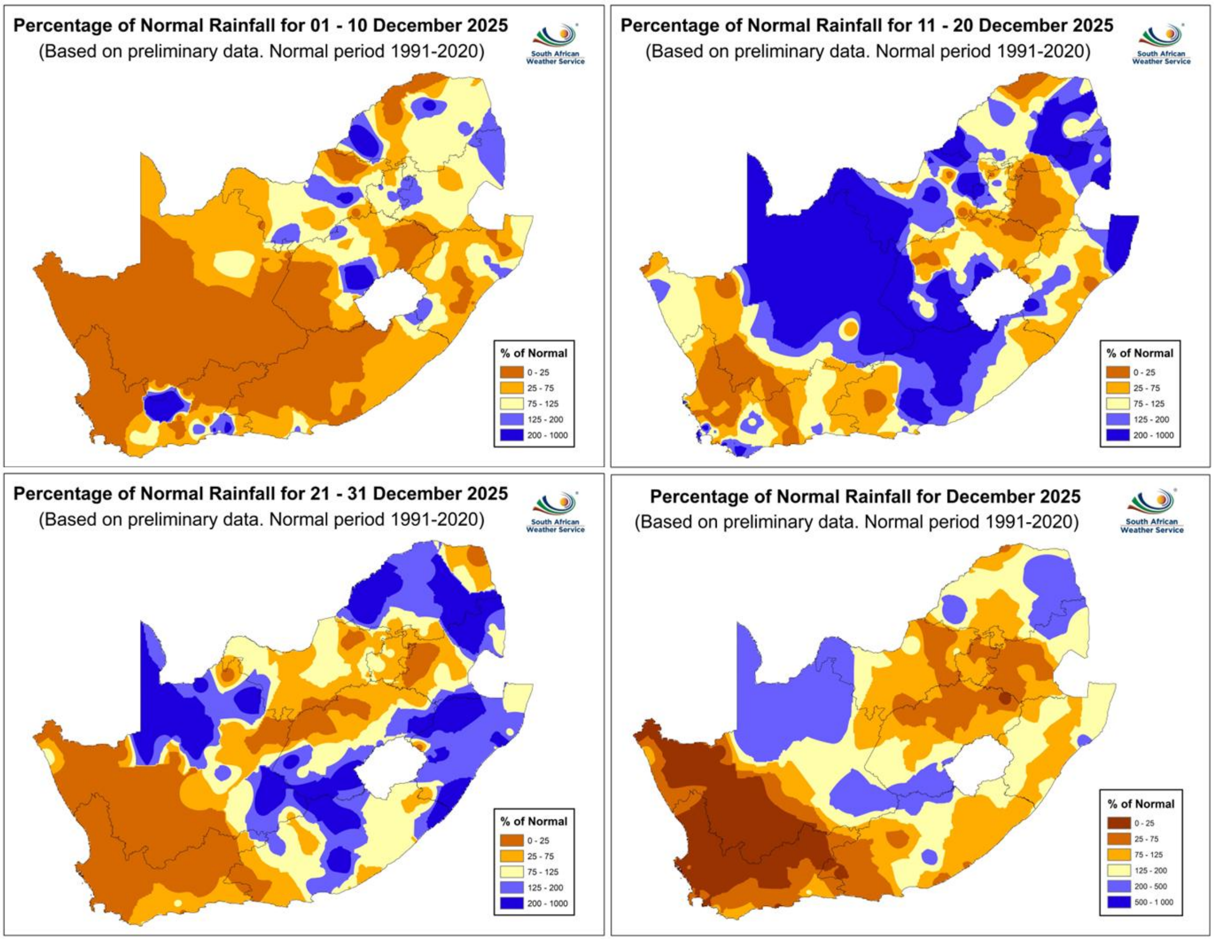


Figure 1: Percentage of normal rainfall distribution for December 2025.

Weather Forecast and Early Warning

Weather significantly impacts water resources by altering quantity, quality, and availability through changes in temperature, precipitation, and extreme events, causing issues. 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 also affect water availability. The South African Weather Services (SAWS) Seasonal Climate Watch December 2025 report indicates that the El Niño-Southern Oscillation (ENSO) is transitioning from a neutral state into a weak La Niña state (SAWS, 2025). SAWS prediction further indicates that we are moving towards a weak La Niña event during the summer season. The weak La Niña will be short-lived during mid- and late summer. The typical effect of the predicted La Niña state on South Africa during summer is an increased likelihood of above-normal rainfall over the northeastern parts of the country. Most of these areas are expected to receive above-normal rainfall during the forecast period up until late summer (Figure 2).

