2 WATER RESOURCES DATA



2 WATER RESOURCES DATA

2. Surface Water Quantity Monitoring

The Department has established and operates a national surface water monitoring network along rivers, dams, estuaries, eyes, canals, and pipelines. The purpose of the national network is to monitor hydrological and hydro-meteorological conditions to enable water resource assessment, planning, water supply management, system operations, and flood forecasting. The summary structure of the surface water monitoring programme in the Department is shown in Figure 2.1. The programmes are divided into two: the first is a hydro-meteorological programme, which monitors evaporation and rainfall, and the second programme is hydrological monitoring, which entails streamflow and dam levels monitoring.



Figure 2.1: Summary structure of the surface water monitoring programmes as of September 2024.

The DWS regional offices have selected several monitoring primary stations equipped with real-time telemetry data transmission systems. These include monitoring stations for dams, evaporation, rainfall, and streamflow. Data is transmitted directly from the monitoring stations to the national office and DWS website in real time. It is made available for all stakeholders as unverified data.

• Dam Levels Monitoring

The national dam monitoring is conducted at a regional level, and the DWS regional officials collect dam gauge plate readings every Monday. Upon capturing the collected data, the national office is responsible for processing, verifying, and disseminating data to various stakeholders through a weekly dam levels bulletin and summary synopsis. The locality map of the dam level stations nationally is presented in Figure 2.2

• Evaporation and Rainfall Monitoring

Evaporation and rainfall monitoring stations are situated at dam sites. The evaporation and rainfall readings are taken daily, except for rain gauges equipped with automatic tipping buckets. Data collected from these monitoring stations are audited monthly and processed at the national office in three months.

• <u>Streamflow Monitoring</u>

The regional offices manage streamflow monitoring stations and are responsible for downloading data from the dataloggers. Several streamflow monitoring stations are equipped with real-time telemetry data transmission systems; data transmitted from these systems can be accessed at <u>www.dws.gov.za/hydrology</u>. The national surface water monitoring network for streamflow gauging stations is presented in Figure 2.3.



Figure 2.2: Dam levels monitoring stations network- September 2024.



Figure 2.3 National Streamflow Monitoring Network - September 2024

2.1.1. Surface Water Quantity Data Availability

The surface water monitoring network has 1 448 stations across all the provinces, as shown in Figure 2.4. At the end of the current reporting period, 1 126 stations were active with data, a slight improvement from the reported 1 123 active stations with data at the end of the 2022/23 hydrological year. All station types across provinces had remarkable data availability, with the Eastern Cape and Gauteng provinces having more than 90% data availability at the end of the reporting period. The national average data availability across all regions is currently 78%.



Figure 2.4 Summary of monitoring networks across South Africa as of September 2024

The station types per province in Figure 2.5 show a predominance of stations for river flow monitoring. However, the number of stations with available data for river flow monitoring has declined across all provinces in the current reporting period. Estuaries are monitored in coastal areas, and the country currently has 47 monitoring stations, the majority of which are in KwaZulu-Natal province. All provinces also had a reasonable number of active stations for reservoir monitoring, with the Western Cape, Gauteng, and Eastern Cape provinces leading, respectively.



Figure 2.5 Station types with available data per province as of September 2024

2.2. Surface Water Quality Monitoring Programmes

The Department of Water and Sanitation seeks to ensure that water resources remain fit for recognised water uses while also maintaining and protecting the viability of aquatic ecosystems. As a result, several water quality monitoring programmes are currently in operation across the country. This section outlines DWS water quality monitoring programmes, their objectives, distribution, and performance during the current reporting period.

2.2.1. National Chemical Monitoring Programme (NCMP)

NCMP provides information on the status and trends of inorganic chemical water quality in South Africa, primarily in rivers, on a national scale. It was established in the 1970s based on the information requirements and national priorities at the time and has been amended over the years to remain relevant to evolving needs. It is the longest-running South African water quality monitoring programme, which has provided data and information for over 50 years on the inorganic chemical quality of surface water resources at various sites across the length and breadth of the country.

Figure 2.6 shows the location of the 339 sites that currently constitute the Priority National Chemical Monitoring Programme (PNCMP). The main objectives of this national scale programme include:

- Having sufficient inorganic water quality data available to determine the status and trends in South African rivers at a national scale;
- Supporting the National River Eco-status Monitoring Programme (REMP); the United Nations Environmental Programme – Global Environmental Monitoring System (UNEP GEMS), and Sustainable Development Goals (especially SDG 6.3) initiatives;
- Contributing to the integrated overarching historical database; and
- The dissemination of data and information.

