



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA



COMMUNITIES OF PRACTICE (COP)
INTEGRATED WORKSHOP AND CAPACITY BUILDING TRAINING

Empowering National Uptake: Leveraging Earth Observation Data and Knowledge

4 - 6 June 2024 | 08h30 – 18h00



Training
4 & 5 June



Workshop
6 June







**Digital Earth
AFRICA**

**Community of Practice
CSIR, South Africa
4 – 6 June 2024**

*Unlocking the promise of tomorrow from the
patterns of the past*

Kenneth Mubea, PhD

Capacity Development Lead
Digital Earth Africa

kenneth.mubea@digitalearthafrika.org

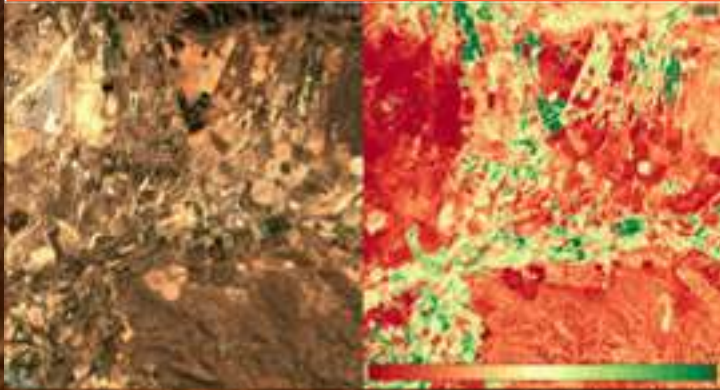


@kenmubea @DEarthAfrica

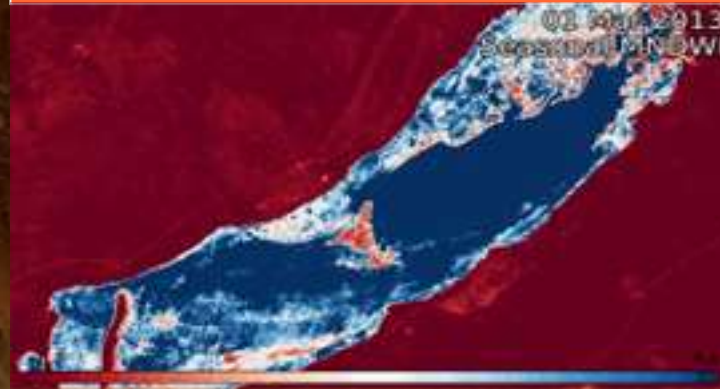
Vision

DE Africa will provide a routine, reliable and operational service, using Earth observations to deliver decision-ready products enabling policy makers, scientists, the private sector and civil society to address social, environmental and economic changes on the continent and develop an ecosystem for innovation across sectors.

Agriculture and food security



Water resources and flood risks



Land degradation



Urbanisation

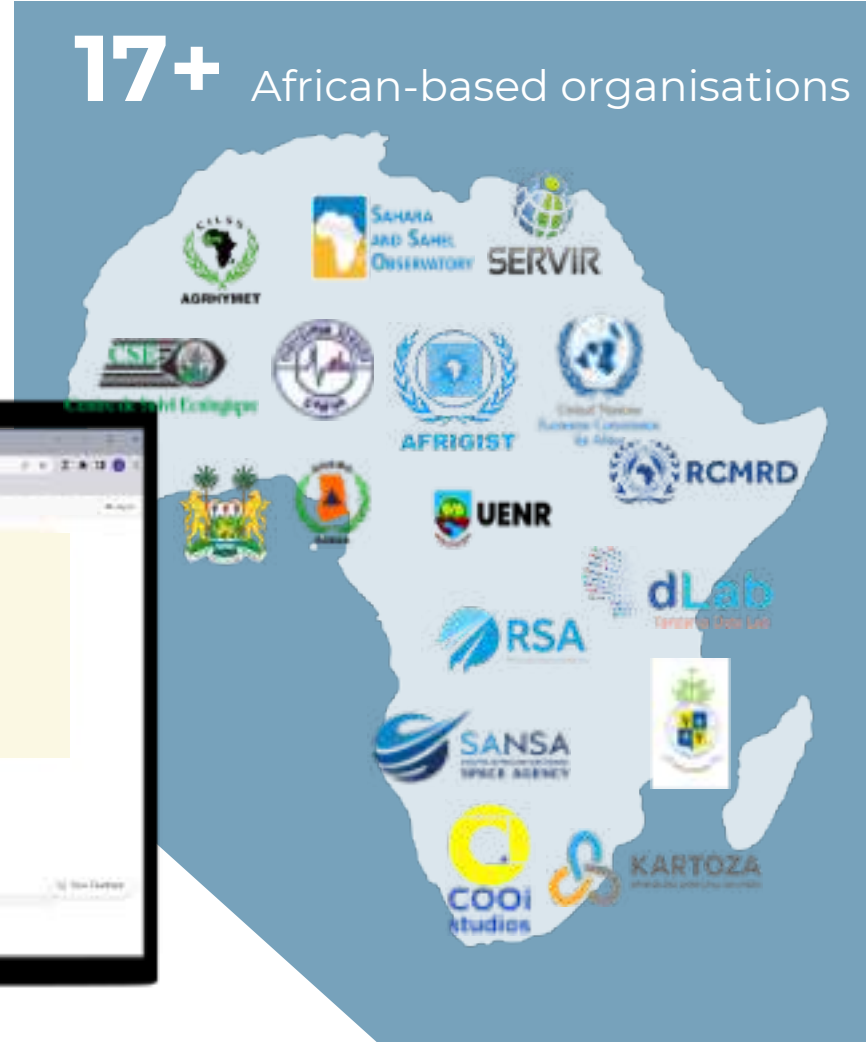


Coastal erosion



Digital Earth Africa

17+ African-based organisations



6

Continental Services

GeoMAD

Cropland Extent Map

Fractional Cover

NDVI Climatologies

Water Observations

Coastlines



34+ technical, strategic
and delivery partnerships

Satellite data available through Digital Earth Africa



Find out more technical detail in [Digital Earth Africa Docs](#)



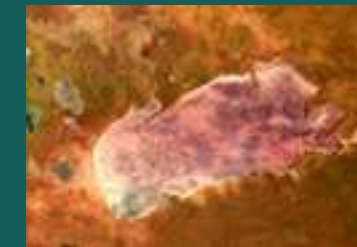
Studying the Tanzanian Coastline with GeoMAD, 2019, RGB



Monitoring crops in Egypt 2001-2020, Landsat, RGB



Monitoring Mount Nyiragongo, 2018 Sentinel-2 RGB and 2021 Sentinel-1



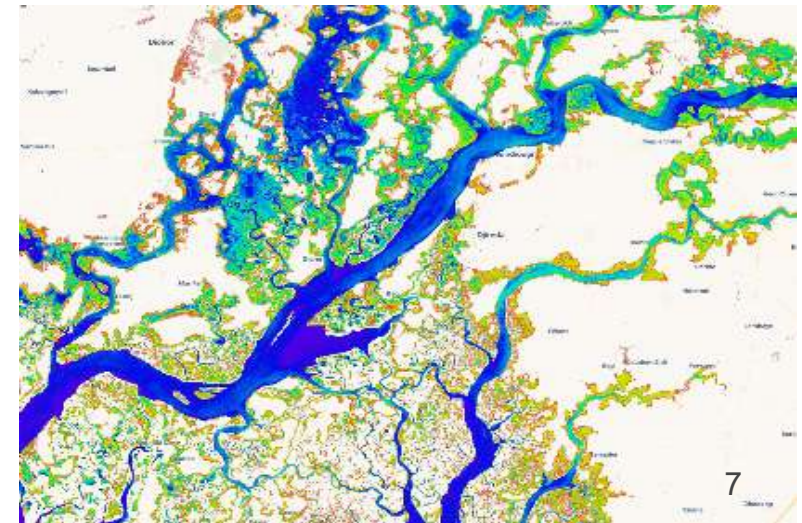
Measuring water extent on rangelands in Etosha National Park, Namibia 1992-2021, Landsat, False Colour



Water Observations from Space (WOFS)



- WOFS – DE Africa’s first continental scale product
- Translates Water Observations from Space into easy to consume information on the presence, location and recurrence of water in Africa.
- Will help countries across Africa map, visualise and manage their water resources by better understanding trends over time.



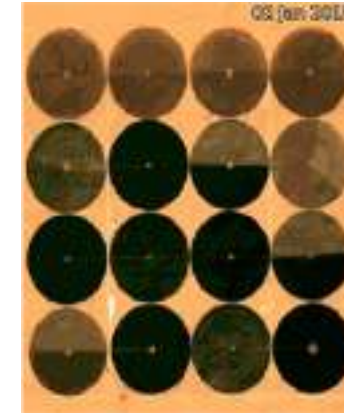
<https://www.digitalearthafrika.org/platform-resources/services-and-analysis-tools>



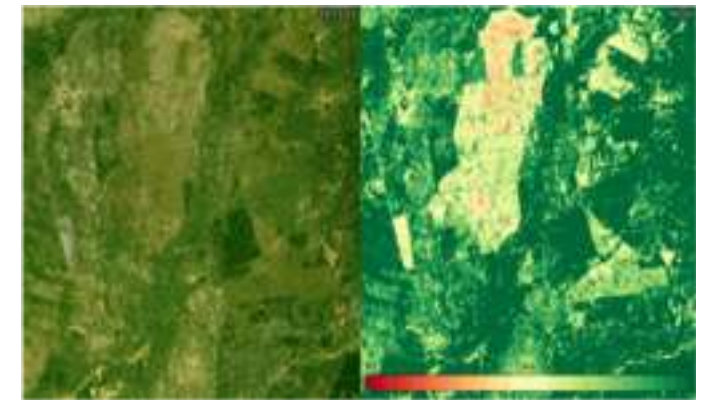
Food security



- The second product in development is a crop monitoring tool to address food insecurity
- Will help to accurately define areas of farmland that has been sowed and harvested to improve food crop production
- The product is being co-developed with a task team formed by users and experts from African institutions



Crop circles in Egypt



Cropped area in Burundi

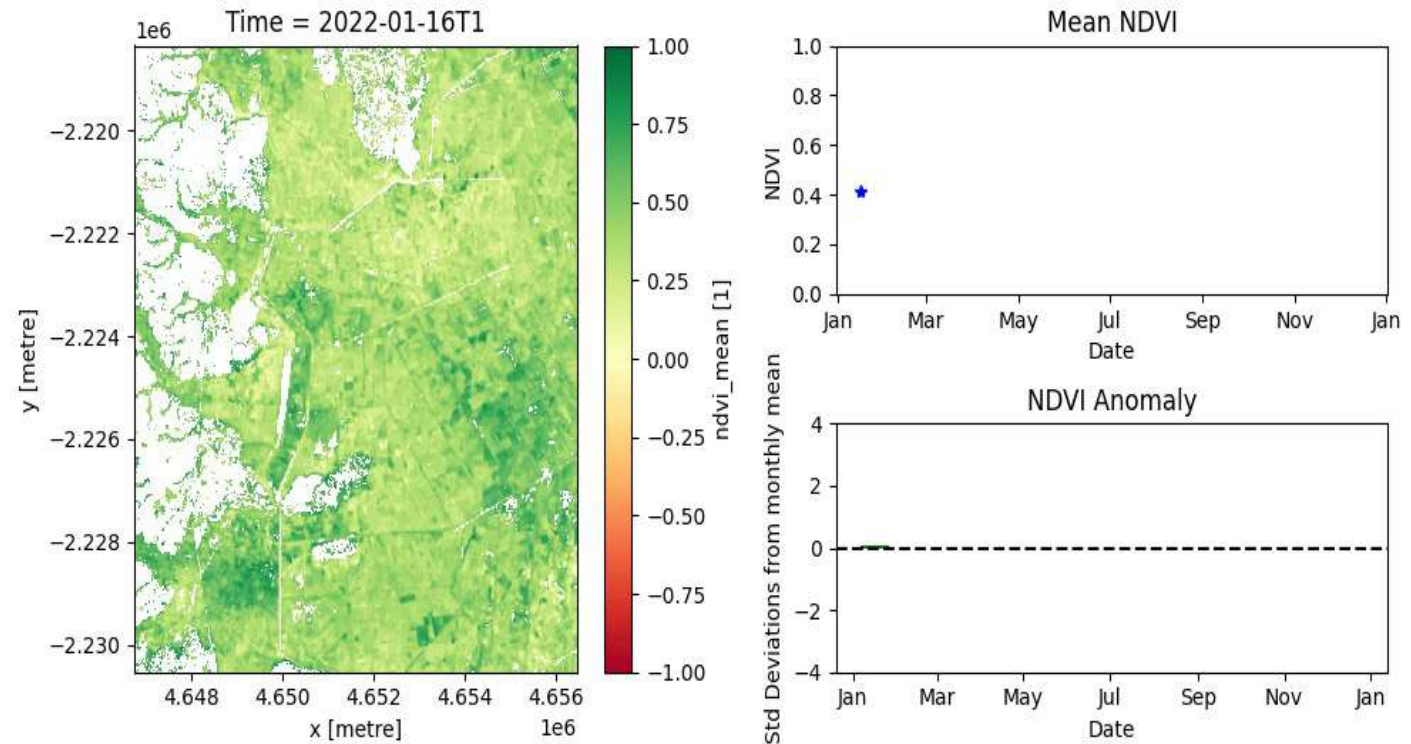


NDVI Mean and Anomaly Animations



- Potential to use this product to monitor agricultural activity across the African continent, and for forecasting and early warning of food security challenges.
- The animation shows the mean NDVI in space, mean NDVI in time, and NDVI anomaly in time for an area of cropland. Non-crop land cover classes were omitted using the Digital Earth Africa [crop mask](#)