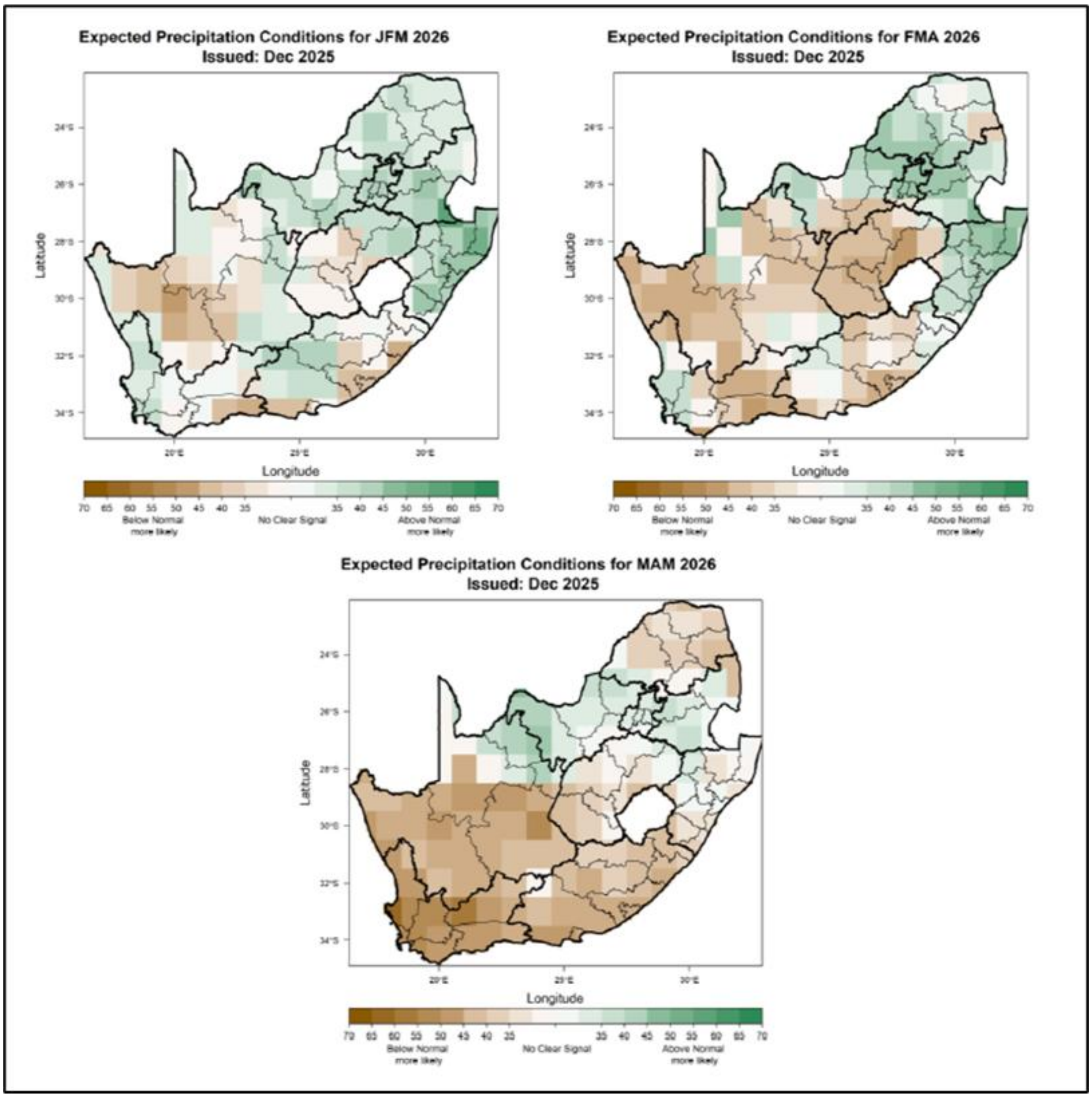


Figure 2: January-February-March 2026 (JFM; left), February-March-April 2026 (FMA; right), March-April-May 2026 (MAM; bottom) seasonal precipitation prediction. (Source: SAWS, 2025).

The SAWS 2025 report also indicates that minimum temperatures are largely expected to be above-normal for most parts of South Africa during summer, with maximum temperatures indicating an uncertain direction during late-summer and early-autumn (Figure 3). Furthermore, maximum temperatures are expected to be above normal for most of the country during mid-autumn.

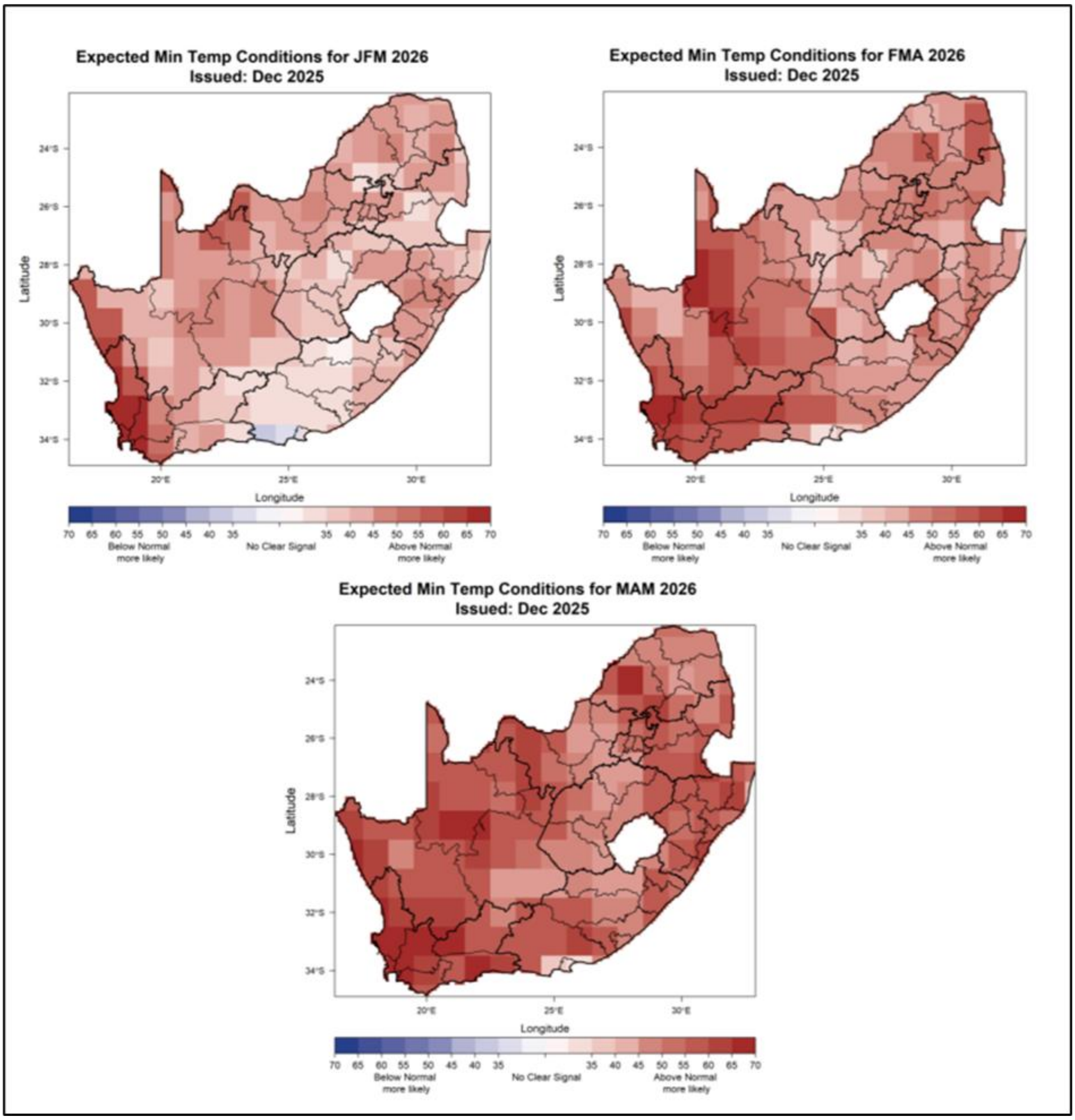


Figure 3: January-February-March 2026 (JFA; left), February-March-April 2026 (FMA; right), March-April-May 2026 (MAM; bottom) seasonal minimum temperature prediction. (Source: SAWS, 2025).