The NCMP monitoring sites are primarily located at the downstream end of each tertiary drainage region to assess the region's impact on water quality. Sites are also chosen for their strategic importance, such as interactions with neighbouring countries, participation in UNEP GEMS, and Sustainable Development Goals (SDG) initiatives, specifically SDG 6.3.2 on Ambient Water Quality. NCMP site selection seeks to preserve long and consistent data records.



Figure 2.6: Location of the PNCMP sites across South Africa as of September 2024.

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The NCMP assesses several parameters, including salinity (measured as Total Dissolved Solids (TDS) or Electrical Conductivity (EC). It also determines the concentrations of several substances, including iron (Fe), sodium (Na), chlorine (Cl), magnesium (Mg), potassium (K), sulphates (SO4), ammonium (NH4), and nitrate-nitrite (NO3 + NO2). The levels of ammonium and nitrate-nitrite provide information about nutrient loading from discharges,, and return flows into water resources. The programme has recently started sampling for trace metal constituents.

Sampling site visit compliance has improved significantly, reaching 72.3% in the current reporting period. This represents a significant increase in compliance rates over the previous three years. For instance, sampling compliance at NCMP sites was only 15.9% during the 2020/21 hydrological year, largely due to COVID-19 travel restrictions. The compliance improved to 42.2% in 2021/22 and slightly decreased to 40.5% in the 2022/23 hydrological year (Figure 2.7).



Figure 2.7: Percentage of Priority NCMP sites visited for sampling purposes over the past four hydrological years.

NCMP remains highly dependent on Regional Office officials, as well as staff at Water User Associations and Catchment Management Agencies, for sample collection. The laboratories at the Department of Water and Sanitation's Resource Quality Information Services (RQIS) directorate are essential for sample analysis, quality assurance, and data capture in the Water Management System (WMS) database. Sample Reception, a sub-directorate of RQIS, is essential for sending out the required supplies to samplers and receiving and logging samples sent to RQIS. These data and other resources available are to the public through the link: https://www.dws.gov.za/iwqs/wms/default.aspx.

2.2.2. National Eutrophication Monitoring Programme (NEMP)

The National Eutrophication Monitoring Programme (NEMP) monitors the status and trends in relation to nutrient enrichment of water bodies in South Africa, and it was established and officially implemented in 2002. The objective of the NEMP is to measure, assess and report regularly on the current trophic status and the nature of the current eutrophication problems for South African water resources. It also reports on the potential for future changes in the trophic status of dams/lakes and rivers in a manner to supports strategic decisions in respect of their national management, being mindful of financial and capacity constraints yet being soundly scientific. The NEMP provides frameworks for addressing the following six (6) objectives for impoundments (dams/lakes) and rivers:

- Establishing trophic status in dams/lakes
- Early warning system water treatment
- Early warning system blooms
- Early warning system invasive macrophytes
- Early warning system long-term impacts
- Nutrient balance

The programme has over 289 registered sites, including dams, lakes, and rivers. The dam sites are selected based on their strategic importance for the region, country, and international commitments. Sampling is conducted at the dam wall or near the abstraction or discharge point. River sites are mostly selected at points that represent the inflow to the dams monitored.

During the 2023/24 hydrological year, 118 sites were sampled for the NEMP (Figure 2.8). The programme has expanded significantly since its inception. The provinces that contributed to sampling compliance were Mpumalanga, Free State, Gauteng, Limpopo, Western Cape, KwaZulu-Natal, and North West. The Northern and Eastern Cape provinces showed improved sampling compliance. Samples were collected by DWS partners and stakeholders, including water boards, Water User Associations



(WUAs)/Irrigation Boards, and National Parks in a variety of water management areas (WMAs)/provinces.

Figure 2.8: NEMP data availability from the year 2019 to 2024.

• Optimized National Eutrophication Monitoring Programme (ONEMP)

Figure 2.9 displays the ONEMP sites across the country. The number of sites monitored in the ONEMP increased from 61 in the previous hydrological year to 82 for the current reporting period, with 21 new sites added across five provinces: Limpopo (5), North West (7), Mpumalanga (5), Gauteng (3), and one in KwaZulu-Natal. During the reporting period, 73 of the 82 monitored dams were assessed, yielding an impressive 89% compliance rate with the monitoring programme. This represents a significant improvement in ONEMP sampling, and plans are being implemented to improve sampling compliance even further.



