

Drought Status Overview

- **What does this dashboard relate to:**

It relates to the assessments of impact of drought and risks management. In order to monitor and manage drought risk, the specific indicators such as precipitation, streamflow, reservoir levels, groundwater levels, and vegetation condition may be used. Thus, drought information systems must have the capability to provide integrated information derived from various indicators. The Drought Status information system is designed to provide regular overview and outlook of drought status in South Africa to water sector decision makers, as well sector wide stakeholders.

In the Drought Status dashboard, the Multi Criteria Decision Analysis (MCDA) method is currently used to integrate rainfall, river flow, dam levels and groundwater level data as the main indicators for generating up to date hydrological drought status information. The Multi Criteria Decision Analysis (MCDA) equation used is given as follows;

$$U(O) = \sum_{i=1}^n U(H_i) \beta_i$$

Where $U(O)$ = Average score for the drought status overview or outlook, $U(H_i)$ = Score of the i^{th} Drought Indicator, β_i = Degree of belief for the i^{th} Drought Indicator.

In the Drought Status and Risk Management dashboard, the satellite based vegetation condition index is used to generate up to date agricultural drought status information. The Vegetation Condition Index (VCI) is based on the comparative Normalized Difference Vegetation Index (NDVI) change with respect to minimum historical NDVI value. Therefore, the VCI will compare the recent Vegetation Index (VI) such as NDVI or Enhanced Vegetation Index (EVI) to the values observed on the same period as in previous years within a specific pixel. The VCI is calculated as shown below,

$$VCI_{ijk} = \frac{VI_{ijk} - VI_{i,min}}{VI_{i,max} - VI_{i,min}} \times 100$$

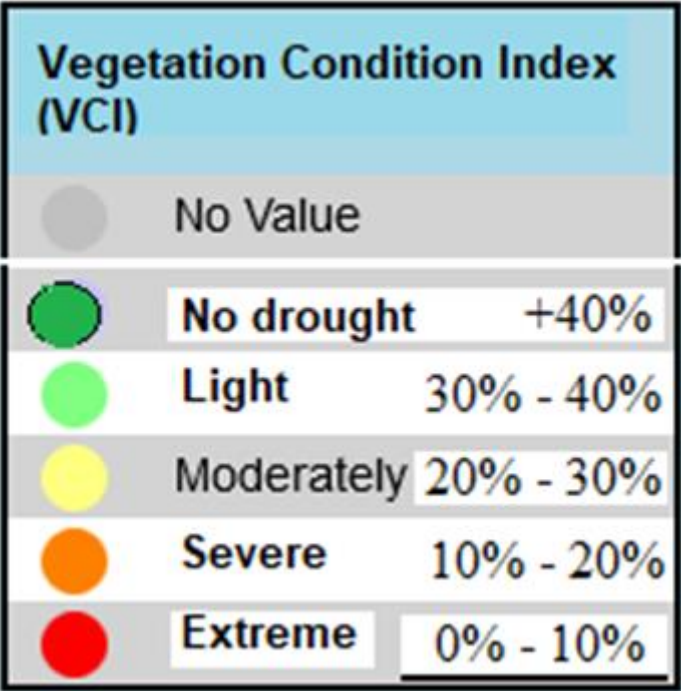
Where: VCI_{ijk} is the VCI value for the pixel i during month j for year k , VI_{ijk} is the monthly vegetation index (VI) value for pixel i in month j for year k whereby both the NDVI utilized as the VI, $VI_{i,min}$ and $VI_{i,max}$ are the multiyear minimum and maximum VI, respectively, for pixel i .

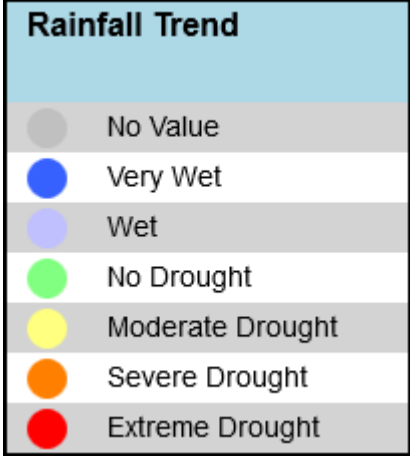
The resulting percentage of the observed value is situated between the extreme values (minimum and maximum) in the previous years. Lower and higher values therefore indicate bad and good vegetation state conditions, respectively.