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 December 2025, the national dam levels were 95% of Full Supply Capacity (FSC). This level is 21.5% higher than at the same time last year, when the overall storage level was at 73.5% of FSC (Table 1). The dam levels have been above 90% FSC since April 2024.

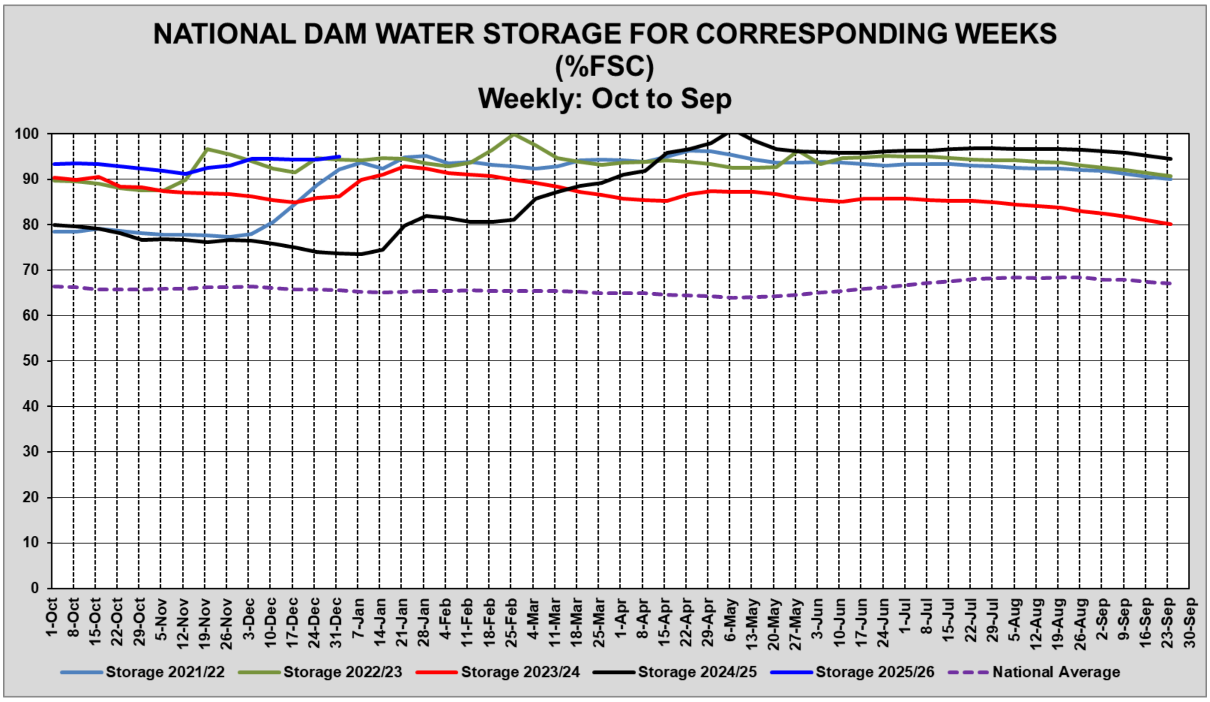


Figure 4: Weekly National Dam Storage at the end of December 2025, for five hydrological years.

Table 1 show a summary of the status of 219 South African dams, plus three dams from the Kingdoms of Eswatini and Lesotho. Based on 29 December 2025 dam data, at least 102 of 222 national dams were above 100% of FSC, and four (<4%) dams were below 10% of FSC (critically low). Gauteng dam levels remain above 103%, which is 19.3% higher than last year, at the same time. Figure 5 further shows the spatial distribution of the 222 national dams and their respective Water Supply Systems.

Table 1: National Surface Water Storage –29 December 2025.

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%	>=10%<50%	>=50%<100%	>=100%	Last Year 29/12/2024	Last Week 22/12/2025	This Week 29/12/2025
Kingdom of Eswatini	333.75	1				1	66.6	100.6	100.6 =
Eastern Cape	1 727.66	46		5	30	11	82.0	74.7	75.5 ↑
Free State	15 656.90	21		1	7	13	69.0	99.5	100.5 ↑
Gauteng	128.08	5				5	83.8	103.2	103.1 ↓
KwaZulu-Natal	4 909.66	19			7	12	79.4	91.2	91.3 ↑
Kingdom of Lesotho	2 362.63	2				2	81.6	101.4	101.2 ↓
Limpopo	1 484.64	29	1	2	6	20	68.8	86.1	89.4 ↑
Mpumalanga	2 538.20	22			7	15	77.6	99.9	100.0 ↑
Northern Cape	146.33	5			2	3	71.7	100.1	103.8 ↑
North West	866.23	28			9	19	57.4	98.2	96.6 ↓
Western Cape - Other Rainfall	269.61	22	3	15	4		86.6	33.4	32.7 ↓
Western Cape - Winter Rainfall	1 596.80	22			21	1	84.6	70.0	68.0 ↓
Western Cape - Total	1 866.41	44	3	15	25	1	84.9	64.7	62.9 ↓
Grand Total:	**32 020.50**	**222**	**4**	**23**	**93**	**102**	**73.5**	**94.4**	**95.0 ↑**