Impactful in addressing climate change



This image shows farmland in Madagascar experiencing dry conditions from June - December 2022 as NDVI anomalies indicate values below the historical baseline

Digital Earth Africa Coastlines

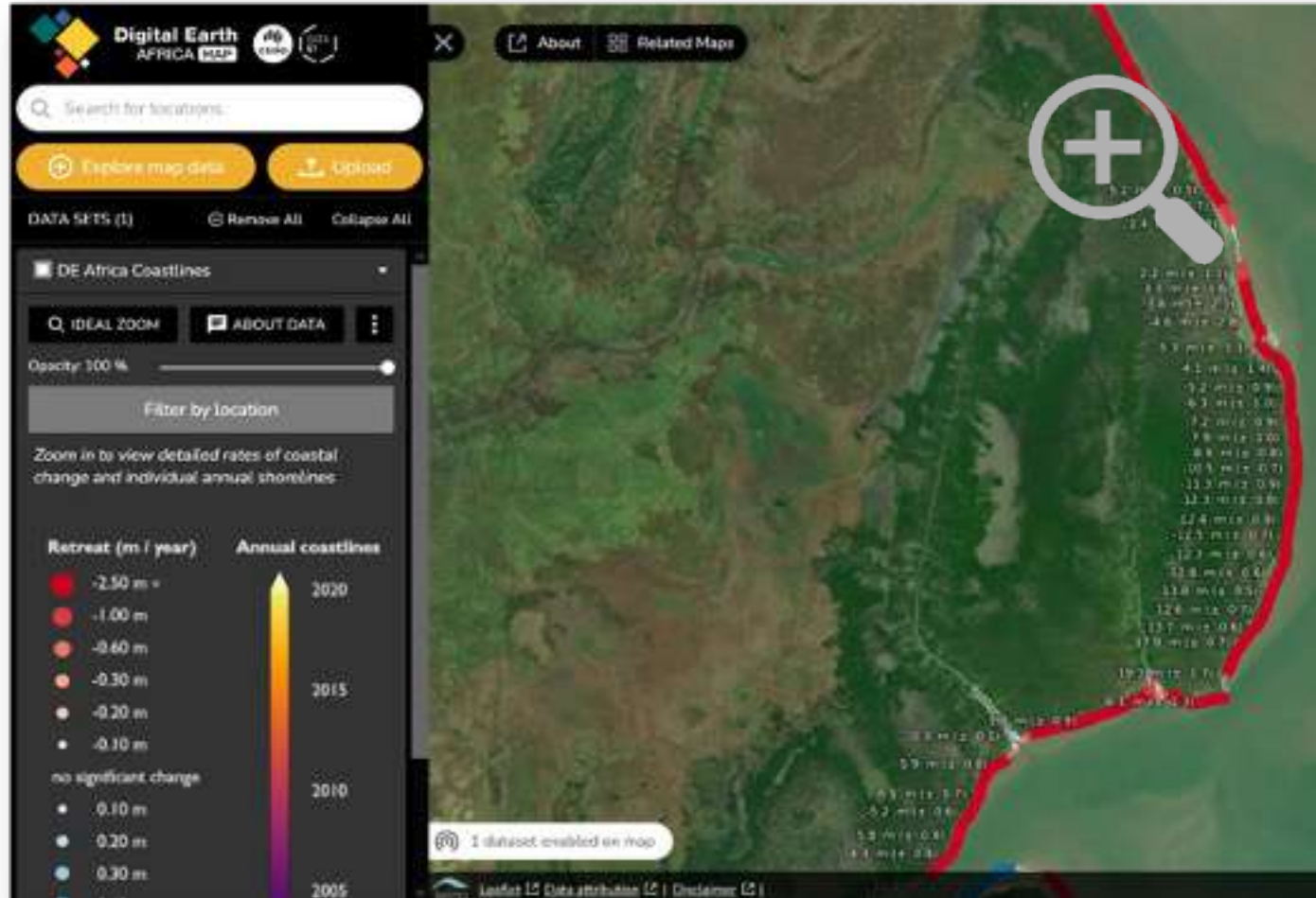


- **Adapted from the Australian Coastlines**
- **Co-developed and validated** with implementing **partners in Africa**: Centre de Suivi Ecologique (CSE) – Senegal, RCMRD - Kenya
- **First Africa-wide** Coastlines monitoring service
- Tracks continental changes **from 2000 to present**
- Monitors more than **60,000 km of coast** with **30 m spatial resolution**
- Provides **free interactive access** to
 - Hotspots
 - Rates of changes
 - Average yearly shorelines

Impactful in addressing climate change



Identify hot spots and rates of change



Mangrove dynamics
in Mozambique



200 meters of shoreline
retreat, Madagascar

<https://maps.digitalearth.africa/>



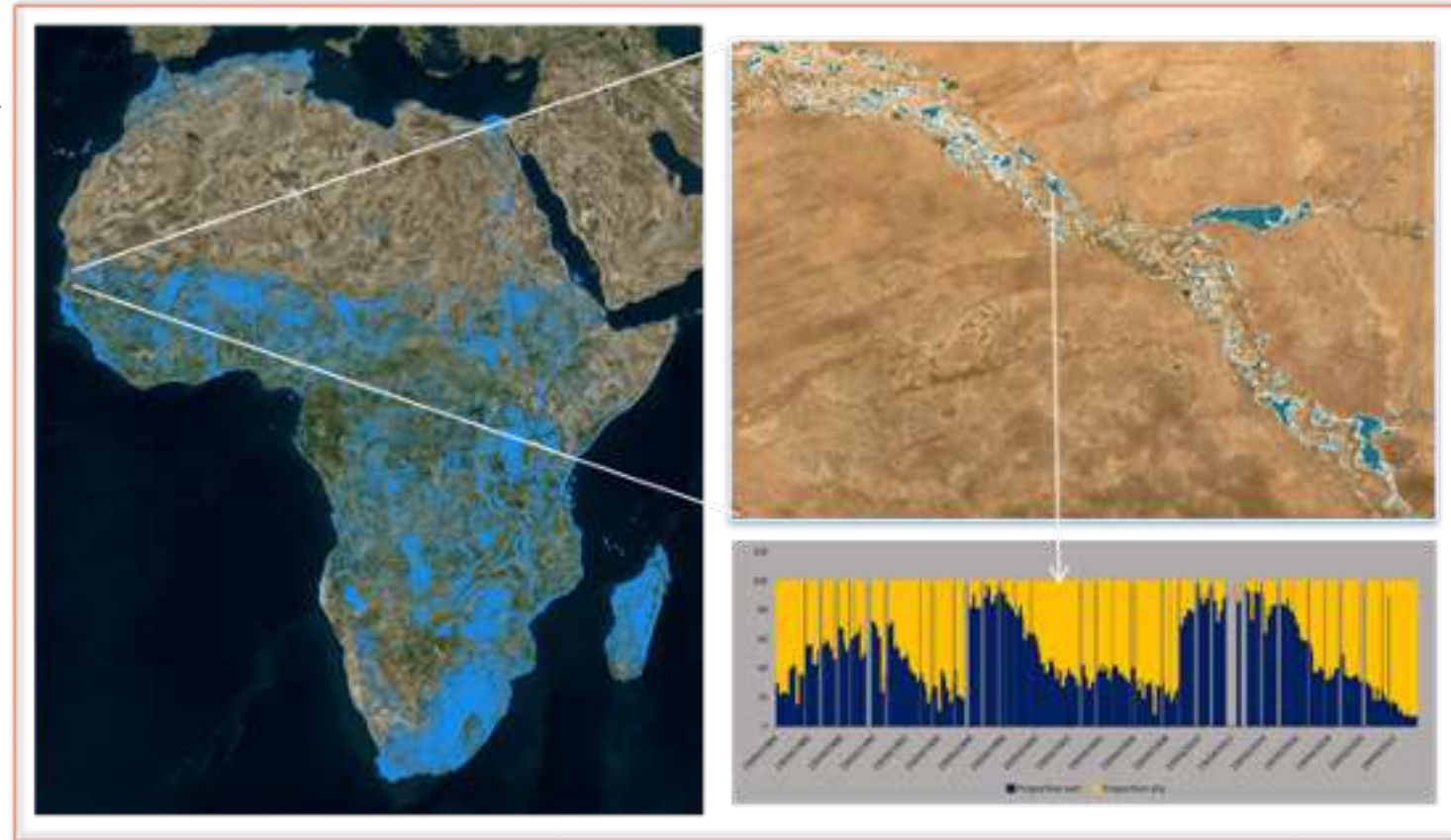
Digital Earth
AFRICA

Waterbodies Continental Service

Building on Water Observations from Space (WOFS), the waterbodies service identifies around 700,000 individual water features across the continent and provides information on changes in surface water within these over the past 3 decades.

The service is being designed to allow users to:

- View and analyse time series of surface water extent for individual water features,
- Understand changes in water bodies over the past three decades and today,
- Monitor and understand the impact of extreme events and plan appropriate action.



Prototyping the new Waterbodies Continental Service, identifying around 700,000 unique water bodies and their change in water over 3 decades

DE Africa Data



There are many ways to access DE Africa data:

View data

DE Africa Map



<http://maps.digitalearth.africa/>

Analyse data

DE Africa Sandbox



<https://sandbox.digitalearth.africa/>

Other platforms include:

Access in GIS software

OWS Map Services

<https://ows.digitalearth.africa/>

Learn how to access & analyse data

Digital Earth Africa Learning Platform

<https://learn.digitalearth.africa.org/>

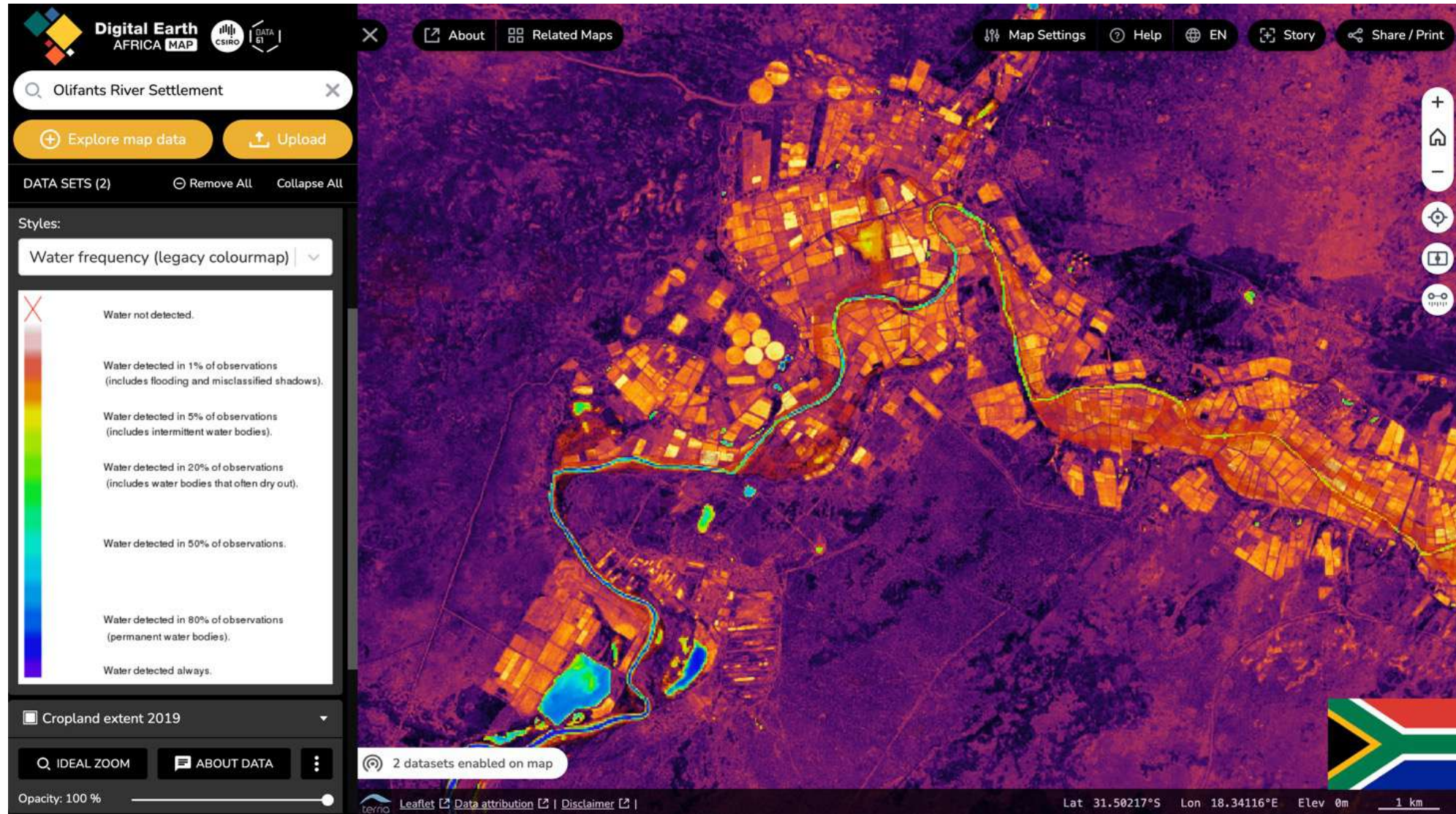
Crop probability

Olifants River Settlement, South Africa



31.54621°S,
18.26838°E

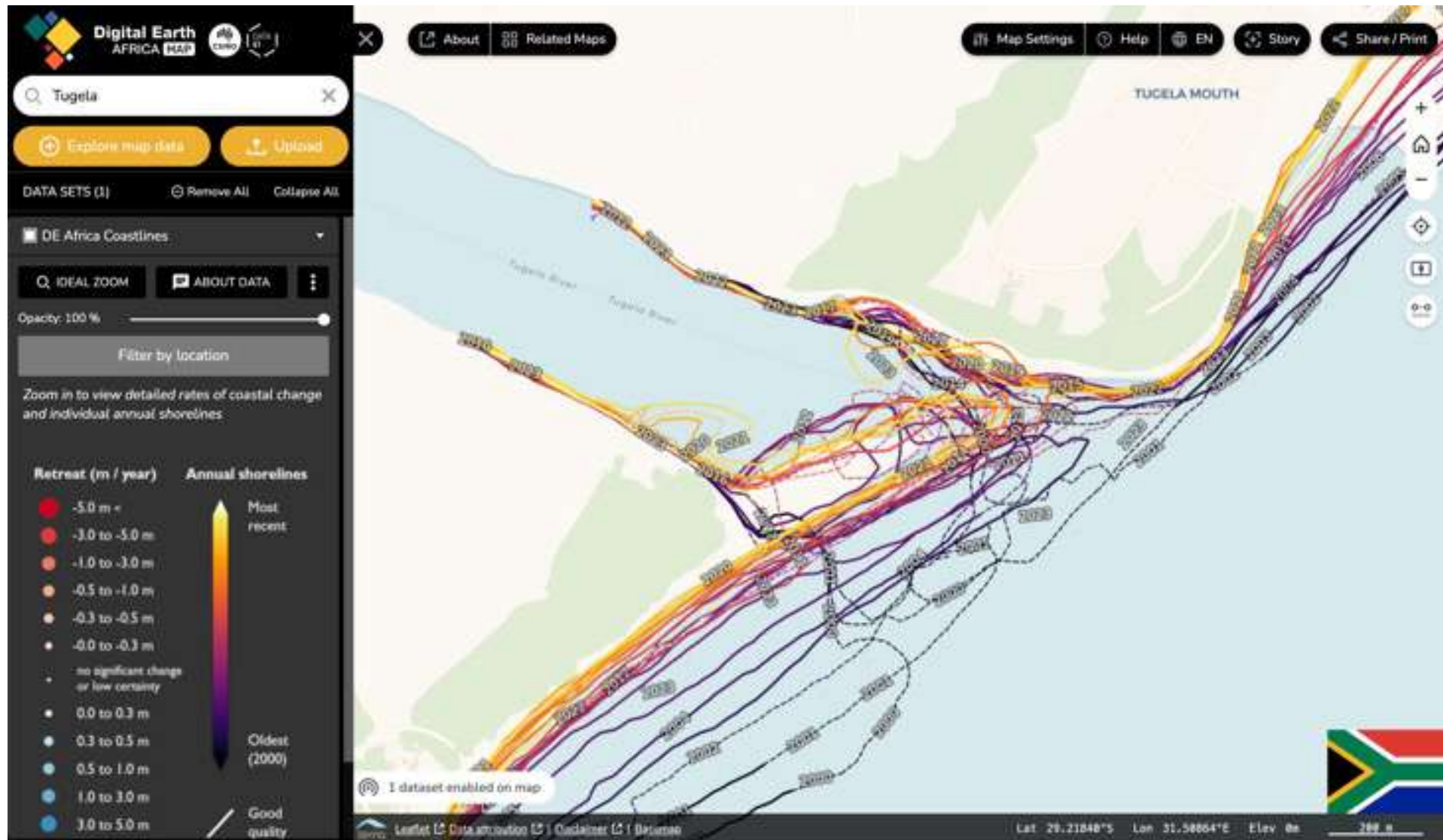
<https://maps.digitalearth.africa/#share=s-gbJttWgpqnLD06Y8JmKu7qx7w1N>



Coastlines

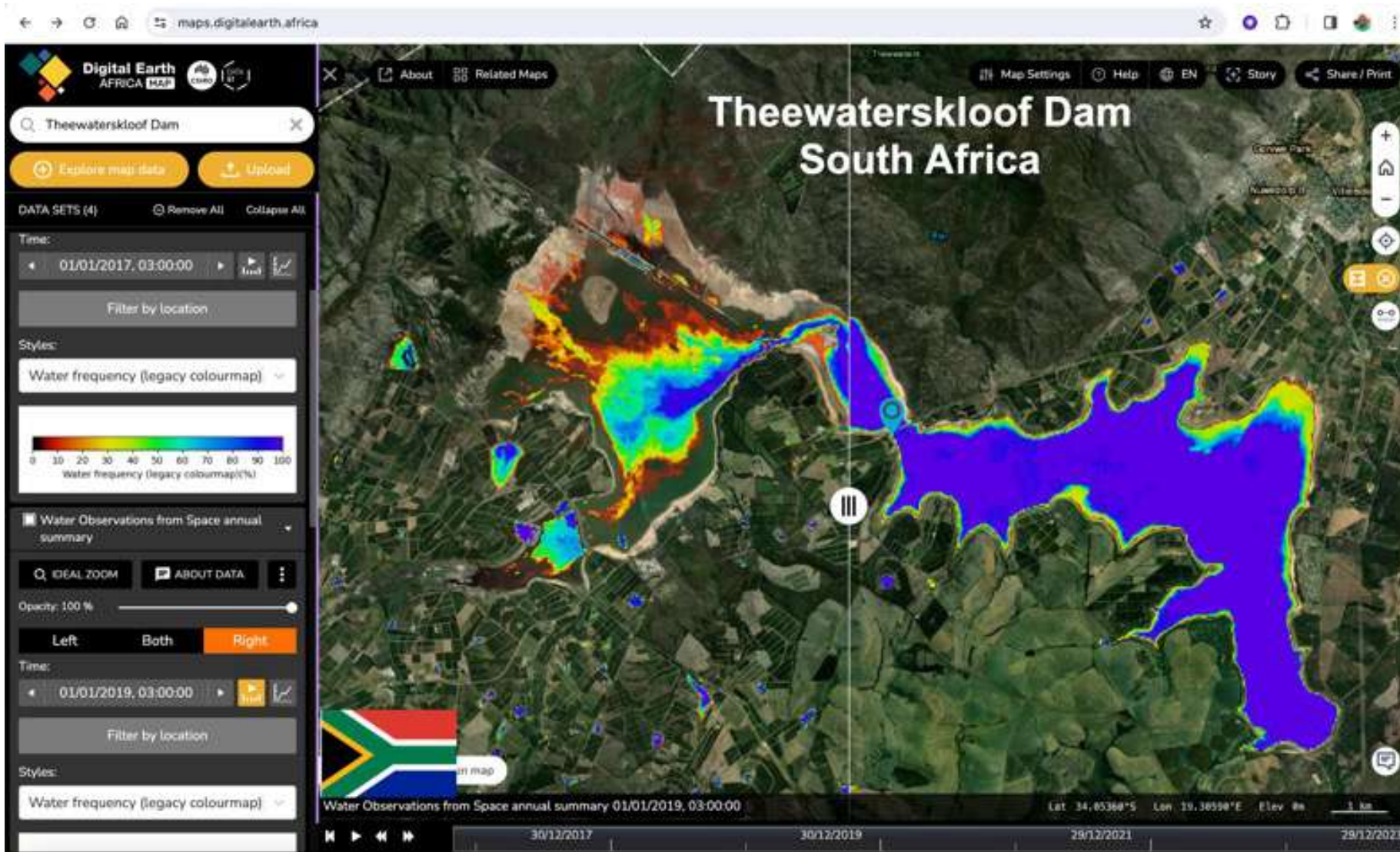
Tugela, KZN, South Africa

29.22513°S, 31.49802°E



<https://maps.digitalearth.africa/#share=s-x7bDGNsqo8nrnzNW3WzypSjbvr7>

Mapping water extent using WOfS: Theewaterskloof Dam, SA



DE Africa Sandbox



- Digital Earth Africa supports all the sectors of the economy from agriculture, water, urbanisation and management of natural resources.
- Some of the algorithms are customised to address the needs in the analysis platform: sandbox <https://sandbox.digitalearth.africa/>



Measuring crop health

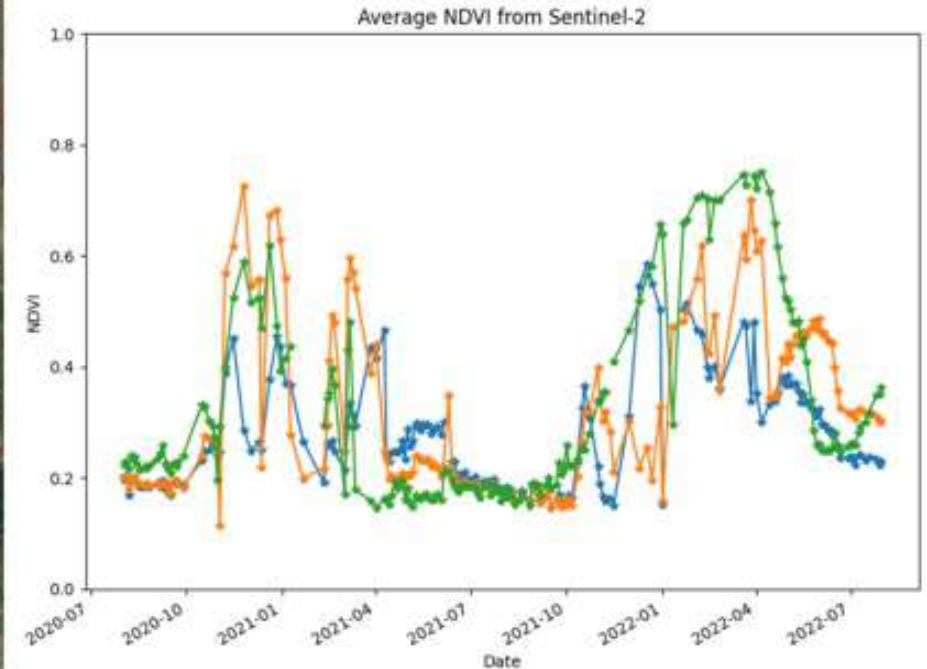
Crop_health.ipynb

Study area e.g.
Hartbeespoort, South
Africa
lat, long, = -25.712780,
27.820860
= buffer = 0.005
date = '2020-08-01'

Draw a polygon within the red box to view a plot of average NDVI over time in that area.



ipyleaflet | Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community



Plot status: polygon successfully added to plot.

Measuring vegetation phenology

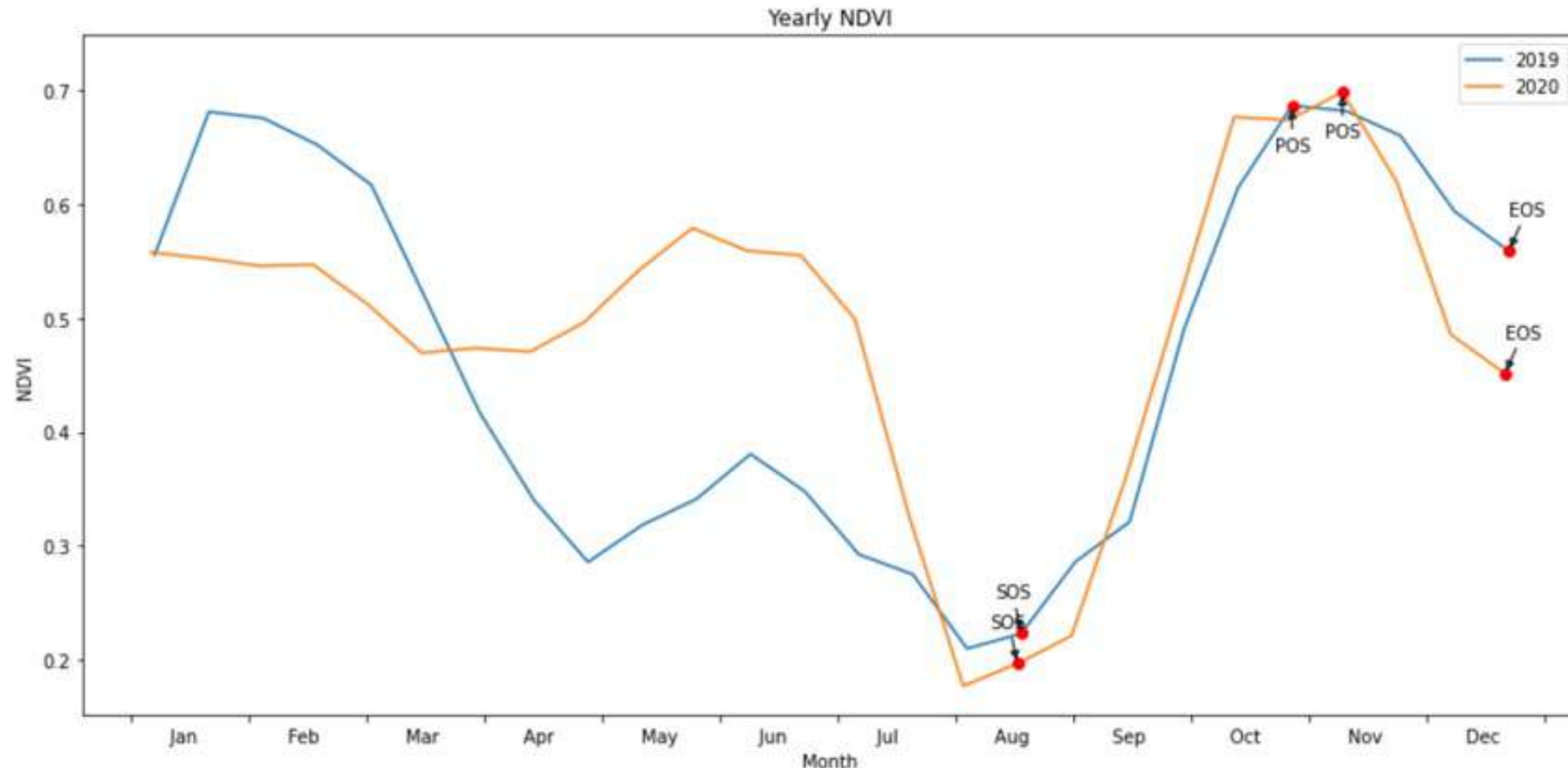
Phenology_optical.ipynb

Steps:

- Calculate phenology statistics using `xr_phenology`

- DE Africa function `xr_phenology` can calculate a number of land-surface phenology statistics that together describe the characteristics of a plant's lifecycle.