Figure 2.9: Distribution of optimised NEMP sites across the country as of September 2024

2.2.3. National Microbial Monitoring Programme

The National Microbial Monitoring Programme (NMMP) aims to provide information on the status and trends of the extent of faecal pollution in terms of the microbial quality of surface water resources in priority areas in South Africa and to assess the potential health risks to humans associated with the possible use of faecal polluted water resources. The program was implemented nationwide in the year 2000 to report on the potential health risks associated with faecal pollution of surface water resources at nationally identified hotspots. An indicator bacteria (*E. coli* and or Faecal Coliform) is used to indicate the presence of other pathogens in water or as an indicator of faecal-contaminated water. The main objectives of the programme are to:

- Provide information on the status and trends of the extent of faecal pollution in terms of the microbial quality of surface water resources in high-priority areas and
- Provide information to help assess the potential health risk to humans associated with the possible use of faecal-polluted water resources at those sites.

The programme's primary emphasis is on national hotspots, and currently monitors 75 hotspot sites and is expanding. Figure 2.10 indicates that active NMMP sites increased from 52 to 75 between September 2023 and September 2024.



Figure 2.10: Active NMMP sites October 2022 – September 2024

The improvements were made possible by working with internal and external stakeholders such as the DWS Regional offices, eThekwini Municipality, the City of Johannesburg, the City of Cape Town, and the Olifants-Doorn Proto CMA. Figure 2.11

illustrates the spatial distribution of NMMP sites across the country. There are ongoing interactions with stakeholders to identify more sites to expand and improve the programme in other areas.



Figure 2.11: Spatial distribution of NMMP sites across the country.

2.2.4. River Eco-Status Monitoring Programme (REMP)

The South African River Health Programme (RHP) was initiated in 1994 in response to the need for more detailed information on the condition of South Africa's River ecosystems. The RHP was instituted before the promulgation of the National Water Act and, as such, did not align completely with the Act, so it was later replaced by the River Eco-status Monitoring Programme (REMP). The REMP enables monitoring of the ecological condition of river ecosystems in South Africa. It provides information regarding the ecological condition of river ecosystems to support the management of rivers and was designed to meet the following objectives:

- Measure, assess, and report the ecological status of river ecosystems;
- Detect and report spatial and temporal trends in the ecological status of river ecosystems;
- Identify and report emerging problems regarding river ecosystems;
- Ensure that all river ecosystem status reports provide scientifically relevant information for the management of these river ecosystems and
- Create public capacity and environmental awareness.

REMP is based on existing approved Eco-Status models such as the Index of Habitat Integrity (IHI), Fish Response Assessment Index (FRAI), Macroinvertebrate Response Assessment Index (MIRAI), Vegetation Response Assessment Index (VEGRAI), and Integrated Ecological Condition (Eco-Status), which are used in the ecological conditions assessment at the sub-quaternary reach or site levels. Monitoring is conducted quarterly, and technical reports are issued annually.

Figure 2.12 presents the spatial distribution of REMP sites across the country. A total of 138 sites have been consistently monitored from the 2016/17 hydrological year to the 2022/23 hydrological year. The annual number of sites monitored increased from 207 in 2016/17 to 503 in 2021/22.



Figure 2.12: Distribution of REMP sites in the 2022/23 hydrological year.

2.2.5. National Wetland Monitoring Programme (NWMP)

The National Wetland Monitoring Programme (NWMP) is a structured initiative designed to assess, monitor, and report on wetlands in South Africa. Its goals include analysing the extent of wetlands, identifying threats to their ecological status, and evaluating the ecosystem services these wetlands provide (Wilkinson *et al.*, 2016). The programme also reports on the "state of wetlands," which aims to demonstrate trends in wetland status over time. The NWMP is organized into a three-tiered hierarchical framework (see Figure 2.13), allowing for effective assessment and monitoring of wetlands at various spatial scales (Wilkinson *et al.*, 2016).