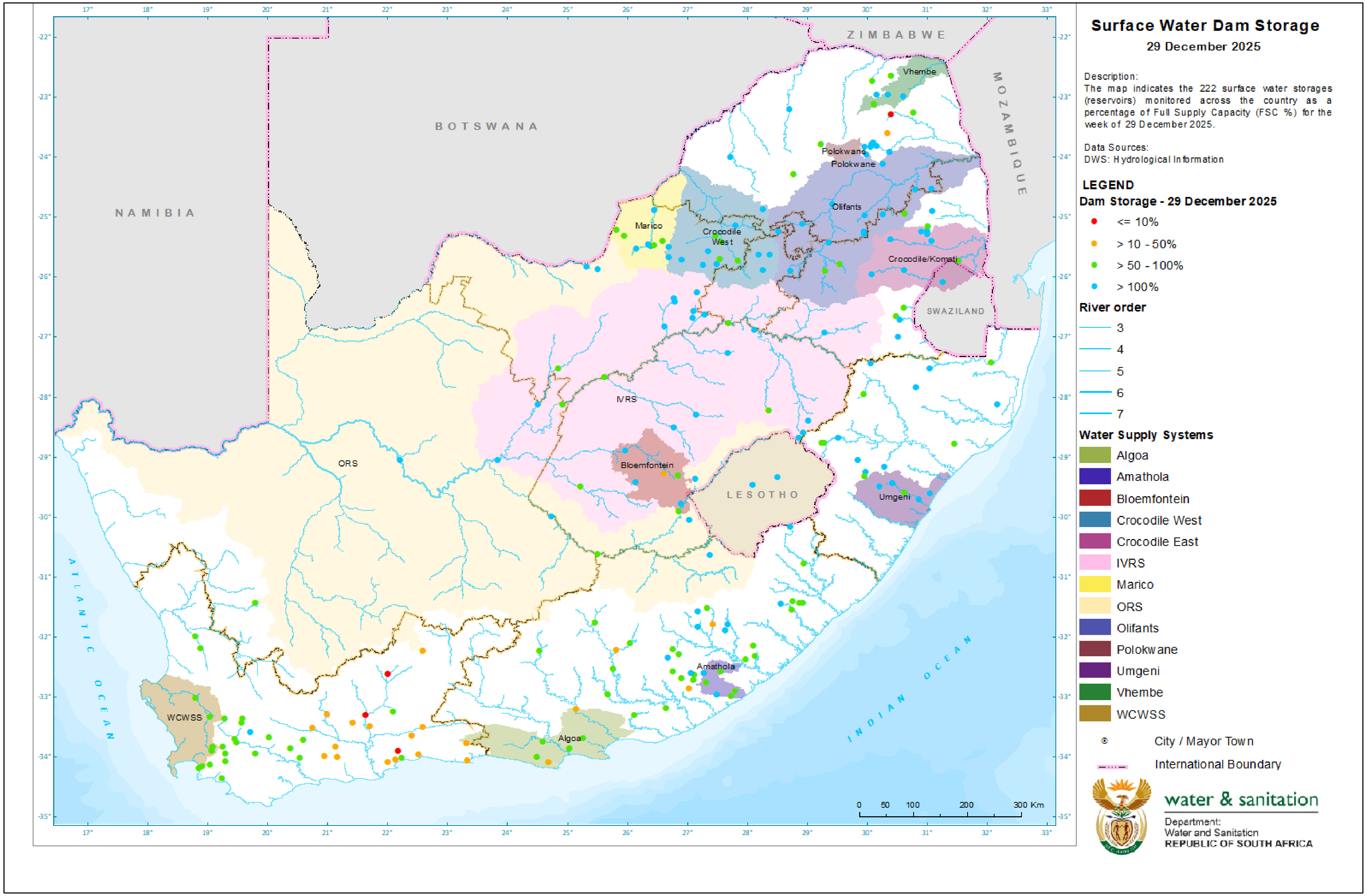
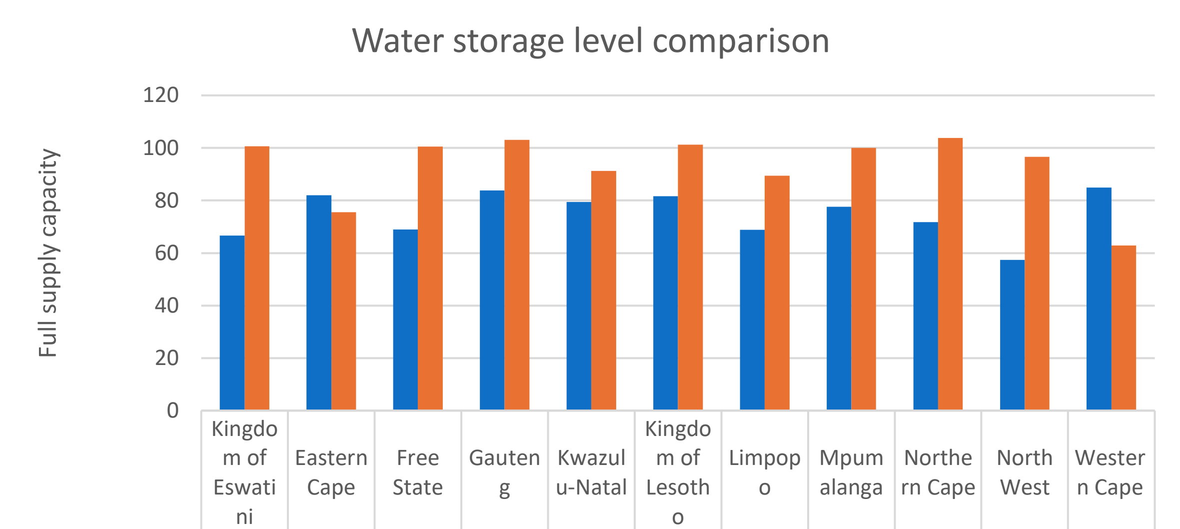


Figure 5: Surface Water Storage Levels – December 2025.

The comparison of the storage levels per province (plus the Kingdoms of Eswatini and Lesotho) for December 2024 and December 2025 is graphically presented in Figure 6. The North West is showing the most significant increase of 39.2%, 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 Northern Cape (+32.1%), Free State (+31.5%), Gauteng (+19.3%), and Mpumalanga (+22.4%) of FSC. The Kingdoms of Eswatini and Lesotho experienced increases of 34% and 19.6%, respectively, compared to the previous year.



	Kingdom of Eswatini	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Kingdom of Lesotho	Limpopo	Mpumalanga	Northern Cape	North West	Western Cape
2024-Dec-29	66.6	82	69	83.8	79.4	81.6	68.8	77.6	71.7	57.4	84.9
2025-Dec-29	100.6	75.5	100.5	103.1	91.3	101.2	89.4	100	103.8	96.6	62.9

Figure 6: Water Storage Levels December 2024 vs. December 2025.

The comparison between December 2024 and December 2025 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)	29 December 2024 (% FSC)	29 December 2025 (% FSC)	Difference (%)
Gariep Dam	Orange River	Free State	4 903.45	71.3	99.9	+28.6
Vanderkloof Dam	Orange River	Free State & Northern Cape	3 136.93	80.5	102.1	+21.6
Sterkfontein Dam	Nuwejaarspruit River	Free State	2 616.90	97.9	100.2	+2.3
Vaal Dam	Vaal River	Free State	2 560.97	24.3	103.6	+79.3
Pongolapoort Dam	Phongolo River	KwaZulu-Natal	2 395.24	73.1	84.0	+10.9

The surface water storage levels at the five major dams in the country exceed 80%, with Gariep and Vaal Dam showing increases of 28.6% and 79.3%, respectively, compared to the previous year. In December 2024, the Vaal dam experienced critically low storage levels and was at 24.3% of FSC.