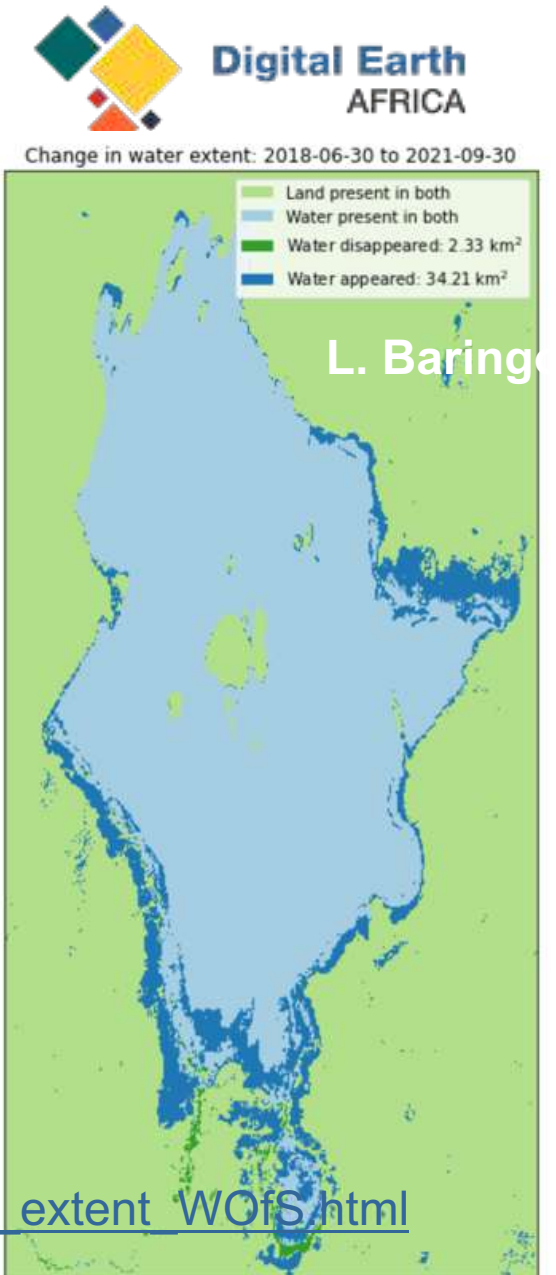
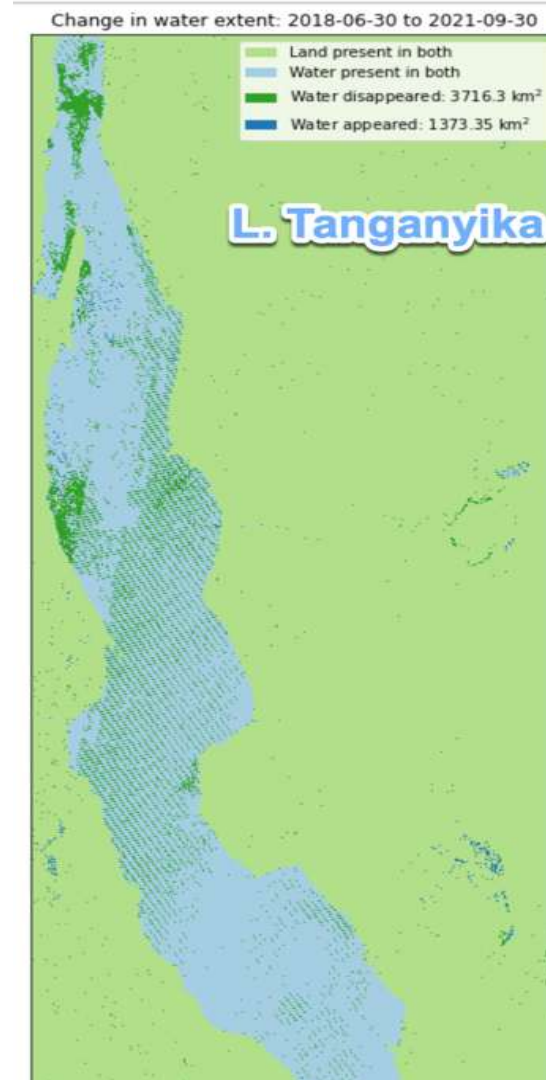
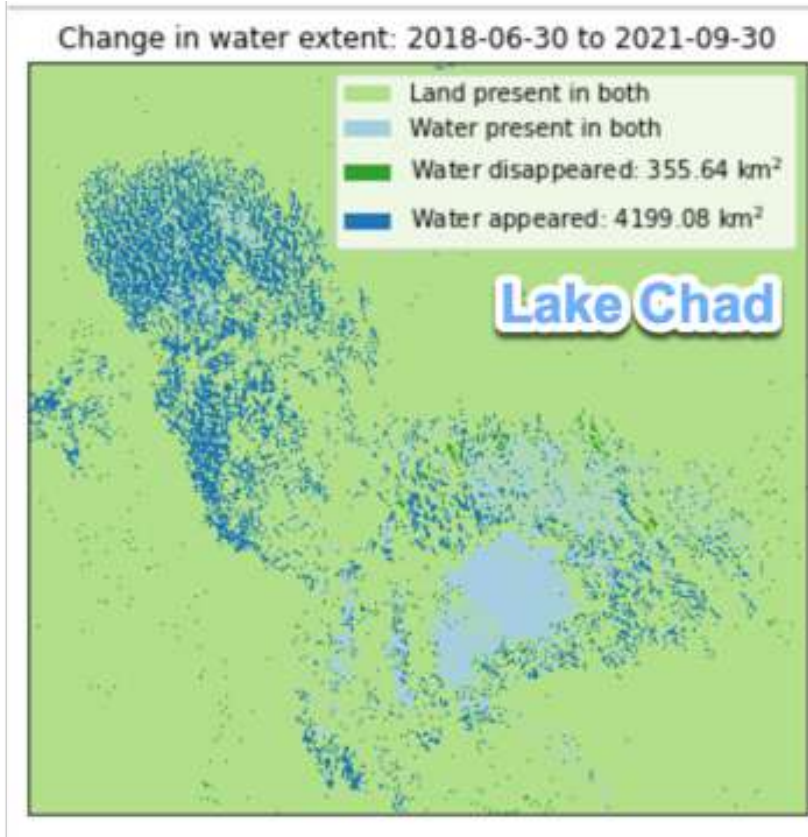
SOS = DOY of start of season
POS = DOY of peak of season
EOS = DOY of end of season
vSOS = Value at start of season
vPOS = Value at peak of season
vEOS = Value at end of season
Trough = Minimum value of season
LOS = Length of season (DOY)
AOS = Amplitude of season (in value unit)
ROG = Rate of greening
ROS = Rate of senescence



Mapping water extent using Water observation from space (WOfS)

Monitoring_water_extent_WOfS.ipynb

Compare water extent



https://docs.digitalearthafrika.org/en/latest/sandbox/notebooks/Real_world_examples/Water_extent_WOfS.html

Flood assessment using Sentinel 1, 2. Lokoja, Nigeria



AFRIGIST in Nigeria, using Digital Earth Africa (DE Africa) to provides insights into flooding in Lokoja, Nigeria

Area of interest
Lokoja, Nigeria

latitude = 7.78

longitude = 6.73

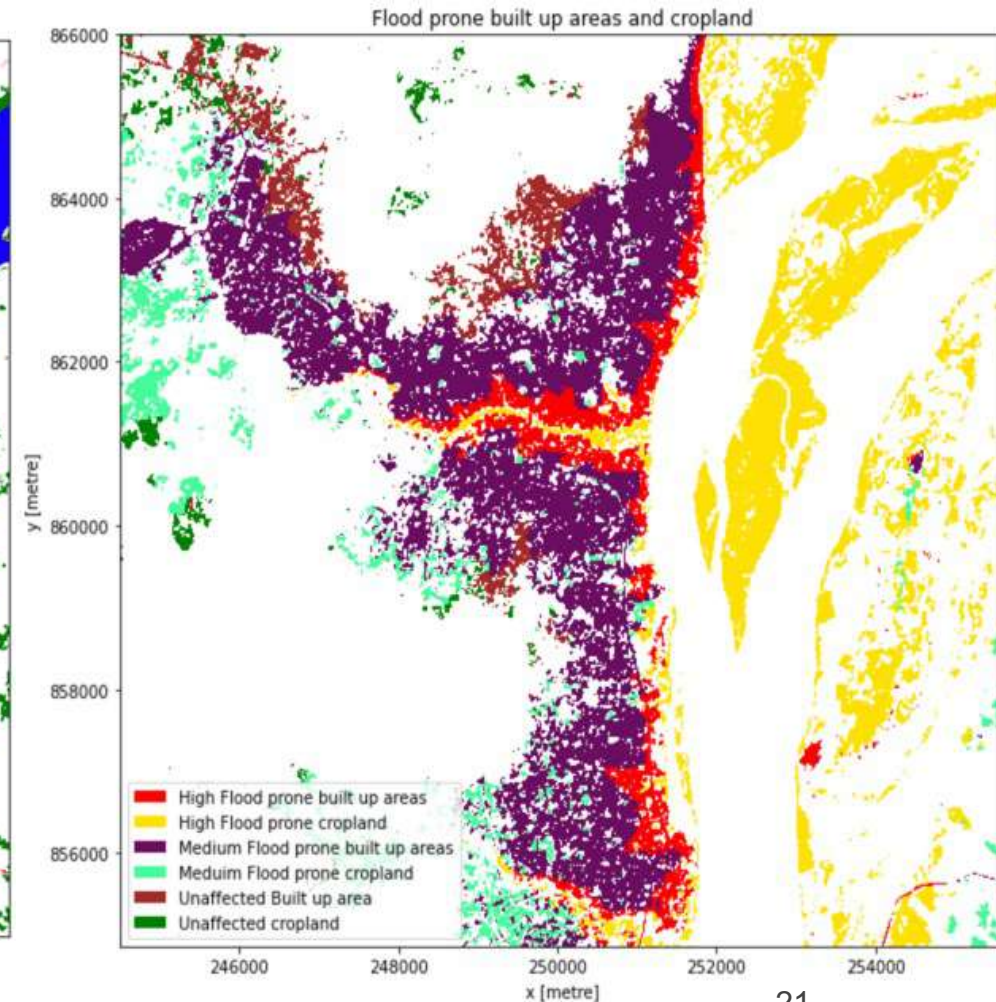
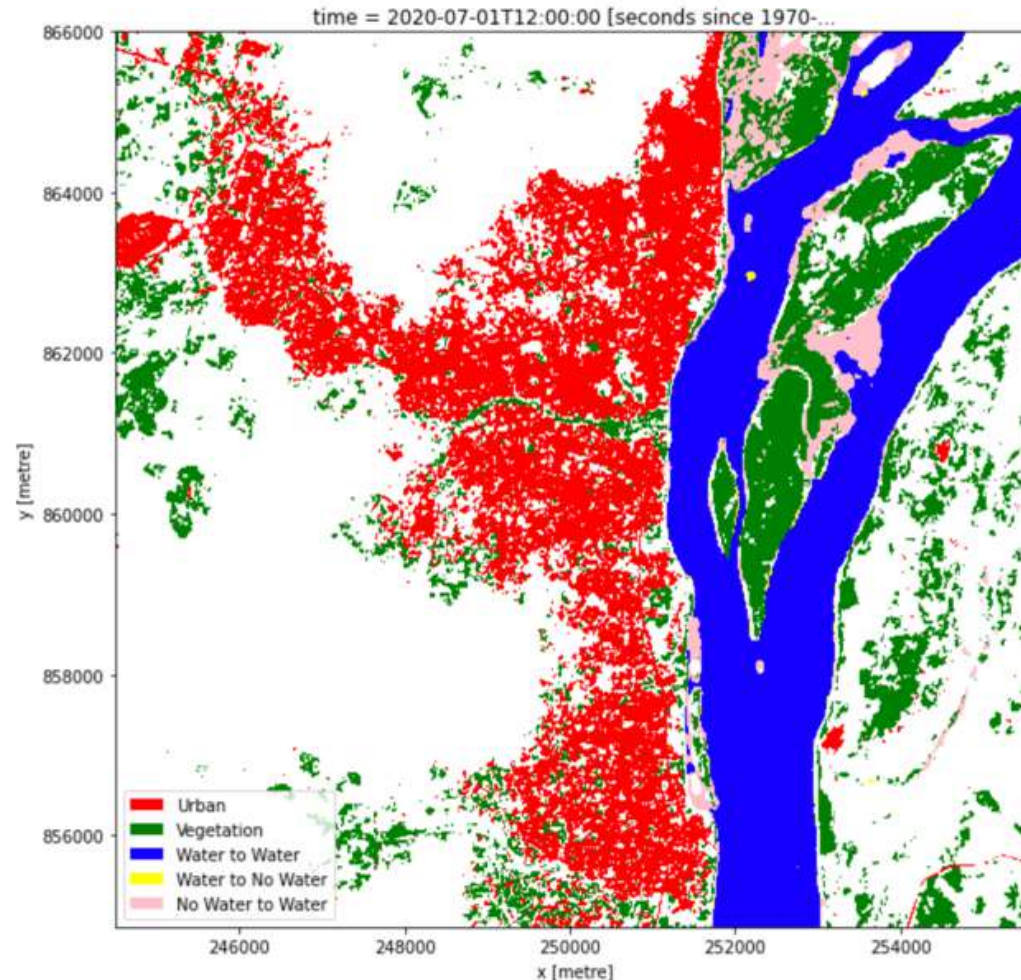
time= ("2022-07", "2022-10")

- Load Sentinel 1
- Water threshold
- Classification
- Flood assessment

Online module will be
available

<https://learn.digitalearth.africa.org>

Scripts: [here](#)



Sandbox Tutorials

	English	French
Flood risk management	https://youtu.be/b74fDdID_kw	https://youtu.be/OUqpykcHoB8
Drought index	https://youtu.be/nQchJpGAzh4	https://youtu.be/mGa15ZcvY1g
Crop health	https://youtu.be/wgHCRrxSkhE	https://youtu.be/VcO9-c4E fz0
Soil moisture	https://youtu.be/OLCROpovoIE	https://youtu.be/dj_ZcC6DvsM

DE Africa Tutorials: <https://www.youtube.com/@digitalearthafrika4021>

Africa Geoportal

<https://www.africageoportal.com>



Africa GeoPortal (Esri)

Esri provides geographic information system software, web GIS and geodatabase management applications. They have developed the [Africa GeoPortal](#), which uses imagery from DE Africa to provide free geospatial tools, data and training for users working on Africa geospatial challenges.