Figure 2.13: NWMP Framework illustrating the three-tiered assessment and monitoring hierarchy

The three tiers are outlined below:

Tier 1: Involves the use of existing datasets and desktop methods. The objective is to focus on four national indicators:

- The total extent of wetlands in the country based on size/mapped wetlands in the country;
- ✓ the total extent of each land cover type surrounding wetlands to provide information based on the potential threats to a wetland;

- ✓ the total extent of wetlands within protected and conservation areas determines the level of protection of a wetland and
- ✓ the total extent of land ownership surrounding wetlands which helps with information on the accessibility of wetlands in an area especially for monitoring

Tier 2: Involves the rapid field assessment of prioritised wetlands using wetland tools to assist with the prioritization of wetlands for ongoing or continuous monitoring under Tier 3.

Tier 3: Involves monitoring of a subset of wetlands prioritised under Tier 2. It has a combination of indicators from Tier 1 and 2, in addition to new indicators that provide additional information on the health of the wetlands, e.g. biotic indicators such as diatoms, fish, aquatic invertebrates, frog and water birds datasets.

Some Tier 2 and Tier 3 objectives were implemented concurrently, prioritising a subset of Tier 2 wetlands for Tier 3 monitoring. The criteria for prioritising wetlands in Tier 2 rapid assessments include Ramsar sites with threatened ecosystems, critically biodiverse areas, and the presence of biological threats, such as red data species. Additionally, wetlands are prioritised based on Resource Quality Objectives (RQOs), ecological status as determined by Reserve Determination Studies, and their inclusion in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). However, Ramsar-listed wetlands will be the primary criterion for long-term monitoring starting from the 2023/24 period. After that, the National Wetland Monitoring Programme (NWMP) will expand to include other priority wetlands.

The water quality protocol under Tier 3 has been implemented at selected Ramsar sites. This includes assessing physical variables on-site and collecting samples for inorganic chemical and microbiological analysis (see Table 2-1 below).

Physical	Chemical	Microbiological
 Temperature (°C), pH (pH Units), Dissolved Oxygen (% & mg/L) Electrical Conductivity (µs/cm) 	 Ca Cl, F, Mg, Na, SO4-Diss- Water, Si and K measured in mg/L, KJELDAHL NITROGEN), NH4-N, NO3+NO2-N (as NITROGEN) in mg/L Total Phosphorus (TP), PO4-P (Ortho Phosphate, TAL (Total Alkalinity as Calcium Carbonate in mg/L pH (PH) (pH units) 	 Escherichia coli (MPN/100 ml) Total Coliform (MPN/100 ml)

Table 2-1: List of physio-chemical and microbial water quality attributes under
NWMP Tier 3

There are 66 registered active water quality sites across 19 wetlands located in Gauteng, Mpumalanga, KwaZulu-Natal, North West, Eastern Cape, Free State, Limpopo, and Northern Cape provinces (see Figure 2.14). At the beginning of the 2023/24 hydrological year, sampling compliance at NWMP water quality sites was 61.2%. However, this figure improved to 73.1% at the start of the 2024/25 hydrological year. Furthermore, 66 monitoring sites were sampled between July and September 2024, a significant increase from the 41 monitoring sites sampled during the same quarter in 2023. This improvement is largely due to the collaborative efforts of all parties involved, including the DWS regions and DFFE Ramsar Management Units.



Figure 2.14: Location of the NWMP active water quality sites across South Africa

2.2.6. National Estuarine Monitoring Programme (NEsMP)

The National Estuarine Monitoring Programme (NEsMP) monitors the estuarine systems across the country based on their significance and priority. Established in 2010, the primary objective of the programme is to measure and assess long-term trends and changes in water quality within South African estuaries. The programme adopts a three-tiered approach to achieve these goals (Cilliers and Adams, 2016) (Figure 2.15):

- ✓ Tier 1: Focuses on the collection of basic physico-chemical data to create a long-term database and establish a baseline dataset of the most significant factors affecting estuaries.
- ✓ Tier 2: Involves determining the freshwater requirements of estuaries, which are divided into abiotic and biotic components (Taljaard et al., 2003; DWAF, 2008).
- ✓ Tier 3: Addresses specific management issues that may arise at any given time in a particular estuary. These issues can include pollution incidents, fish kills, and specific developments that could impact the health of an estuary.



Figure 2.15: Three-tiered approach of NESMP.

NEsMP has 177 registered sites across the country. These sites are evenly distributed along the entire length of each estuary, from the mouth to the upper reaches. The number of sites within each estuary is determined by its Estuary Functional Zone (EFZ), which includes all areas critical to the estuary's functionality, such as open water areas, floodplains, salt marshes, and the near-shore surf zone.