However, by the end of March 2025, the dam's storage levels had increased to 107.3% of FSC and has remained above 100% FSC since then.

Another year-on-year improvement was observed in the critical level category at the Middle-Letaba Dam in Limpopo, which rose from below 1.1% to 8.3% of FSC at the end of December 2025 (Table 3).

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

Reservoir	River	Province	Full Supply Capacity (Mm^3)	29 December 2024 % FSC)	29 December 2025 (% FSC)	Difference (%)
Middel-Letaba Dam	Middel-Letaba River	Limpopo	171.93	1.1	8.3	+7.2

District Municipalities

Figure 7 presents the 24-month Standardised Precipitation Index (SPI) map analysed at the end of November 2025 alongside December 2025 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 Ehlanzeni 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 Sedibeng DM experienced the most significant increases (>70%) in dam storage levels in December 2025, followed by Capricorn DM and Fezile Dabi DM (>40%). Also noteworthy, the Central Karoo and Eden DM experienced a significant annual decline (>-50%) in dam levels.

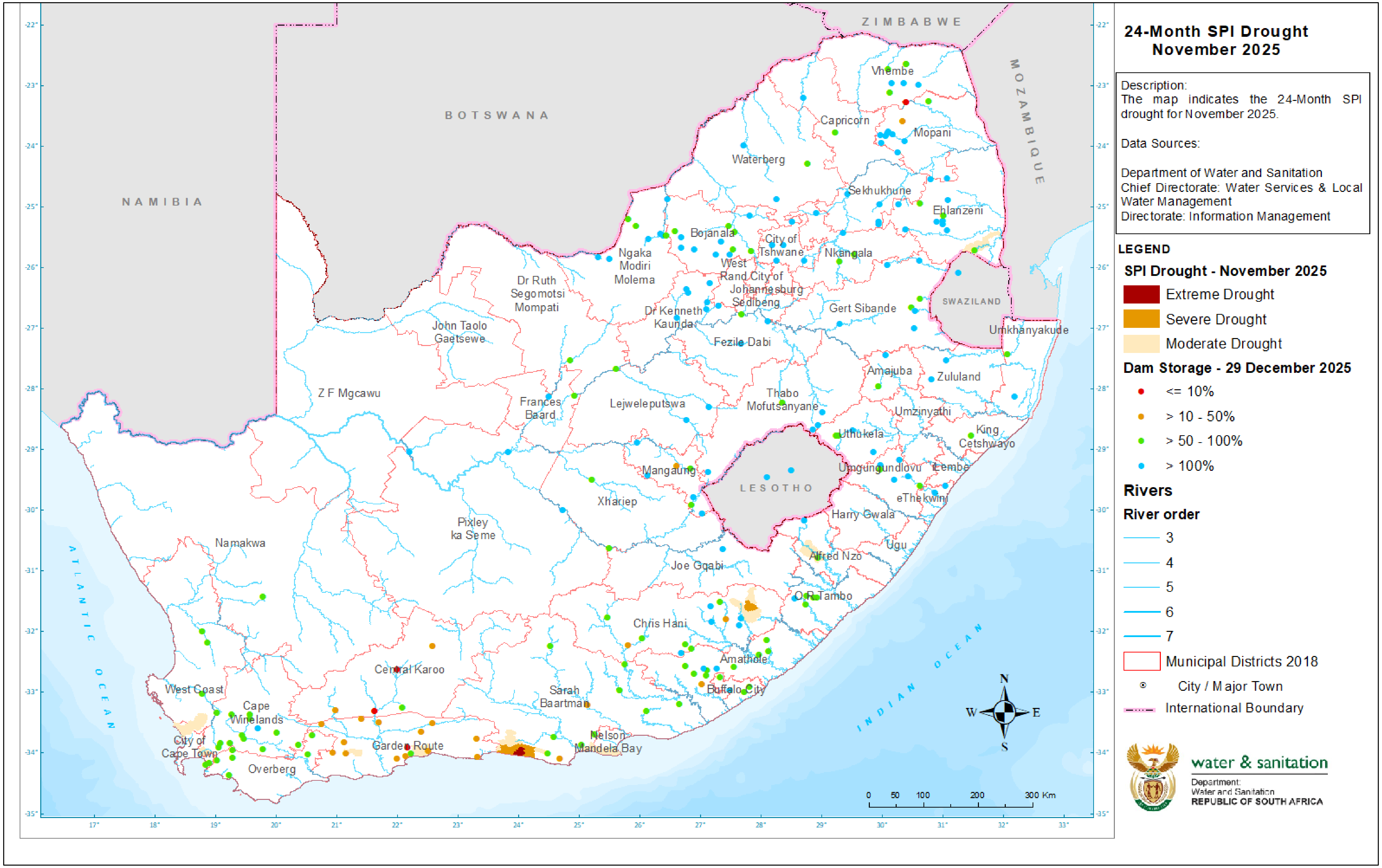


Figure 7: 24-Month Standardised Precipitation Index (SPI) – November 2025, including dam levels - December 2025.