English <https://youtu.be/jU5o0J37iQk>

French: <https://youtu.be/9zDYQJFvZp8>

The best location for geospatial tools, data, and training
for users working on Africa's geospatial challenges!

Other Access



DE Africa Metadata Explorer

The [DE Africa Metadata Explorer](https://explorer.digitalearth.africa/products) is a website that uses existing Open Data Cube infrastructure to inspect metadata for DE Africa services and underlying datasets. It includes a time-picker and coverage map to help users find datasets. The explorer can be used to locate and download individual data files from DE Africa. <https://explorer.digitalearth.africa/products>

Open Geospatial Consortium (OGC) Web Services

The [OGC Web Services](#) delivers DE Africa data through standard Application Program Interfaces (APIs). It offers users freely available and interoperable data via services that are compatible with international open standards, allowing users to visualise and analyse data with Geographic Information System (GIS) clients.

Reference

https://docs.digitalearthafrica.org/en/latest/platform_tools/explorer.html

https://docs.digitalearthafrica.org/en/latest/platform_tools/web_services_gis.html [Web Services]

Making an impact use cases

- Published use case studies (Kenya, Ghana, Tanzania, Botswana, Uganda), across government, industry, academic
- Use case studies in development (Senegal, Benin, Burkina Faso, Niger, Botswana, Kenya, Nigeria)
- 2 industry projects supported



Using satellite data to monitor agriculture in Ghana - The GAIMS platform from Big-Data Ghana.



Using Earth observation to protect and conserve wetlands in Kenya



Rising Lakes in the Rift Valley in Kenya



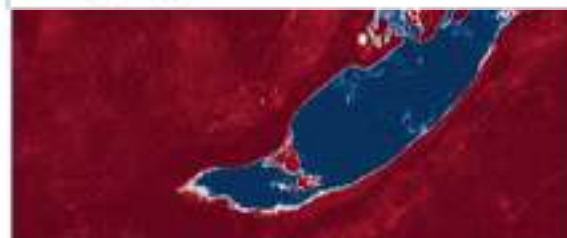
Monitoring urbanisation in Gulu City, Uganda



EO for conservation: rehousing giraffes on Lake Baringo, Kenya



Monitoring Fire Activity in the Table Mountain National Park, Cape Town



Water Assessment and Monitoring in the Lake Ngami, Lower Okavango Delta, Botswana



Monitoring Chlorophyll in Lake Elmenteita, Kenya



Coastlines in Africa



Mangroves in Zanzibar

Diversity and inclusion



Digital Earth
AFRICA



youth mappers



2022 TECHNICAL CHALLENGE



Congratulations TO THE WINNERS



Jokotola Omidiji

Winner

Monitoring mangrove forest
degradation in parts of Niger Delta



Sinethemba Mtshali

First Runner - Up

Effects of the Migrant Crisis on
the African Continent



Digital Earth
AFRICA

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Information for Agriculture, Food and Water Security

- **Objectives**

1. Support consultations with African agricultural and water management agencies to understand needs, opportunities, and gaps for using Earth observations (EO)-based services to increase agricultural productivity and sustainability.
2. Develop a Roadmap for DE Africa to deliver services tailored to these needs, improving productivity and building resilience.

Botswana, Ethiopia, Kenya, Rwanda, South Africa, and Uganda



Australian Government
**Australian Centre for
International Agricultural Research**



Monitoring coastline change in the Kwa-Zulu Natal Tugela River mouth using Coastlines on DE Africa maps showing how coastlines have retreated over the years.



<https://maps.digitalearth.africa/#share=s-5Y65KQly5B1i5lCw6QTm4S7EoQC>

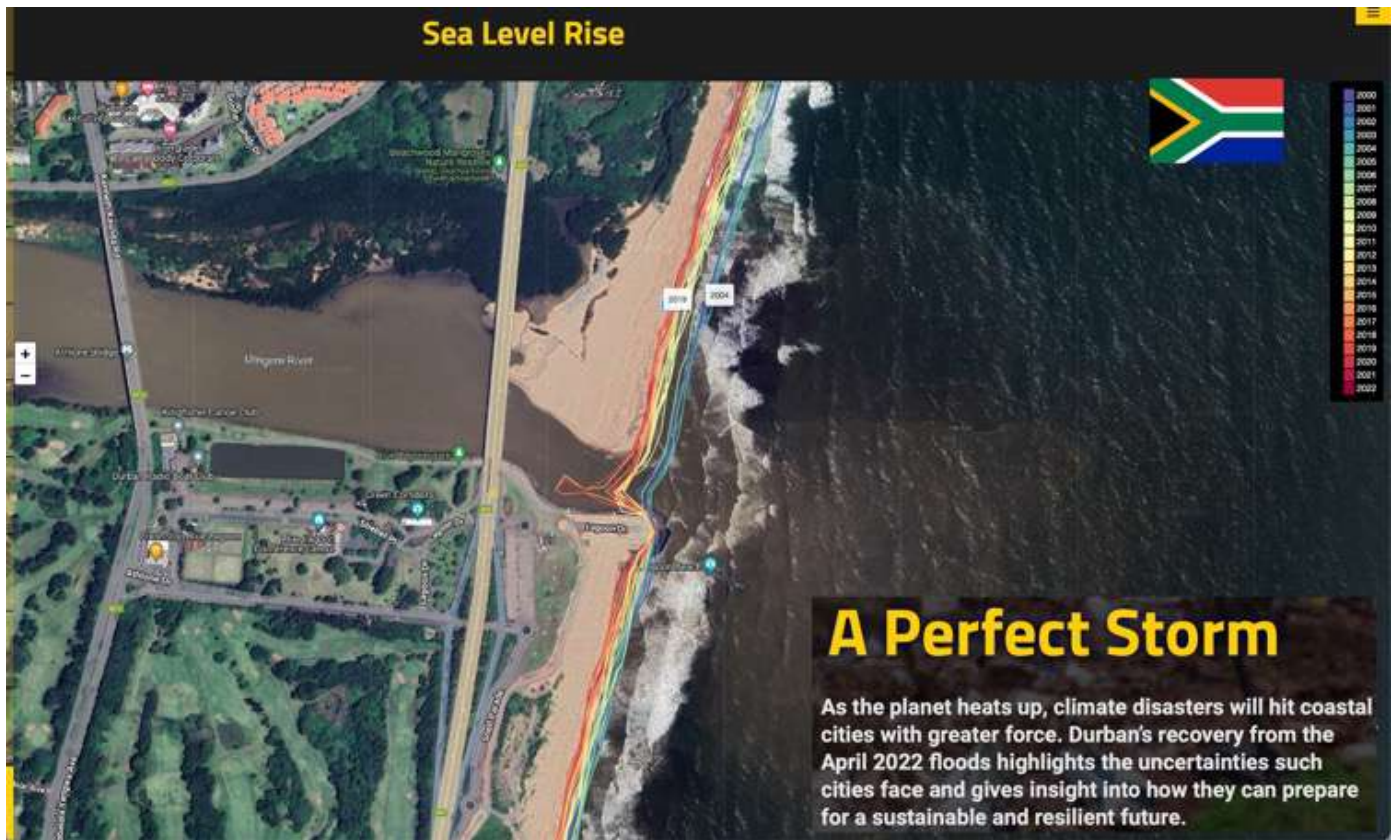
Monitoring coastline change in the Kwa-Zulu Natal Tugela River mouth using Coastlines on DE Africa maps showing how coastlines have retreated over the years.

Digital Earth Africa

<https://sarva.saeon.ac.za/coastal-vulnerability/>

[Google Earth Engine Coastlines script](#): Bishop-Taylor, R., Nanson, R., Sagar, S., Lymburner, L. 2021. Digital Earth Australia Coastlines. Geoscience Australia, Canberra.
<https://doi.org/10.26186/116268>

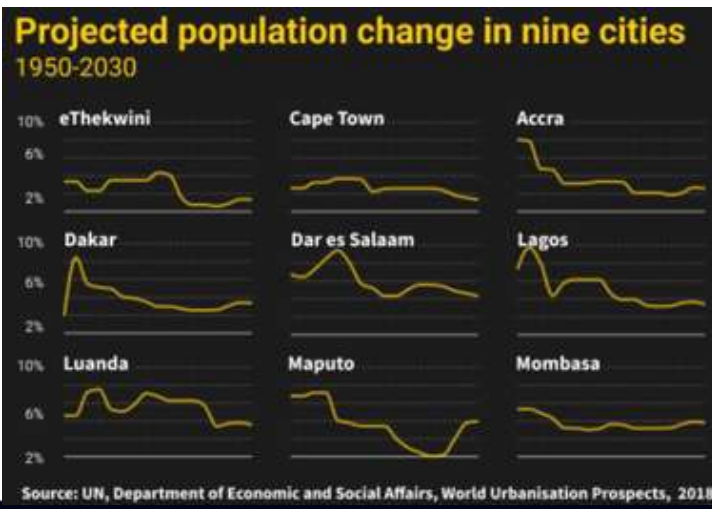
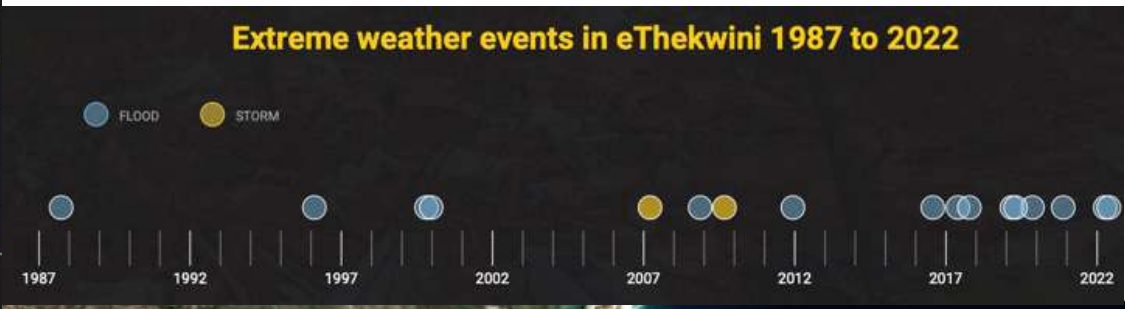
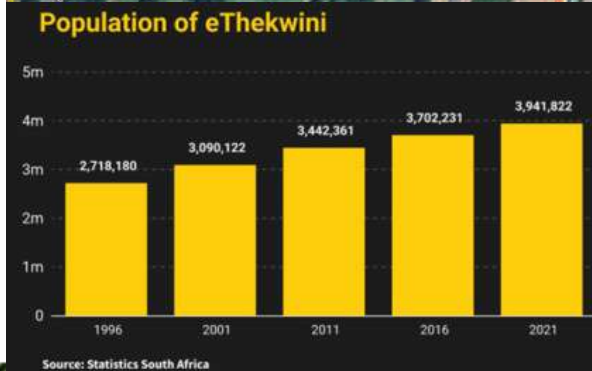
Monitoring coastline change in eThekweni, Durban, South Africa using Coastlines on DE Africa



Digital Earth Africa is revolutionising coastal management and supporting decision-making in infrastructure and livelihood-threatening situations. Insights into #coastalresilience are available through Digital Earth Africa, addressing the need to take #ClimateAction in #Durban, #SouthAfrica. story by @outlierafrica

<https://perfectstorm.theoutlier.co.za>

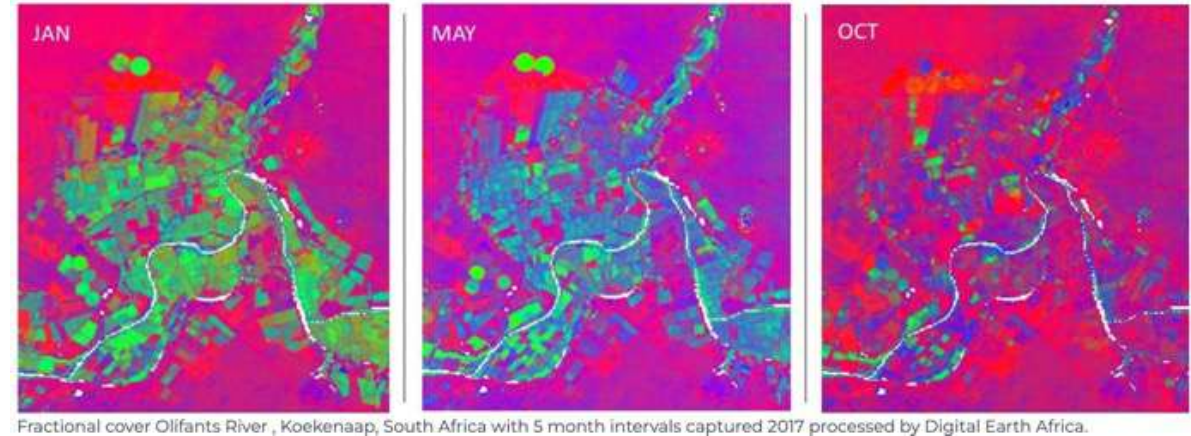
The April 2022 flooding in Durban was a case of inland river flooding, rather than a coastal storm surge.