Out of the 177 registered sites, 143 were sampled during the 2023/2024 hydrological cycle, representing an increase of 22 sites compared to the previous cycle (Figure 2.16). The Western Cape made a significant contribution to sampling compliance, while the Eastern Cape and KwaZulu-Natal faced challenges due to budget constraints and a lack of human resources.



Figure 2.16: The expansion of NEsMP sites over the past hydrological years.

The NEsMP is based on collaborations with a wide range of stakeholders who are affected by or interested in estuaries. These stakeholders include conservation organisations such as Ezemvelo KZN Wildlife, SANParks, Cape Nature, and the Eastern Cape Parks and Tourism Agency. Volunteers from conservation organisations such as the Lower Breede River Conservation Trust, Aquatic CSI, and Adopt-A-River Eco-Solutions also contribute to the programme. This initiative also includes local and district municipalities on the West Coast, Eden, and universities like the University of Zululand.

This collaborative approach ensures that all parties are responsible for programme management, funding, and implementation. Figure 2.17 shows the spatial distribution of these sites across the country.



Figure 2.17: Spatial distribution of NEsMP sites during the 2023/2024 hydrological year

2.3. Groundwater Monitoring programmes

The DWS Groundwater Monitoring Programme is divided into two programmes: groundwater quality monitoring and groundwater level monitoring (Figure 2.18). The Groundwater Quality Monitoring Programme comprises two sub-programmes, the National Groundwater Quality Monitoring, also known as the ZQM Programme and the Acid Mine Drainage (AMD) Special Monitoring Programme managed by the National Office at the Cradle of Humankind World Heritage (CoH-WHS) and at Dundee. The Groundwater Level Monitoring programme also comprises two sub-programmes: the combined groundwater level networks managed by the Regional Offices and Catchment Management Agencies (CMA) and the AMD Special Monitoring programme managed by the National Office.



Figure 2.18: Groundwater Monitoring Programmes

2.3.1. Groundwater Quality Monitoring Programmes

The Groundwater Quality Monitoring (ZQM) Programme was established in 1994. The objectives of the ZQM programme are to investigate the influence of rainfall on groundwater quality, to determine the state of groundwater quality nationally, and to observe groundwater quality trends. The ZQM programme has 420 groundwater quality stations, monitoring chemical and physical parameters nationwide. These sites are distributed in strategic locations such as schools, clinics, farms, hospitals, and community supply centres.

The spatial distribution of the ZQM sites based on the 2024 Apr/May monitoring run is presented in Figure 2.19.





NATIONAL STATE OF WATER REPORT 2024

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Distribution of the National Groundwater Quality Monitoring Geosites

JUNE 2024

Data sources: Groundwater quality data: Directorate: National Hydrological Services, Water Management System (WMS), Dep. of Water & Sanitation (DWS).

National Groundwater Quality Monitoring Programme:

- Active Geosites (418)
- Active Geosites not sampled in 2024 (77)
- Active Geosites sampled in 2024 (341)

Geosites Sampled per Province / Area April - June 2024

- Eastern Cape = 50
- Free State = 39
- Gauteng = 23
- Kruger National Park = 9
- Kwazulu-Natal = 0
- Limpopo = 112
- Mpumalanga = 12
- Northern Cape = 40
- North West = 16
- Western Cape = 40

LEGEND

- Major City/Town
- Selected Groundwater Dependent
 Town
- International Boundary
- Provincial Boundary
- Water Management Area Boundary

2012 Water Management Areas

- 1 Limpopo
- 2 Olifants
- 3 Inkomati-Usuthu
- 4 Pongola-Mtamvuna
- 5 Vaal
- 6 Orange
- 7 Mzimvubu-Tsitsikamma
- 8 Breede-Gouritz
- 9 Berg-Olifants

Directorate: National Hydrological Services

Task Ref: GM24_280

The AMD special programme at the Cradle of Humankind World Heritage Site (CoH-WHS) was established in 2012. It has 24 monitoring stations, and the frequency is four times a year. The AMD special programme at CoH-WHS aims to evaluate the hydrochemical impact of historical mining activities around CoH-WHS property. Monitoring is a collaboration between the Council for Scientific and Industrial Research (CSIR) and the Gauteng provincial office. The AMD special programme at Dundee was established in 2011. Its objective is to evaluate the impact of defunct coal mines on the local water resources within the Sandspruit catchment.