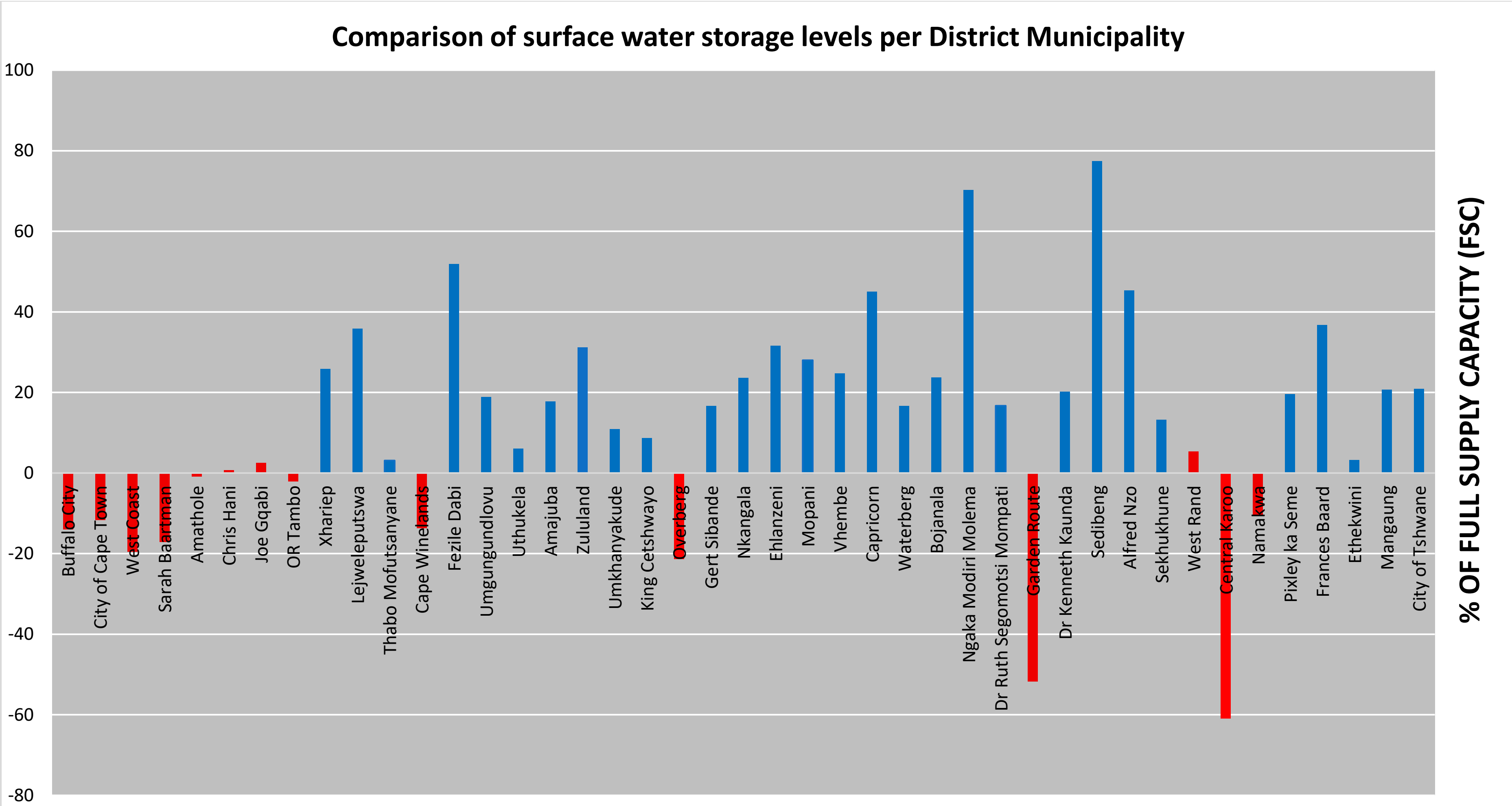


Figure 8: Comparison of water storage levels per District Municipality, December 2024 vs December 2025.

Water Supply Restrictions

The water supply systems and their respective restrictions are given in Table 4. Due to infrastructure limitations, permanent restrictions are applicable for the Polokwane and Bloemfontein Water Supply Systems.

Table 4: Water Supply Systems with Restrictions

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

The dam storage levels of South Africa's National Water Supply Systems are presented in Table 5. 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 10,574 Mm^3. At the end of December 2025, the IVRS was at 100.8% of FSC, reflecting a substantial recovery of +30.7% compared to 70.1% at the same time last year. The Orange Water Supply System, the second-largest, comprises only two dams yet holds over 7,996 Mm^3. At the end of December 2025, the storage level of the Orange System was at 100.7% of FSC, marking a +25.8% increase 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 5: Water Supply Systems storage levels December comparisons

Water Supply Systems/ Clusters	Capacity in $10^6 m^3$	29 Dec 2024 (% FSC)	22 Dec 2025 (% FSC)	29 Dec 2025 (% FSC)	System Description
Algoa System	143	82.4	52	50.8	Five dams serve the Nelson Mandela Bay Metro, Sarah Baartman (SB) DM, Kouga LM and Gamtoos Irrigation: 1. Kromrivier Dam 2. Impofu Dam 3. Kouga Dam 4. Loerie Dam 5. Groendal Dam
Amathole System	216	98.7	90.1	89.8	Six dams serve Bisho & Buffalo City, East London: 1. Laing Dam 2. Rooikrans Dam 3. Bridle Drift Dam 4. Nahoon Dam 5. Gubu Dam 6. Wriggleswade Dam
Klipplaat System	54	91.8	90.7	95.1	Three dams serve Queenstown (Chris Hani DM, Enoch Ngijima LM): 1. Boesmanskrantz Dam 2. Waterdown Dam 3. Oxkraal Dam
Butterworth System	13	95.4	92.3	92	Xilinxa Dam and Gcuwa weirs serve Butterworth
Integrated Vaal River System	10 574	70.1	100	100.8	14 dams serve Gauteng, Sasol, and ESKOM: 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	229	83.0	97	102	Three dams serve Thohoyandou: 1. Albasini Dam 2. Vondo Dam 3. Nandoni Dam
Bloemfontein	179	70.3	80.1	80.3	Four dams serve Bloemfontein, Botshabelo and Thaba Nchu: 1. Rustfontein Dam 2. Groothoek Dam 3. Welbedacht Dam 4. Knellpoort Dam

Water Supply Systems/ Clusters	Capacity in $10^6 m^3$	29 Dec 2024 (% FSC)	22 Dec 2025 (% FSC)	29 Dec 2025 (% FSC)	System Description
Polokwane	265	78.2	104.9	104.3	Two dams serve Polokwane 1. Flag Boshielo Dam 2. Ebenezer Dam
Crocodile West	417	77.4	97.7	94.0	Seven dams serve Tshwane up to Rustenburg: 1. Hartbeespoort Dam 2. Rietvlei Dam 3. Bospoort Dam 4. Roodeplaat Dam 5. Klipvoor Dam 6. Vaalkop Dam 7. Roodekopjes Dam
uMgeni System	928	85.9	97.3	100.7	Five dams serve Ethekwini, iLembe & Msunduzi: 1. Midmar Dam 2. Nagle Dam 3. Albert Falls Dam 4. Inanda Dam 5. Spring Grove Dam
Cape Town System	636	89.8	73.2	71.6	Six dams serve the City of Cape Town: 1. Voelvlei Dam 2. Wemmershoek Dam 3. Berg River Dam 4. Steenbras-Lower Dam 5. Steenbras-Upper Dam 6. Theewaterskloof Dam
Crocodile East	161	55.4	101.3	101.3	Kwena Dam supplies Nelspruit, Kanyamazane, Matsulu, Malelane and Komatipoort areas & Surroundings
Orange	8 098	74.9	99.6	100.7	Two dams service parts of the Free State, Northern and Eastern Cape Provinces: 1. Gariep Dam 2. Vanderkloof Dam
uMhlathuze	300	91	98.5	99.7	Goedertrouw Dam supplies Richards Bay, Empangeni Towns, small towns, surrounding rural areas, industries and irrigators, supported by lakes and transfer from Thukela River

Extreme Weather Events – December 2025

During the first week of December, Gauteng faced isolated to scattered chances of showers and thundershowers many of which intensified into severe systems capable of producing significant hail (SAWS, 2025a). The South African Weather Service (SAWS) frequently issued severe thunderstorm warnings during this time, highlighting the elevated risk of hail, flooding, and disruptive winds (Figure 9).