Fractional cover Olifants River Settlement, South Africa



Digital Earth Africa's Fractional Cover, derived from Landsat **U.S. Geological Survey (USGS)**, is a powerful tool that provides valuable insights into seasonal vegetation, environmental conditions, and agricultural activities across Africa. Operating at 30 meters, this tool spans decades, enabling long-term comparisons of environmental conditions and helping to detect changes in vegetation cover. The data obtained from this tool is critical for monitoring and managing the continent's resources, making it an indispensable resource for environmental monitoring and agriculture. Check out the tool in action at Olifants River Settlement, South Africa 🇿🇦. **#DigitalEarthAfrica #FractionalCover #Agriculture #EnvironmentalMonitoring #LandsatUSGS**



<https://maps.digitalearth.africa/#share=s-2yrrGBYGlbP9EEU56GxMmfdmYAZ>

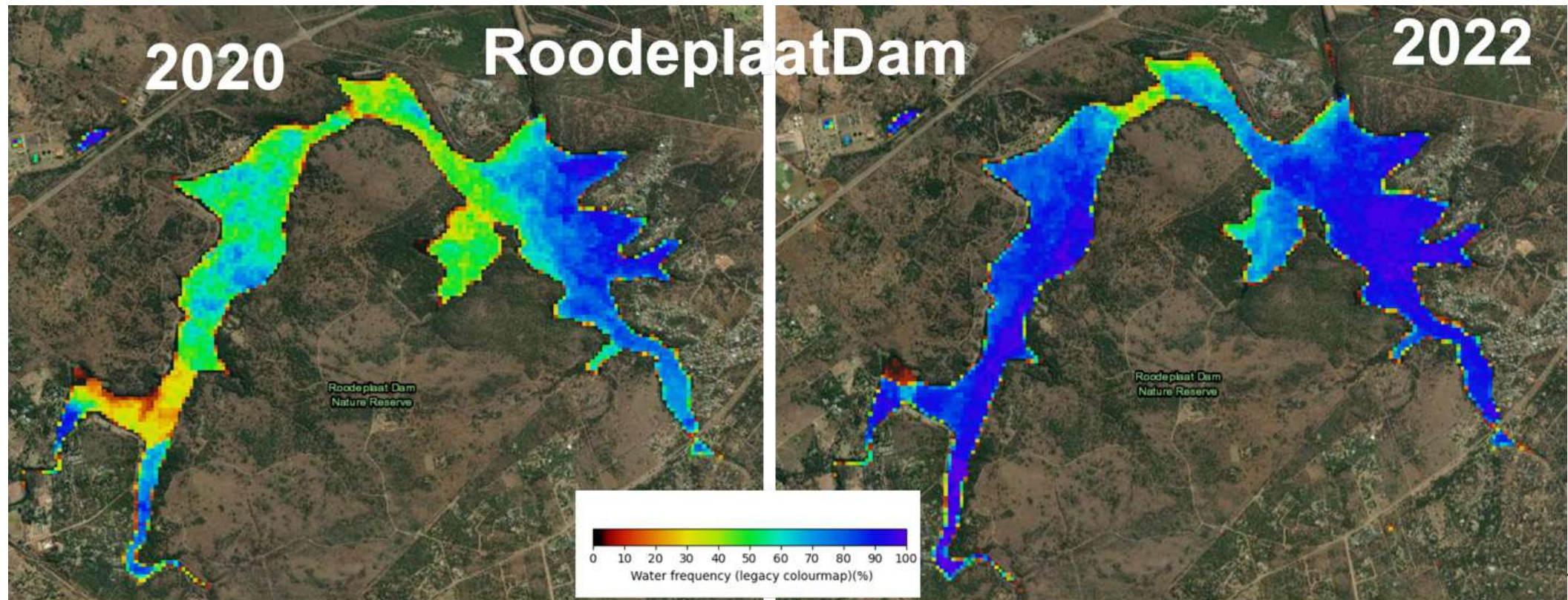
https://docs.digitalearthafrica.org/en/latest/data_specs/Fractional_Cover_specs.html

Monitoring Roodeplaat Dam, South Africa



Digital Earth Africa's water observation from space is providing crucial insights into the impact of climate change on Roodeplaat Dam in South Africa 🇿🇦. Through these observations, we can clearly see the effects of drought in 2020 and recharge in 2021. This data is critical in developing a better understanding of our planet's changing climate. Let's continue to prioritise the collection and analysis of this important information. #climatechange

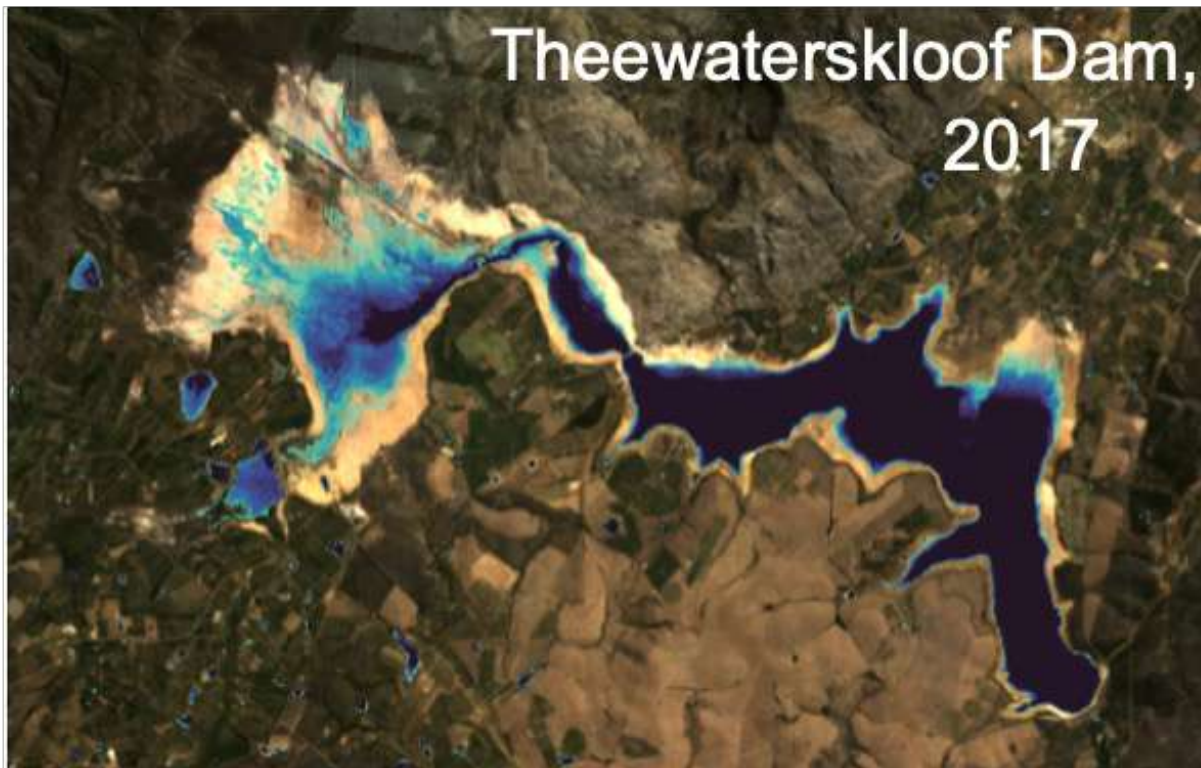
<https://maps.digitalearth.africa/#share=s-ksndSHeaxFdHbcPeCZXYvgq6nc2>



Monitoring Theewaterskloof dam, South Africa



Digital Earth Africa's water observation from space is providing crucial insights into the impact of climate change on Theewaterskloof dam in South Africa 🇿🇦 . which experienced droughts in 2017. This is a significant step in helping African countries tackle climate change. <https://maps.digitalearth.africa/#share=s-vbwVmjuGgmC87sB1MZfZWLuj4Pj>



Monitoring Clanwilliam Dam, South Africa



Digital Earth Africa's water observation from space and water bodies service providing crucial insights on