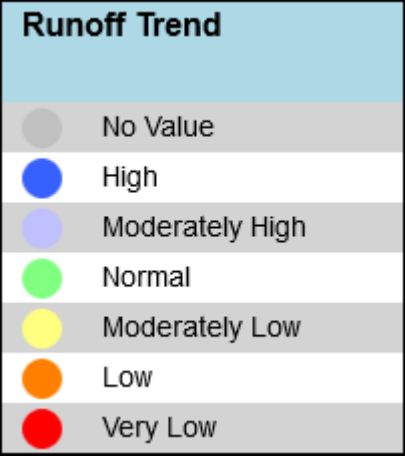
The Land cover overview is based on the South African National Land-Cover 2018 dataset (provided by the Department of Environmental Affairs), which was generated from multi-seasonal Sentinel-2 satellite imagery and available under an open-source license agreement. The term of use governing the original data apply and can be found on https://egis.environment.gov.za/gis_data_downloads.

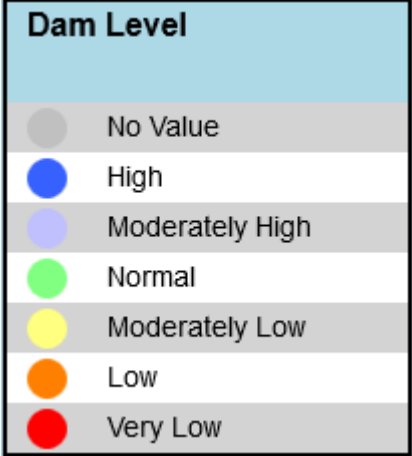
- **What information does the Dashboard aim to Disseminate? What questions does this dashboard aim to answer?**

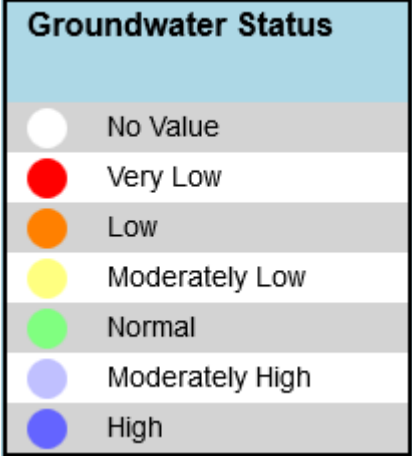
The dashboard aims to answer the following questions:

What information does the Dashboard aim to Disseminate?	What questions does this dashboard aim to answer?	Trend Indicators	Vegetation Condition Index (VCI)
<p>Vegetation Condition Index → National and Provincial state of Vegetation in RSA</p>	<p>What is the current National and Provincial state of Vegetation Condition in RSA?</p>	 <p>Vegetation Condition Index (VCI)</p> <ul style="list-style-type: none"> No Value No drought +40% Light 30% - 40% Moderately 20% - 30% Severe 10% - 20% Extreme 0% - 10% 	<p>Vegetation Condition Index (VCI) based on the relative Normalized Difference Vegetation Index (NDVI)</p>

What information does the Dashboard aim to Disseminate?	What questions does this dashboard aim to answer?	Trend Indicators	Multiple Criteria Decision Analysis (MCDA)
<p>Rainfall Status Overview → National and Provincial state of rainfall in RSA</p>	<p>What is the current National and Provincial state of rainfall in RSA?</p>	 <p>Rainfall Trend</p> <ul style="list-style-type: none"> ● No Value ● Very Wet ● Wet ● No Drought ● Moderate Drought ● Severe Drought ● Extreme Drought 	<p><u>Allocated MCDA Number</u></p> <p>1 ≅ Very Low</p> <p>2 ≅ Low</p> <p>3 ≅ Moderately Low</p> <p>4 ≅ Normal</p> <p>5 ≅ Moderately High</p> <p>6 ≅ High</p>