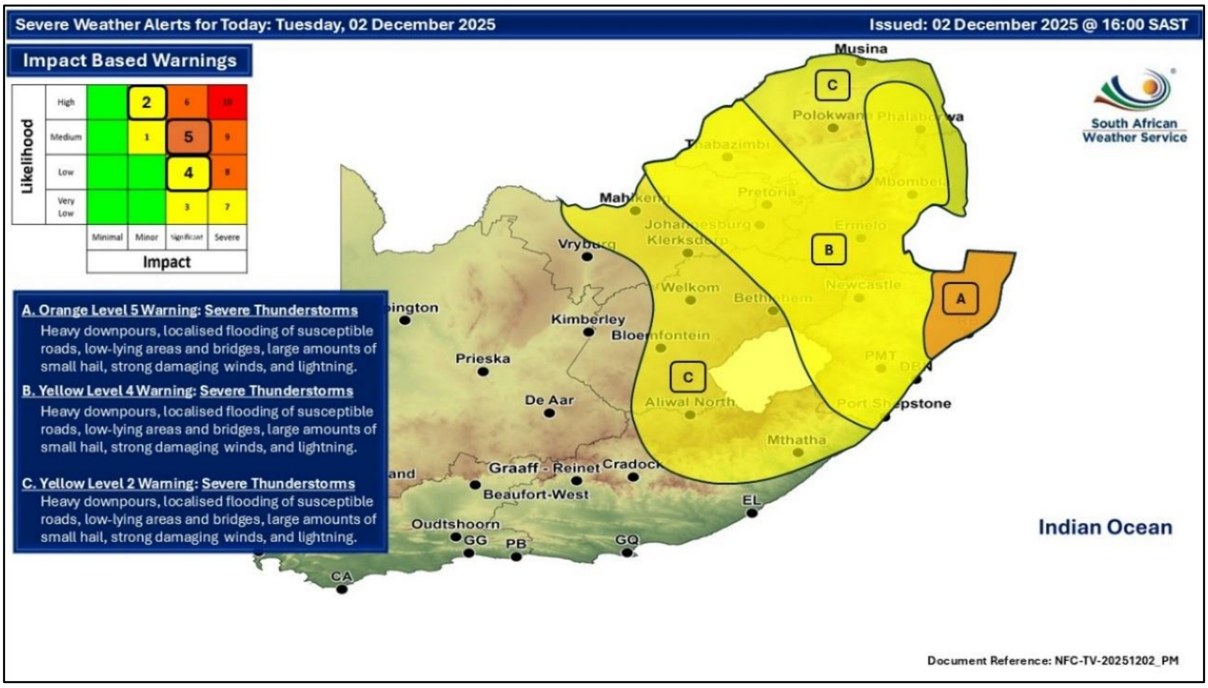


Figure 9: SAWS Level 4 warning map for Gauteng, 02 December 2025.

By mid-December, SAWS continued to forecast thunderstorms with hail for Gauteng, emphasizing persistent atmospheric instability. On 10 December 2025, an 60% chance of rainfall was predicted by SAWS for Johannesburg, culminating in late afternoon thunderstorms featuring hail, strong winds, and localised flooding. As the systems moved through, the province experienced ongoing storm activity that extended into surrounding regions, including Limpopo, North West, and Mpumalanga—areas often impacted by the same storm clusters that form over Gauteng.

December in Gauteng is well-known for intense, fast-developing thunderstorms that frequently produce damaging hail. Situated firmly within South Africa's summer rainfall belt, the province consistently becomes a focal point for extreme convective activity as the season progresses. In December 2025, severe thunderstorms swept across Gauteng, bringing large hailstones, torrential rain, and strong winds that resulted in widespread damage to property, infrastructure, and vehicles.

Large hailstones were particularly over the East Rand (Brakpan, Benoni, Springs, Kempton Park, Thembisa, and Boksburg) and Pretoria North (Daspoort, Wonderboom, and Sinoville) as depicted in Figure 10. The impacts in Gauteng were far-reaching and often immediate. Reports from social media indicated that hailstorms around Johannesburg and Pretoria caused road flooding, extensive vehicle damage, and property destruction, typical outcomes of summer storm patterns in the province. In some neighbourhoods, hail accumulated so heavily that it remained unmelted long after storms had passed, stressing the intensity and volume of ice produced within a short time frame (SAWS,2025a).

Figure 10: Extensive hail accumulation, reaching several centimetres in depth, covering entire road surfaces and residential areas (Source: Facebook).

These events often emerge from highly unstable atmospheric conditions that trigger powerful updrafts capable of forming and sustaining hail. These impacts align directly with what is typically associated with severe thunderstorms characterised by strong convective updrafts and intense storm-cell organisation (SAWS, 2025a).

Radioactivity and its significance in water quality

Radioactive elements are unstable atoms (radionuclides) that release excess energy to achieve a more stable state. As they transform into more stable forms, they emit ionising radiation. This process, known as radioactivity or radioactive decay, can happen over a wide range of timescales, from seconds to billions of years, depending on the element. The time that it takes for one-half of the radionuclides to disintegrate or decay is called the half-life of the radionuclide. There are three main types of radioactivity, classified by the nature of the emitted radiation:

- Alpha (α) radiation comprises heavy, positively charged particles with low penetrating power that can be shielded by a sheet of paper or the outer layer of skin.
- Beta (β) radiation involves lighter, negatively charged particles with moderate penetrating power, which can be shielded by a few millimetres of materials such as aluminium or plastic.
- Gamma (γ) radiation is high-energy electromagnetic radiation with no charge and high penetrating power, requiring dense materials like concrete or lead for shielding.

All elements have at least one radioactive isotope (radioisotope); some are naturally occurring, while others are synthetic. In South Africa, radioactivity holds particular significance due to its unique geology, rich in uranium and other radioactive minerals, and the extensive legacy of mining activities (Matshusa *et al*., 2017). Managing radioactivity is essential to safeguard public health and water resources.