ABOUT DATA

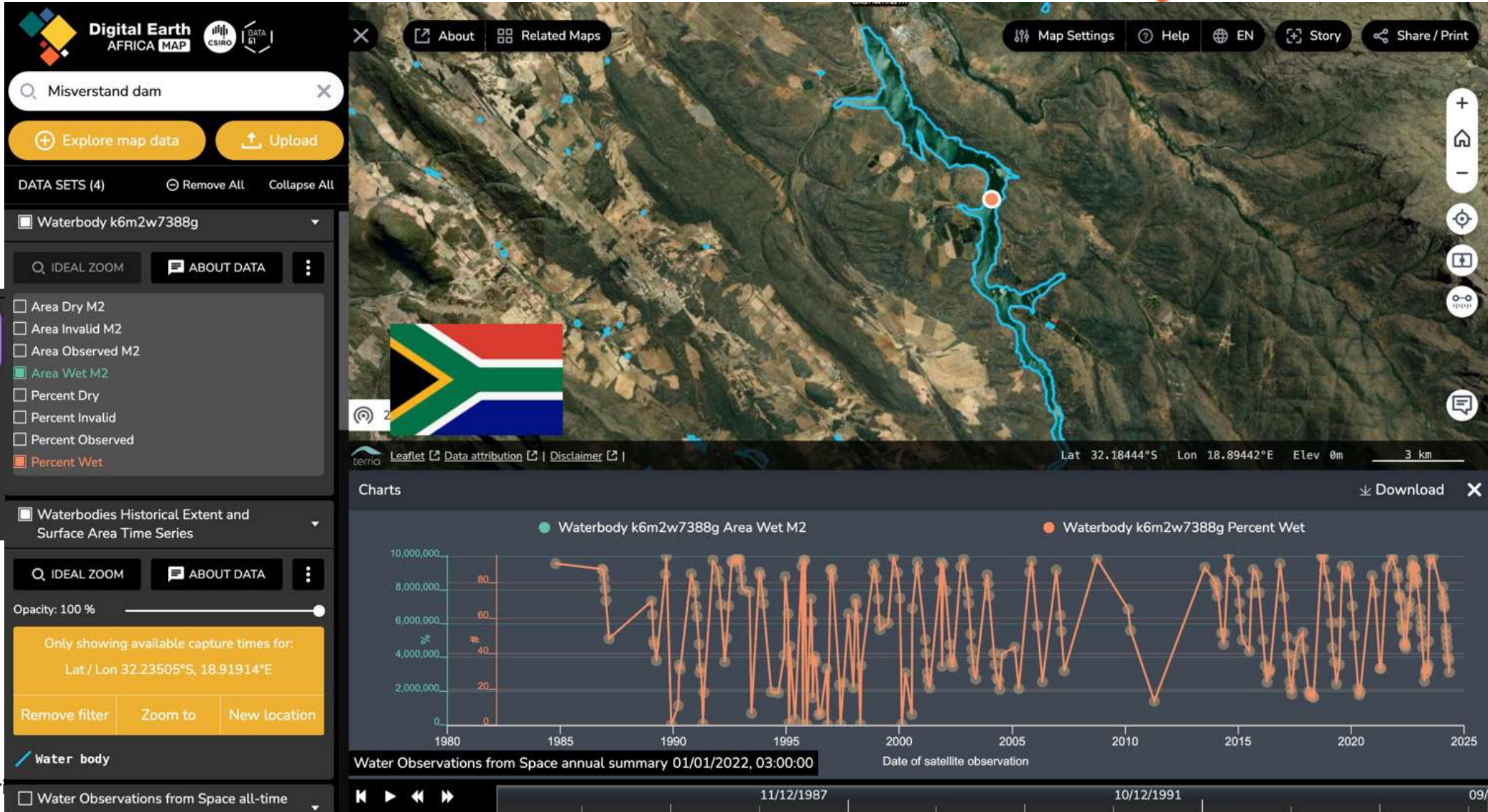
Edit Style

Export

Remove

<https://maps.digitalearth.africa/#share=s-wxfKIEOQO0juvU1s6rD16vdhIsH>

Digital Earth Africa

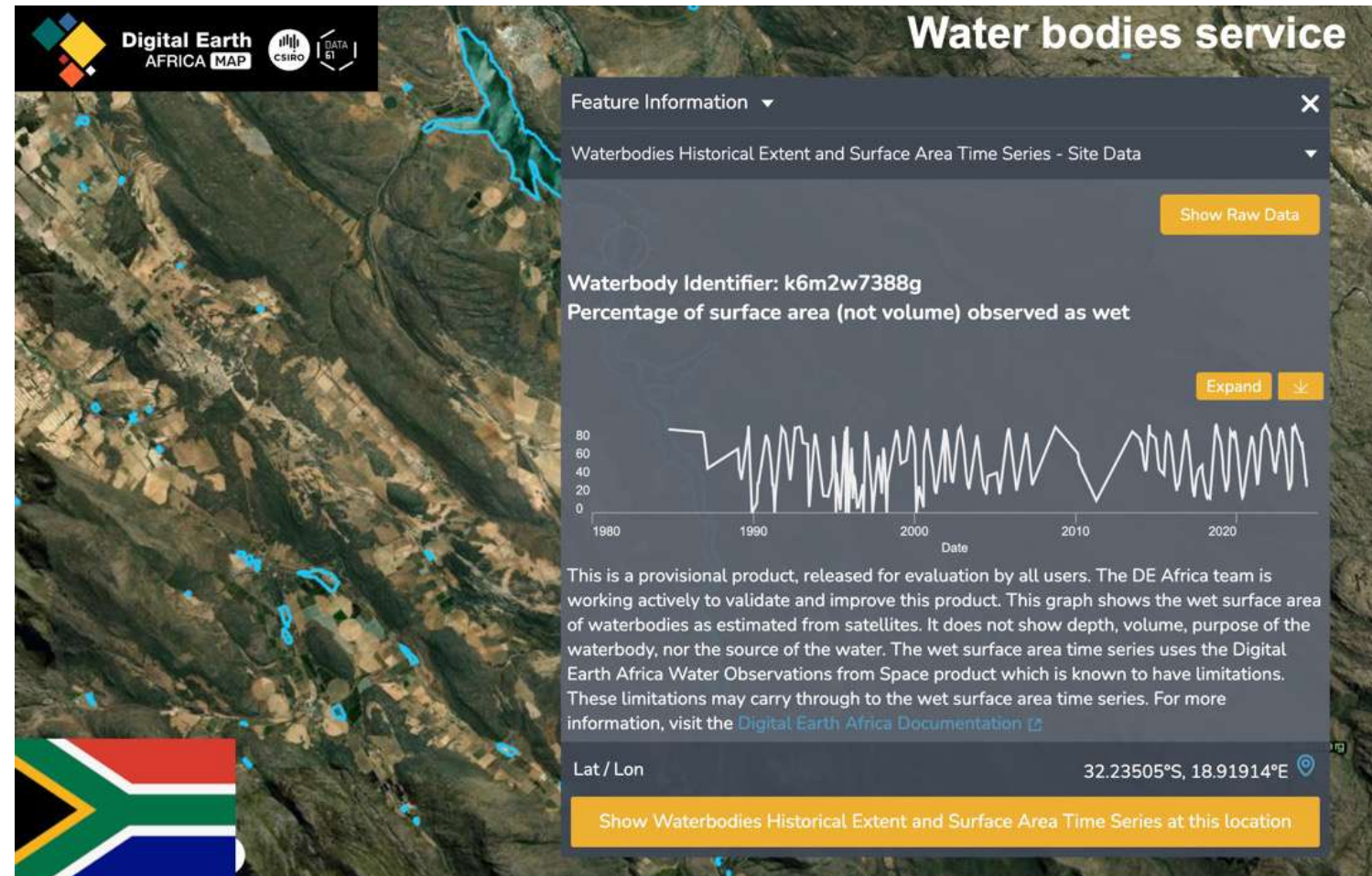
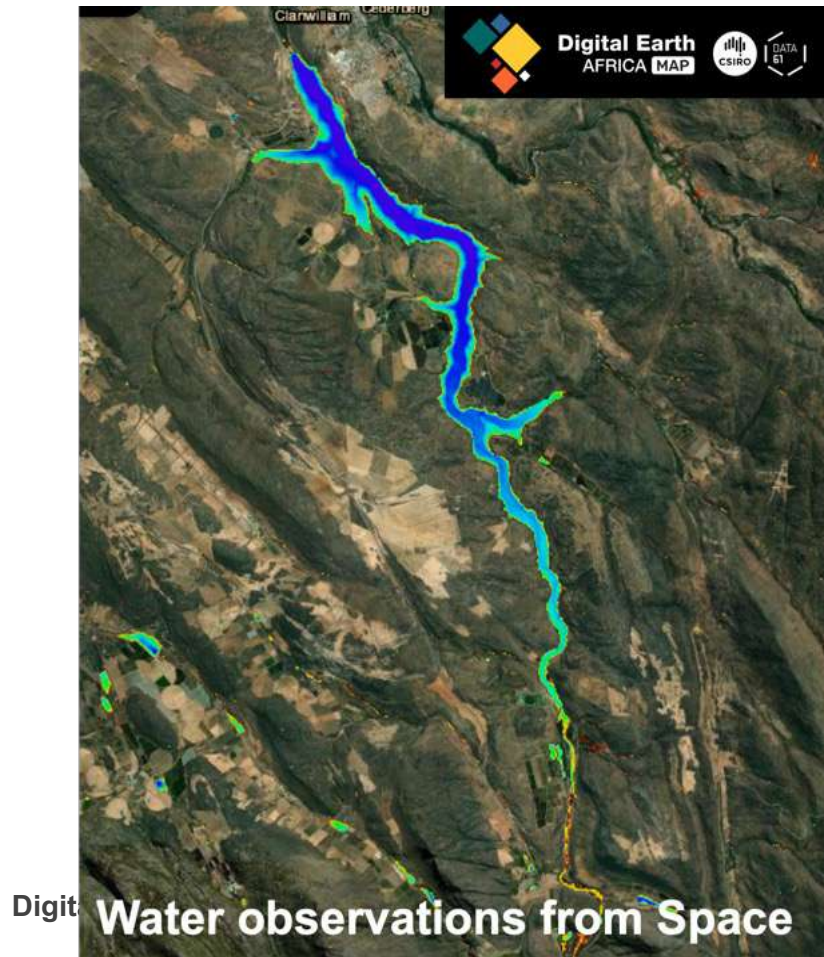


Monitoring Clanwilliam Dam, South Africa



Digital Earth Africa's water observation from space and water bodies service providing crucial insights on Clanwilliam Dam in Western Cape, South Africa 🇿🇦 in 2017 revealed drought: <https://maps.digitalearth.africa/#share=s-wxfKIEOQO0juvU1s6rD16vdhIsH>

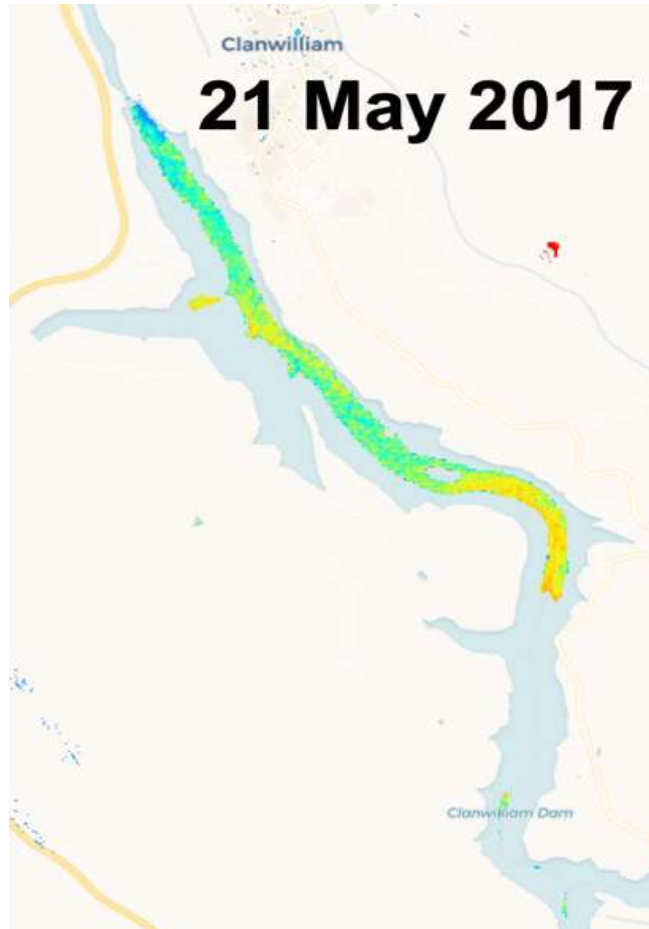
<https://drive.google.com/file/d/1t4mUsaTIHrYd3NcBydCzyzyL3iYxQ5Aj/view?usp=sharing>



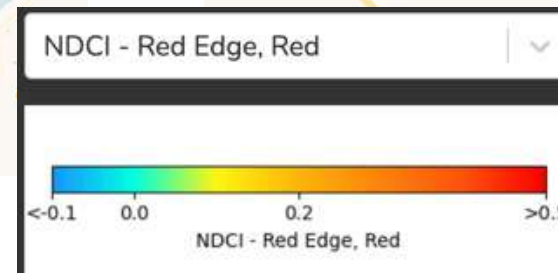
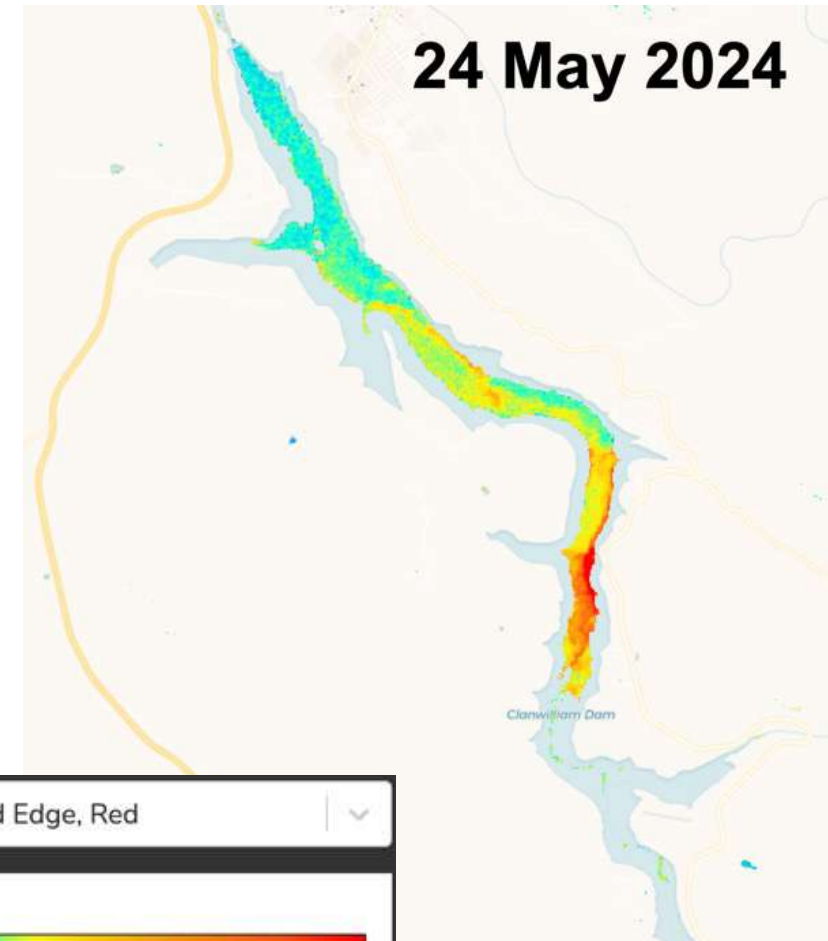
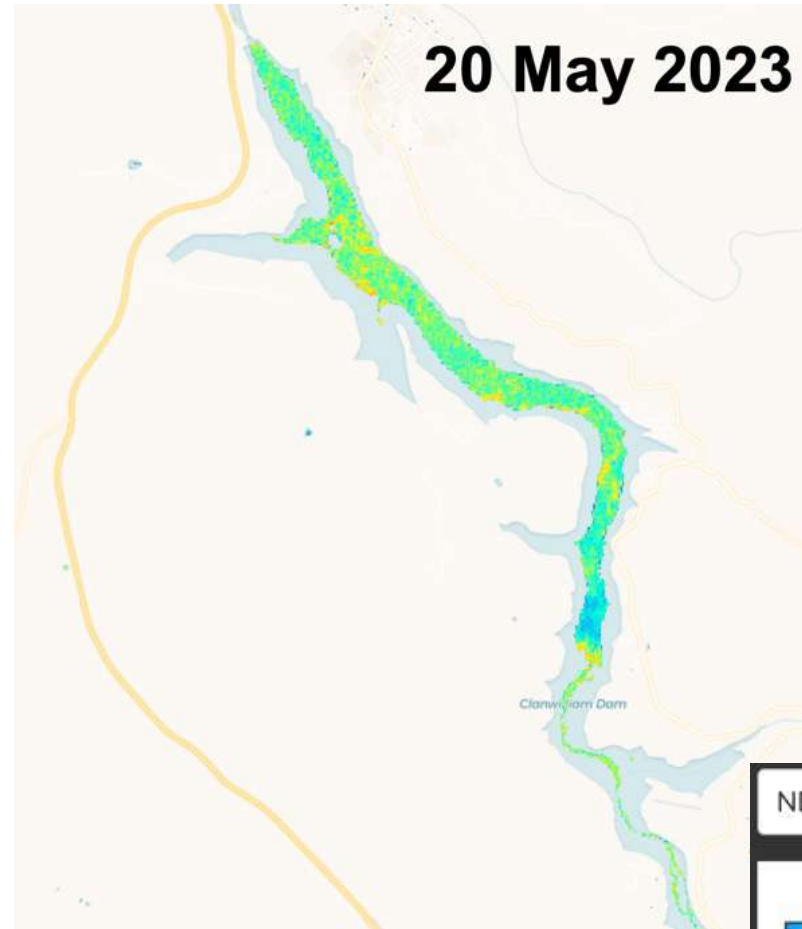
Monitoring Clanwilliam Dam, South Africa



Sentinel 2 NDCI shows water quality <https://maps.digitalearth.africa/#share=s-dOHG11XrIP5f694fN1y85bILBuE>