2.3.2. Groundwater Quality Data Availability

The respective regions monitor the groundwater quality monitoring network except for Gauteng, Mpumalanga, and parts of the North West, where the National office conducts the monitoring. For the hydrological year 2023/24, the groundwater monitoring data coverage starts with the Sep/Oct 2023 monitoring run. This monitoring usually runs from September through to November every year.

During the 2023 Sept/Oct sampling run, were 391 sites available for sampling, of which 305 (78%) were sampled (Table 2-2). KwaZulu-Natal, Western Cape, and Northern Cape were at the lowest performance, at 0%, 33%, and 58%, respectively.

Province/ Area	Total number of geosites to be sampled	Total number of geosites not sampled	% geosites not sampled	Total number of geosites sampled	% geosites sampled
Easter Cape	36	2	6%	34	94%
Free State	39	0	0%	39	100%
KwaZulu-Natal	10	10	100%	0	0%
Kruger National Park	9	0	0%	9	100%
Limpopo	121	8	7%	113	93%
North West	13	3	23%	10	77%
Northern Cape	79	33	42%	46	58%
Western Cape	40	27	68%	13	33%
Mpumalanga, Gauteng, parts of North West. Monitoring conducted by National Office	44	3	7%	41	93%
Total	391	86	22%	305	78%

Table 2-2: Sampling Status of the ZQM programme Sept/Oct 2023

During the 2024 Apr/May sampling run, there were 418 sites available for sampling, of which 341 (82%) were sampled (Table 2-3). KwaZulu-Natal and Northern Cape at their lowest performance, at 0% and 44%, respectively.

Province/ Area	Total number of geosites to be sampled	Total number of geosites not sampled	% geosites not sampled	Total number of geosites sampled	% geosites sampled
Easter Cape	51	1	2%	50	98%
Free State	39	0	0%	39	100%
KwaZulu-Natal	12	12	100%	0	0%
Kruger National Park	9	0	0%	9	100%
Limpopo	121	9	7%	112	93%
North West	13	3	23%	10	77%
Northern Cape	90	50	56%	40	44%
Western Cape	40	0	0%	40	100%
Mpumalanga, Gauteng, parts of North West. Monitoring conducted by National Office	43	2	5%	41	95%
Total	418	77	18%	341	82%

 Table 2-3: Sampling Status of the ZQM Programme Apr/May 2024

A normalised percentage data availability (2016-2024) based on 420 active monitoring stations from the ZQM programme is presented in Figure 2.20.



Figure 2.20: ZQM programme data availability on WMS from 2016 to 2024 during the time of reporting.

A significant improvement in the 2023/24 hydrological year's groundwater quality data availability is observed. At 82% (341 samples), groundwater quality data availability

has been the highest since 2016. This data is available on the WMS database and is available on request from <u>georequests@dws.gov.za</u>.

2.3.3. Groundwater Level Monitoring

The monitoring frequency for groundwater levels varies significantly from province to province, as summarised previously in Table 2-4. The monitoring frequencies vary from monthly to every 2-monthly to quarterly. The most common frequency is quarterly at 73,8%, followed by monthly at 16,5%, dominated by KwaZulu-Natal, Mpumalanga, and Free State. Gauteng province monitoring frequency is mainly 2-monthly at 98%. The AMD special program is monitored at 90,5% monthly.

Table 2-4: Groundwater level monitoring frequency and equipment status. Out of the 1,726 active monitoring sites, 1,360 sites are monitored manually with a dip meter, while 366 sites are equipped with electronic data loggers. The regions without electronic data loggers are KwaZulu-Natal, Gauteng, Free State, and North West. The groundwater level data is collected and uploaded to the HYDSTRA database system, where it can be extracted for analysis. Groundwater level monitoring data is available to the public through a data request email, which can be sent to <u>georequests@dws.gov.za</u>.

2.3.4. Groundwater Level Data Availability

As of 31 October 2024, there were 1,726 groundwater level sites (geosites) which were active for monitoring, and 1,640 (95%) had groundwater level data available. Figure 2.21 presents a comparison of groundwater data availability for September 2023 and September 2024 as extracted on 14 February 2025.



Figure 2.21: Groundwater level data availability status, September 2023 vs September 2024 as of 14 February 2025.