Sources of radioactivity in water arise from natural and anthropogenic origins, with natural sources being globally dominant (He *et al*., 2022). Natural sources include geological formations that release radionuclides derived from uranium, thorium, and potassium into groundwater. Additionally, radon gas, which is a decay product of uranium, can infiltrate groundwater. Other naturally occurring radionuclides found in water include uranium, radium, lead-210, polonium-210, and radon-222 (South African Water Quality Guidelines, 1996). Anthropogenic sources include nuclear power generation, medical and research activities, mining and mineral processing (particularly uranium and gold mining), and industrial processes such as phosphate fertiliser production and coal combustion, all of which can introduce radioactive contaminants into surface and groundwater.

Health Implications of Radioactivity in Water

Low-level exposure to radionuclides in water rarely causes immediate and acute health effects, but prolonged exposure can increase health risks. These include cancers such as lung, bone, and kidney cancer, organ toxicity from radionuclide accumulation (e.g. iodine-131 in the thyroid), and potential reproductive or developmental effects at high exposure levels (Aluvihara et al., 2025)

Environmental Impacts of Radioactivity on Aquatic Plants, Animals and Ecosystems

Radioactivity can disrupt aquatic ecosystems by reducing photosynthesis and impairing plant growth. Aquatic animals may accumulate radionuclides, leading to DNA damage, reduced fertility, and increased mortality (Pradhoshini *et al*., 2023). This contamination can propagate through food webs via bioaccumulation and biomagnification (Zheng *et al*., 2025). Over time, this can reduce biodiversity, alter ecosystem structure and cause long-term ecological degradation.

Measuring Radioactivity in Water

Key monitoring parameters used for measuring radioactivity in water are gross alpha activity, gross beta activity, radon concentration (important in borehole water) and specific radionuclides such as uranium, tritium, cesium and strontium. Common laboratory techniques include liquid scintillation counting and spectrometry (e.g. Inductively Coupled Plasma Mass Spectrometry/ICP-MS is used to identify and measure the concentration of uranium isotopes and other specific radionuclides). Radioactivity is measured in Becquerels (Bq), with drinking water results reported in Bq/L. One Becquerel is defined as one radioactive decay or disintegration per second.

Regulatory guidelines for dissolved radionuclides in drinking water

The World Health Organisation (WHO) recommends an initial screening of drinking water samples for both gross alpha activity and gross beta activity with the following limits:

- Gross alpha activity: **≤ 0.5 Bq/L**
- Gross beta activity: **≤ 1.0 Bq/L**

It also recommends that if either of the screening limits is exceeded, then the concentrations of individual radionuclides should be determined and compared with regulatory limits. The SANS 241-1: 2015 2nd edition Drinking Water Quality Standard sets the limit for uranium concentration as **≤ 0.03 mg/L (30 µg/L)**.

Remediation and Treatment Technologies

Treatment technologies to remove radionuclides in water resources include ion exchange (effective for uranium and radium removal), reverse osmosis (highly effective for a broad range of radionuclides), coagulation and filtration (useful for radionuclides that bind to particulates), aeration (for removing gaseous radionuclides such as radon) and adsorption using activated carbon or special resins. A method to treat acid mine drainage for radioactivity involves raising the pH (neutralisation) with agents such as lime - $Ca(OH)_2$, or limestone - $CaCO_3$, to precipitate radioactive elements, which can then be removed by sedimentation and filtration (Baloyi *et al*., 2023).

Compiled by:

Hulisani Mafenya, Nokulunga Biyase, Anna Ramothello, Mirrander Ndhlovu, Thandekile Mbili, Judy Reddy, and Joshua Rasifudi

For technical inputs and inquiries:
Sub-Directorate: Integrated Water Resource Studies
Tel: 012 336 6856
Email: IntegratedWaterStudies@dws.gov.za

Accessible on the National State of Water Reporting Web page:
https://www.dws.gov.za/Projects/National%20State%20of%20Water%20Report/MonthlyBulletin.aspx

Department of Water and Sanitation
Private Bag X313
Pretoria
0001

Glossary

Term	Definition
DM	District Municipality
DWS	Department of Water and Sanitation
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
WHO	World Health Organisation
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

References

Aluvihara S, Pestano-Gupta F, Omar MH, Alam SF, Ghani AA, Hilonga A and Abdulaali HH. (2025). Water Contamination and Pollution Due to Radioactive Materials, Natural and Anthropogenic Sources, and Their Health Impacts: A Review. *Marine Biology and Environmental Sciences*.

Baloyi, J., Ramdhani, N., Mbhele, R., & Ramutshatsha-Makhwedzha, D. (2023). Recent Progress on Acid Mine Drainage Technological Trends in South Africa: Prevention, Treatment, and Resource Recovery. *Water*, *15*(19). https://doi.org/10.3390/w15193453

He, R., Liaw, S., Zhou, M., Zhou, X., & Luo, H. (2022). Environmental evaluation of radioactivity levels and associated radiation hazards in groundwater around the WIPP site. *Ecotoxicology and Environmental Safety*, *242*, 113849. https://doi.org/10.1016/j.ecoenv.2022.113849

Matshusa, K., & Makgae, M. (2017). Prevention of future legacy sites in uranium mining and processing: The South African perspective. *Ore Geology Reviews*, *86*, 70-78. https://doi.org/10.1016/j.oregeorev.2017.01.024

Pradhoshini, K. P., Priyadharshini, M., Santhanabharathi, B., Ahmed, M. S., Parveen, M. H. S., War, M. U. D., Musthafa, M. S., Alam, L., Falco, F., & Faggio, C. (2023). Biological effects of ionizing radiation on aquatic biota – A critical review. *Environmental Toxicology and Pharmacology*, *99*, 104091. https://doi.org/10.1016/j.etap.2023.104091

SAWS, 2025. Seasonal Climate Watch: January 2026 to May 2026 (Issued: 19 December 2025). SAWS, Centurion, South Africa.

SAWS, 2025a. Impact-Based Warning: Severe Thunderstorms Causes Havoc: 30 November 2025, issued 01 December 2025.

South African National Standard (SANS) 241-1: 2015 – Edition 2 Drinking Water.

South African Water Quality Guidelines, Volume 1: Domestic Water Use, 2nd edition, 1996.

WHO Guidelines for Drinking-Water Quality. 4th edition: 2022.

Zheng, B., Li, H., Wang, L., Yang, M., Li, C., Zheng, J., & Yang, H. (2025). Radionuclides in marine food web along China's coastal waters: Activity, distribution and trophic level bio-magnification. *Environmental Research*, *275*, 121370. https://doi.org/10.1016/j.envres.2025.121370

.