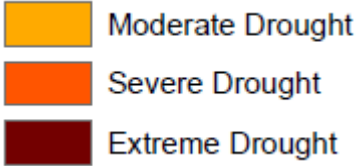
What information does the Dashboard aim to Disseminate?	What questions does this dashboard aim to answer?	Trend Indicators	Multiple Criteria Decision Analysis (MCDA)
<p>Runoff Status Overview → National and Provincial state of streamflow in RSA</p>	<p>What is the current National and Provincial state of streamflow in RSA?</p>	 <p>Runoff Trend</p> <ul style="list-style-type: none"> ● No Value ● High ● Moderately High ● Normal ● Moderately Low ● Low ● Very Low 	<p><u>Allocated MCDA Number</u></p> <p>1 ≅ Very Low</p> <p>2 ≅ Low</p> <p>3 ≅ Moderately Low</p> <p>4 ≅ Normal</p> <p>5 ≅ Moderately High</p> <p>6 ≅ High</p>

What information does the Dashboard aim to Disseminate?	What questions does this dashboard aim to answer?	Trend Indicators	Multiple Criteria Decision Analysis (MCDA)
<p>Dams Status Overview → National and Provincial state of dams in RSA</p>	<p>What is the current National and Provincial state of dams in RSA?</p>	 <p>Dam Level</p> <ul style="list-style-type: none"> ● No Value ● High ● Moderately High ● Normal ● Moderately Low ● Low ● Very Low 	<p><u>Allocated MCDA Number</u></p> <p>1 ≅ Very Low</p> <p>2 ≅ Low</p> <p>3 ≅ Moderately Low</p> <p>4 ≅ Normal</p> <p>5 ≅ Moderately High</p> <p>6 ≅ High</p>

What information does the Dashboard aim to Disseminate?	What questions does this dashboard aim to answer?	Trend Indicators	Multiple Criteria Decision Analysis (MCDA)
<p>Groundwater Status Overview → National and Provincial state of groundwater in RSA</p>	<p>What is the current National and Provincial state of groundwater in RSA?</p>	 <p>Groundwater Status</p> <ul style="list-style-type: none"> ○ No Value ● Very Low ● Low ● Moderately Low ● Normal ● Moderately High ● High 	<p><u>Allocated MCDA Number</u></p> <p>1 ≅ Very Low</p> <p>2 ≅ Low</p> <p>3 ≅ Moderately Low</p> <p>4 ≅ Normal</p> <p>5 ≅ Moderately High</p> <p>6 ≅ High</p>
<p>Drought Status Overview and Outlook → Current national and provincial state of drought in RSA → Outlook of the national and provincial state of drought in RSA</p>	<p>What is the current state of drought in the Republic of South Africa (RSA), and what is the outlook?</p>	<p><i>Drought Status Overview</i></p>	<p><u>Drought Status Overview (DSOv)</u></p> <p><i>DSOv = sum(% Indicator x MCDA Number)</i></p> <p>% Rainfall Indicator ≅ 15 % ≅ 0.15</p>

What information does the Dashboard aim to Disseminate?	What questions does this dashboard aim to answer?	Trend Indicators	Multiple Criteria Decision Analysis (MCDA)
		<div style="border: 1px solid black; padding: 5px;"> <p>Drought Trends</p> <ul style="list-style-type: none"> No Value Very Wet Wet No Drought Moderate Drought Severe Drought Extreme Drought </div> <p style="text-align: center;"><i>Drought Status Outlook</i></p> <div style="margin-left: 20px;"> <ul style="list-style-type: none"> ↑ Improved → Stable ↓ Declined </div>	<p>% Runoff Indicator \cong 15 % \cong 0.15</p> <p>% Dam Indicator \cong 15 % \cong 0.15</p> <p>% Groundwater Indicator \cong 15 % \cong 0.15</p> <p>1 - 1.833 \cong Extreme Drought</p> <p>1.833 - 2.667 \cong Severe Drought \cong 15 % \cong 0.15</p> <p>2.667 and 3.500 \cong Moderate Drought \cong 15 % \cong 0.15</p> <p>3.500 - 4.333 \cong No Drought \cong 15 % \cong 0.15</p> <p>4.333 - 5.167 \cong Wet \cong 15 % \cong 0.15</p>