Compared to 2023, the data availability has improved by 10% from 85%. For September 2024, all the regions except North West and Limpopo have data availability greater than 95%. The most significant improvement in 2024 came from KwaZulu-Natal, where data availability was restored from 4% to >95% availability levels. The region with the poorest performance in 2024 is Limpopo, at 78%. However, Limpopo had 202 active sites, which makes it the third-biggest monitoring network nationally, requiring relatively more resources. In Limpopo, groundwater is a strategic water source and accounts for nearly 70% of the rural domestic water supply. Urgent internal interventions are in place to restore data availability in Limpopo.

The spatial distribution of the 1 726 active monitoring sites is presented in Figure 2.22. For Western Cape, most of the 494 active geosites are densely located on the Berg-Olifants WMA. At the same time, the WMA, which has a diversified groundwater level management portfolio, is the Vaal WMA. The geosites in the Vaal WMA are managed by Northern Cape, North West, Free State, and Gauteng.



Figure 2.22 Status of active groundwater level monitoring sites – October 2024

Active Sites used for **Groundwater Level Monitoring**

OCTOBER 2024

Description:

This map indicates the number of active groundwater level monitoring sites. The sites are grouped into nine groups with different colors to differentiate between the Provincial Offices responsible for the monitoring thereof.

Data Sources:

Water Management Areas: Department of Water & Sanitation (DWS), Directorate Catchment Management. Boundaries and towns: Chief Directorate National Geospatial Information (NGI), Department Agriculture, Land Reform and Rural Development. Groundwater data: Department of Water & Sanitation (DWS), Directorate National Hydrological Services, Hydstra Database.

The total number of sites = 1 726

LEGEND

- Major Cities/Towns
- Groundwater Dependent Towns
- _____ International Boundary
- Water Management Area Boundary

Responsible Provincial Office:

- Region1 Western Cape
- Region2 Eastern Cape
- Region3 Kwa-Zulu Natal ٠
- Region4 Gauteng
- Region5 Mpumalanga
- Region6 Free State
- Region7 Northern Cape
- Region8 Limpopo
- Region10 North West
- Acid Mine Drainage Region National Office

Directorate: National Hydrological Services

2.4. National Integrated Water Information System

The National Integrated Water Information System (NIWIS) was conceptualised to meet the objective of serving as a single extensive, integrated, accessible national water information system to fulfil the mandate of both the National Water Act (No. 36 of 1998; Chapter 14, Sections 137 to 145), as well as the National Water Services Act (No 108 of 1997; Chapter 10, Sections 67, 68 & 69). Effective 01 September 2015, NIWIS went live with 43 dashboards developed and implemented. Ever since NIWIS has been experiencing enormous growth through enhancements responding to ever-growing business information requirements, NIWIS is an information system intended to provide information to researchers, water managers, and the public at large, and this system can be accessed at https://www.dws.gov.za/niwis2.



Figure 2.23 NIWIS landing page (<u>https://www.dws.gov.za/niwis2/</u>)

NIWIS allows for user customisation and is convenient. It has since become one of the Department's strategic investment tools, which ensures that information on the sector is readily available and conveniently disseminated. However, the system is currently experiencing challenges, where the automation has been taking place at a business level, not at a Departmental level, which has resulted in many parallel systems that are not complementing one another, albeit sharing the same client or water information in some cases. However, further developments in NIWIS are in progress despite these challenges.

2.5. Citizen Science information

Citizen Science involves the public's participation in generating scientific knowledge. This inclusive and collaborative process enhances scientific expertise and empowers local communities to make informed decisions regarding water management. In 2006, the Department of Water and Sanitation (DWS) acted on a parliamentary question on the health of South African Rivers and initiated an *Adopt-a-River* programme. The programme's objective is to create awareness and foster public participation in protecting and managing rivers in South Africa. The programme was implemented in 2010 after a Strategic Framework was developed, and implementation was tested in selected rivers across South Africa. It was later expanded to areas where interested stakeholders would want to participate in protecting and managing their water resources.

In 2014, DWS reviewed the Adopt a River programme through the Water Research Commission (WRC) and provided recommendations for a way forward. Part of the review included a revision of the institutional and governance framework based on the original framework and challenges encountered during implementation. The new framework is decentralised and provides more opportunities for various stakeholders in society (non-governmental organizations, community lead groups, private sector, etc.) to take part in the programme to ensure long-term sustainability, including the roles and responsibilities of each role player. The revised Adopt-a-River Programme focused on the involvement of schools, training, and capacity building and recognized the role of citizen science in monitoring water resources (Graham et al.., 2016). A Ground model made up of volunteer groups the group is recognised as impactful in providing data and information to local and regional agencies under the guidance of the National DWS Coordinator, with the Catchment Management Forum and Catchment Management Agency being the main channel of communication between DWS and NGOs and other groups.

According to the reviewed programme's Institutional Framework and Governance Structure (Graham *et al.*, 2016). The National Coordinator is also responsible for housing the citizen science database. DWS is currently in the process of setting up a National Citizen science database that will not only house data collected by citizens but also make it available to the public to engage in the data, much like other national monitoring databases.

2.5.1. Evolution of the Programme: Adopt-a-River Citizen Science Programme

In 2015, the Adopt-a-River programme evolved into the Adopt-a-River – Citizen Science Programme. This follows the review of the initial programme with the vision of" Healthy Rivers for all" and appreciating that improving water quality data will require governments and organisations to work collaboratively with locals who collect

data, particularly where there are gaps in national monitoring programmes. Citizen science networks can enable large amounts of data to be collected for decision-making, and citizen scientists can act as stewards of their local water systems.

NGOs, private parastatals, local government, community organisations, etc., across the country are the foundation of the programme as implementers on the ground and are required to work closely with the DWS National Coordinator. Although DWS is the National Coordinator, collaboration is voluntary and relies strongly on implementers' cooperation and collaboration. Very few implementors from the private and NGO Fragmented efforts and withholding data from the National coordinator work against open science and achieving "Healthy Rivers for All". DWS is establishing a National Citizen Science Database, where citizens can share and engage with data collected by citizen scientists throughout the country to help monitor and track impact.

Various activities other than water river health monitoring take place under the Adopta-River Citizen Science Programme, as indicated in Table 2-5 below.

Component	Tools/Mode of Delivery	Purpose
Safety, Health, and Environment	Training on Health and Safety in the water environment	To empower volunteers with basic health and safety knowledge, as well as an understanding of the water environment
Solid waste removal	General guidance on waste management (sorting and recycling)	Maintain water resources that are free of solid waste
Water resource monitoring (citizen science)	Citizen science tools (Water Research Commission (WRC) Project K5/2350)	To assist communities with understanding the condition of their rivers' health and encourage ownership to improve their water resources
Removal of Alien invasive species	A comprehensive manual for river rehabilitation in South Africa, including identification, removal, and control of alien invasive plants (WRC Project KSA2: K5/2270)	Increase water availability, conserve biodiversity, and empower communities to take care of their water resources.
Awareness, Capacity Building, and advocacy	Pamphlets, Posters, Door to door campaigns, workshops, training and representation at forums, engaging perpetrators, and other communication tools	To create awareness and training on water resource management, encourage advocacy and recourse, and reduce negative impacts on the environment.

Table 2-5 Adopt-a-River Citizen Science Programme core activities

2.5.2. Challenges and Opportunities

While the citizen science approach has gained prominence in integrated water resources management, particularly in the Adopt-a-River – Citizen Science Programme, it is not without challenges. Fragmentation of efforts and lack of collaboration by some implementers in integrating collected data and activities with the DWS National coordinator into existing national monitoring networks and decision-making processes means that its full potential in influencing governance and policy is yet to be fully realised. Channels of reporting and coordination of activities by implementers on the ground are done directly with the DWS National Coordinator and through the Catchment Management Forums.

Most of the citizen science miniSASS data is sitting on a database hosted by a private implementer, and the DWS National Coordinator does not have access to this data. The Adopt-a-River Citizen Science Programme presents a tremendous opportunity should the water sector stakeholders come together in collaboration with the DWS National Coordinator. Some of the opportunities include:

- Contribute to Sustainable Development Goal (SDG) Target 6.3.2: Data generated through Citizen Science initiatives or monitoring can also be used to support and provide information on ambient water quality.
- Contribute to UNESCO Intergovernmental Hydrological Programme -IX strategy implementation on priority area 1 (Scientific Research and Innovation): Conducting and sharing research on integrating citizen science into the hydrological discipline to improve understanding of the water cycle, enabling science-based decision-making.
- Practise Open Science
- Strengthening community action
- Improved policy and decision-making
- Public awareness and engagement
- Enhanced data collection