What information does the Dashboard aim to Disseminate?	What questions does this dashboard aim to answer?	Trend Indicators	Multiple Criteria Decision Analysis (MCDA)
			<p>5.167 - 6 \cong Very Wet \cong 15 % \cong 0.15</p> <p><u>Drought Status Outlook (DSOt)</u></p> <p><i>DSOt = sum(% Indicator x MCDA Number)</i></p> <p>% Rainfall Indicator \cong 50 % \cong 0.5</p> <p>% Runoff Indicator \cong 50 % \cong 0.5</p> <p>% Dam Indicator \cong 0 % \cong 0</p> <p>% Groundwater Indicator \cong 0 % \cong 0</p> <p>1 - 1.833 \cong Declined</p>

What information does the Dashboard aim to Disseminate?	What questions does this dashboard aim to answer?	Trend Indicators	Multiple Criteria Decision Analysis (MCDA)
			<p>1 - 2.667 \cong Stable</p> <p>2.667 - 6 \cong Improved</p>
Drought Affected Settlements	Which settlements in RSA are affected by moderate, severe and extreme drought?	 <p>Moderate Drought</p> <p>Severe Drought</p> <p>Extreme Drought</p>	N/A

- **Data Type, Source, Accessibility and Update Frequency**

The dashboard aims to answer the following questions:

Data Type	Data Source & Accessibility	Data Update Frequency	Conditions for Data Used
Monthly Average Rainfall Data	<p>→ DWS website (Incomplete)</p> <p>→ HYDSTRA (Incomplete)</p> <p>→ South African Weather Services (SAWS)</p>	→ Monthly	<p>→ The DWS is not the sole data custodian.</p> <p>→ The NIWIS developers are not responsible for the quality and integrity of the data used.</p>

Data Type	Data Source & Accessibility	Data Update Frequency	Conditions for Data Used
Runoff Data → National and Provincial state of streamflow in RSA	→ DWS website → HYDSTRA	→ Weekly, Monthly	→ Verified and unverified data may be used. → Where verified data is used, a delay in data update frequency may be experienced. → The NIWIS developers are not responsible for the quality and integrity of both the verified and unverified data used.
Dams Data → National and Provincial state of dams in RSA	→ DWS website → HYDSTRA	→ Weekly, Monthly	→ Verified and unverified data may be used. → Where verified data is used, a delay in data update frequency may be experienced. → The NIWIS developers are not responsible for the quality and integrity of both the verified and unverified data used.
Groundwater Data	→ DWS website → HYDSTRA	→ Monthly	→ Verified and unverified data may be used. → Where verified data is used, a delay in data update frequency may be experienced. → The NIWIS developers are not responsible for the quality and integrity of both the verified and unverified data used.
Affected Settlement Data	→ Agricultural Research centre (ARC)	→ Monthly	→ The NIWIS developers are not responsible for the quality and integrity of the data used. → Data updated as and when available.

- **Person(s) who championed the dashboard:**

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- **Enquiries:**

- For all dashboard enquiries click [HERE](#) to go to the Contact Us page.
- **Alternatively** you may reach us by calling or emailing us using the details below:

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Or email: NIWIS_Support@dws.gov.za

- **Links to other Sources of related Information:**

<http://www.dwa.gov.za/Hydrology/>

<http://www.dwa.gov.za/groundwater/>

<http://www.weathersa.co.za/>

<http://www.arc.agric.za/>

<https://www.sansa.org.za/products-services/earth-observation/>

https://egis.environment.gov.za/sa_national_land_cover_datasets

- **Are there any limitations / cautions related to using this information?**

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