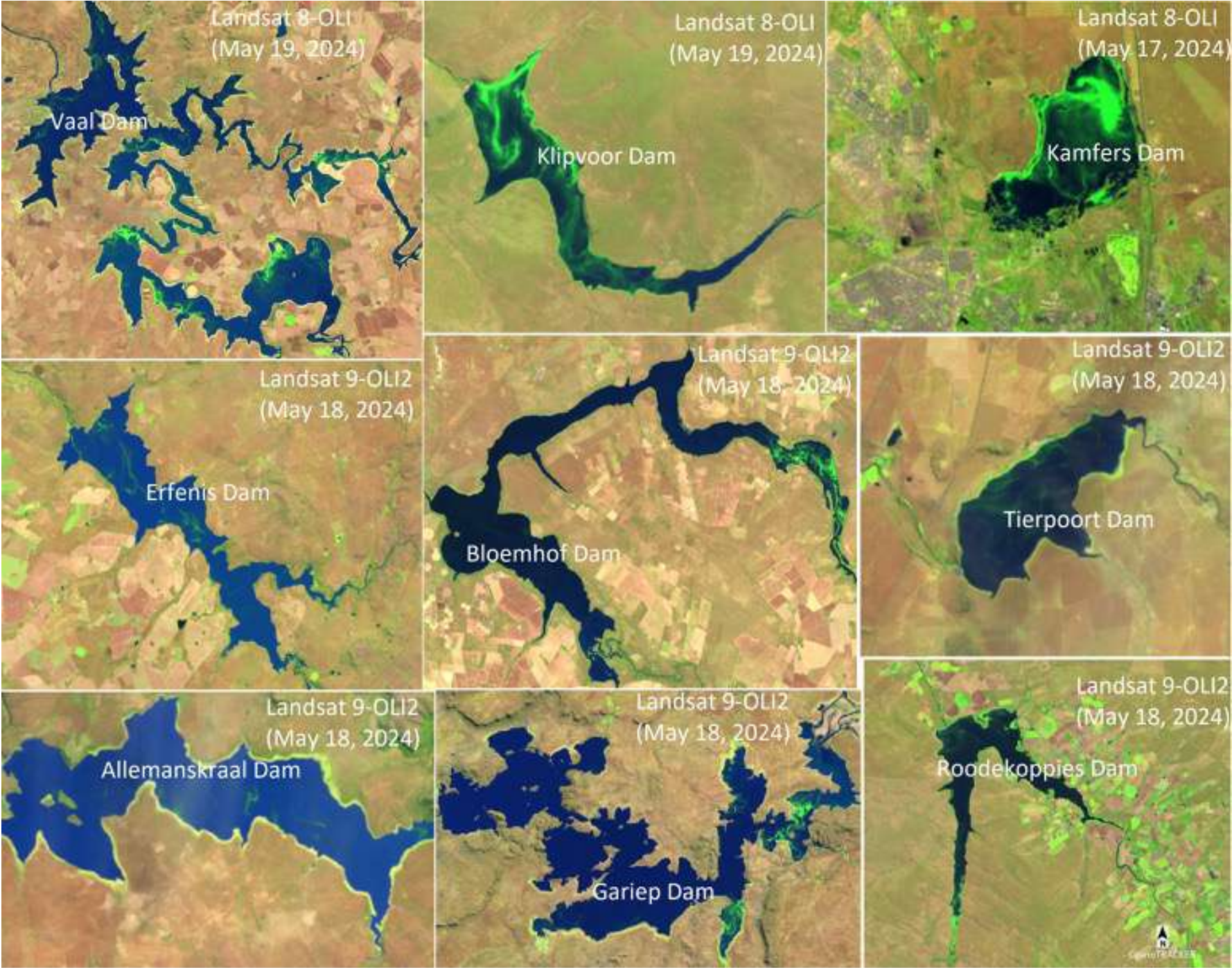


Digital Earth Africa



Landsat showing algae bloom

Landsat 8
Landsat 9

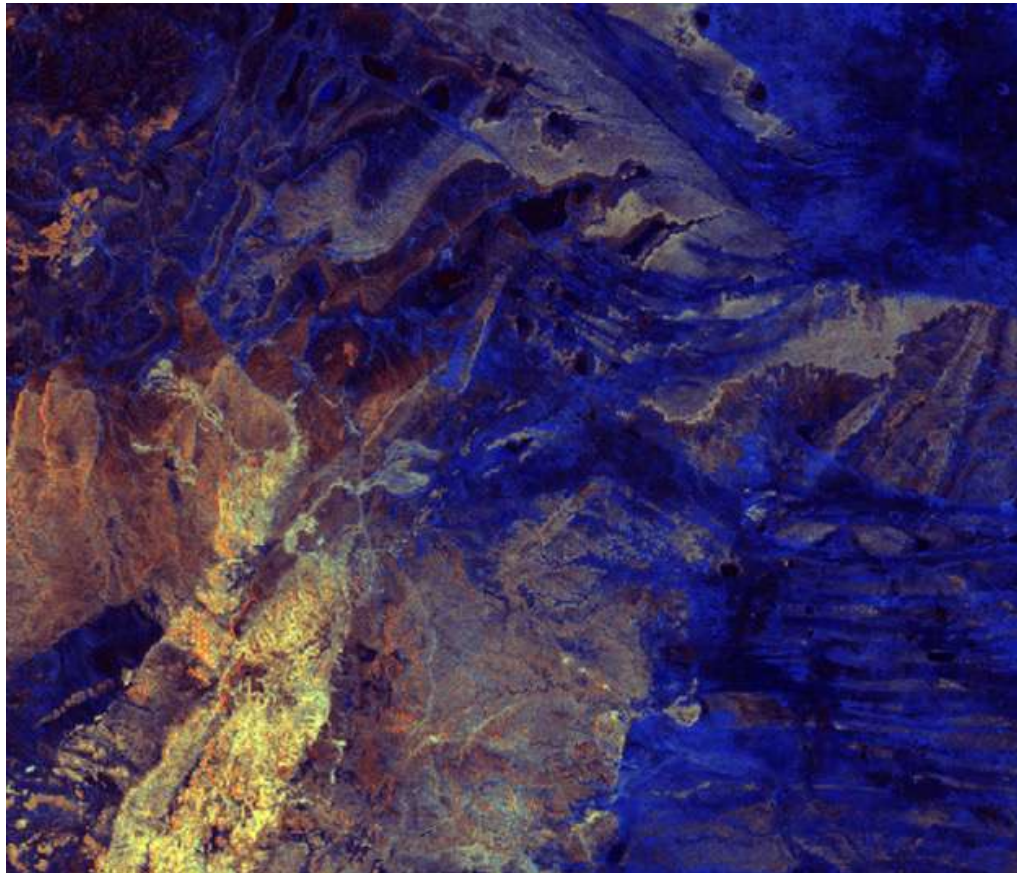


Sentinel 2 images show Hakskeen Pan, South Africa, South Africa



#Sentinel2 images have showcased the developments around Hakskeen Pan, South Africa 🇿🇦 26°49'45.1"S 20°10'19.8"E

<https://maps.digitalearth.africa/#share=s-byh9IL2JUnmfWbsgfgGKo4XOOBL>



Digital Earth Africa

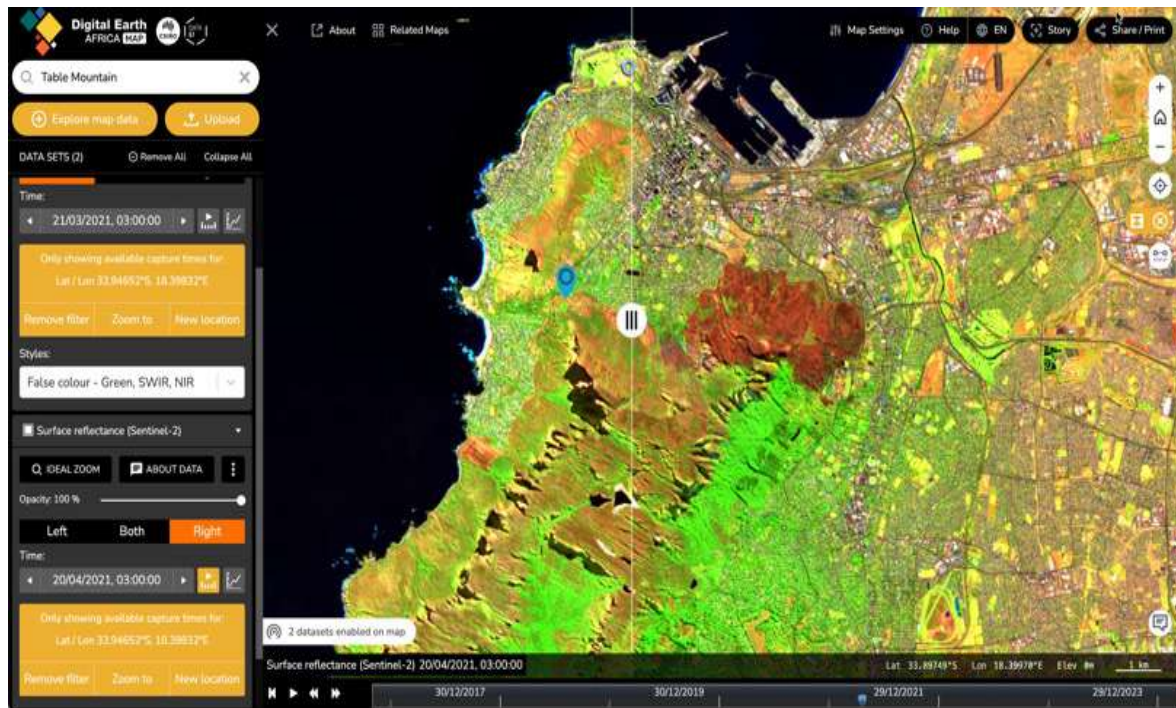


Table mountain, South Africa



Sentinel2 images showing Table Mountain National Park Cape Town in South Africa 🇿🇦

<https://maps.digitalearth.africa/#share=s-AckmGGNKMW0POdBFSS2Na1pYfpy>

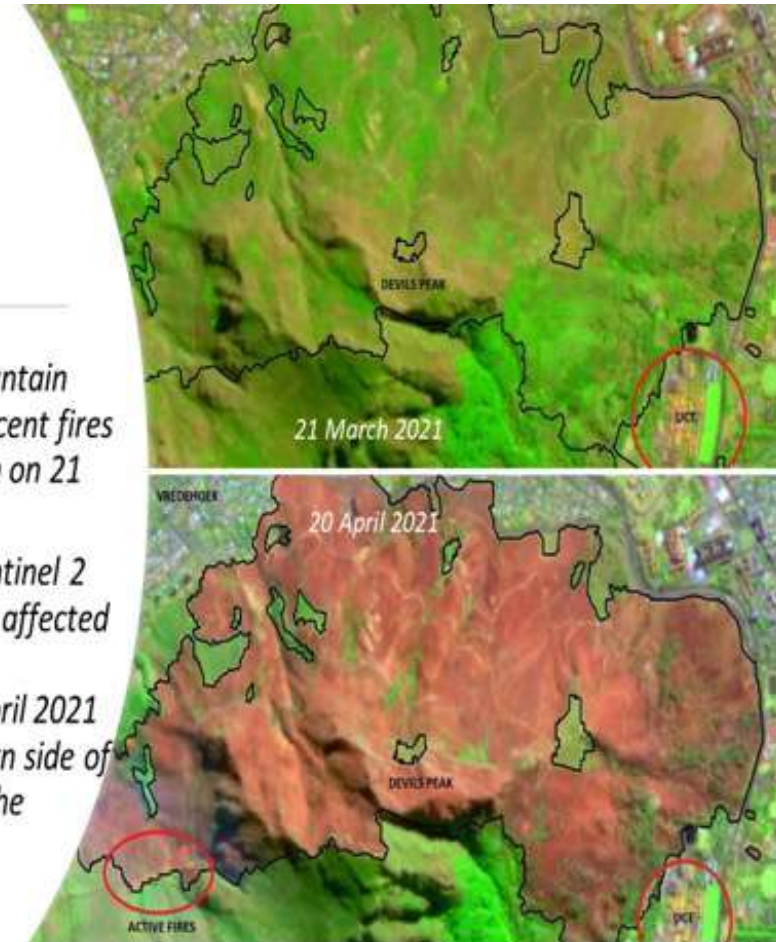


Digital Earth Africa



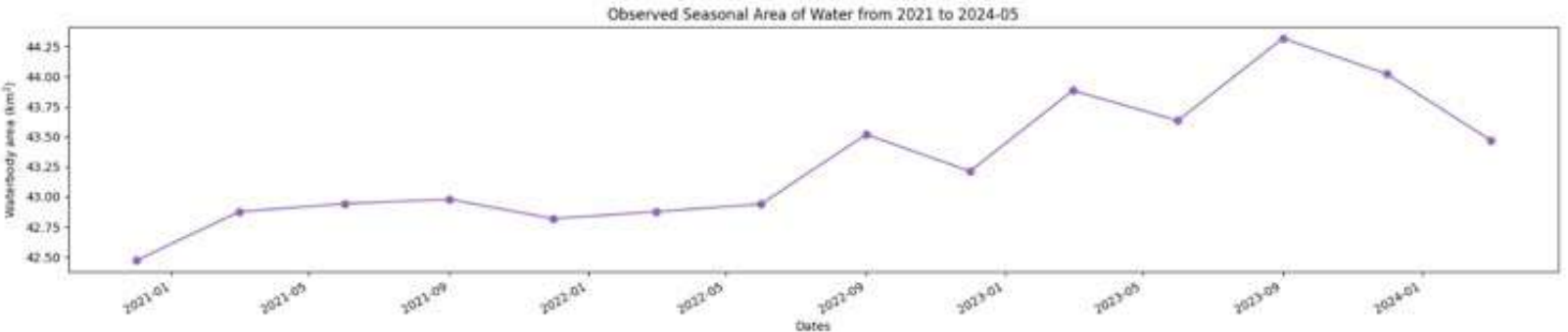
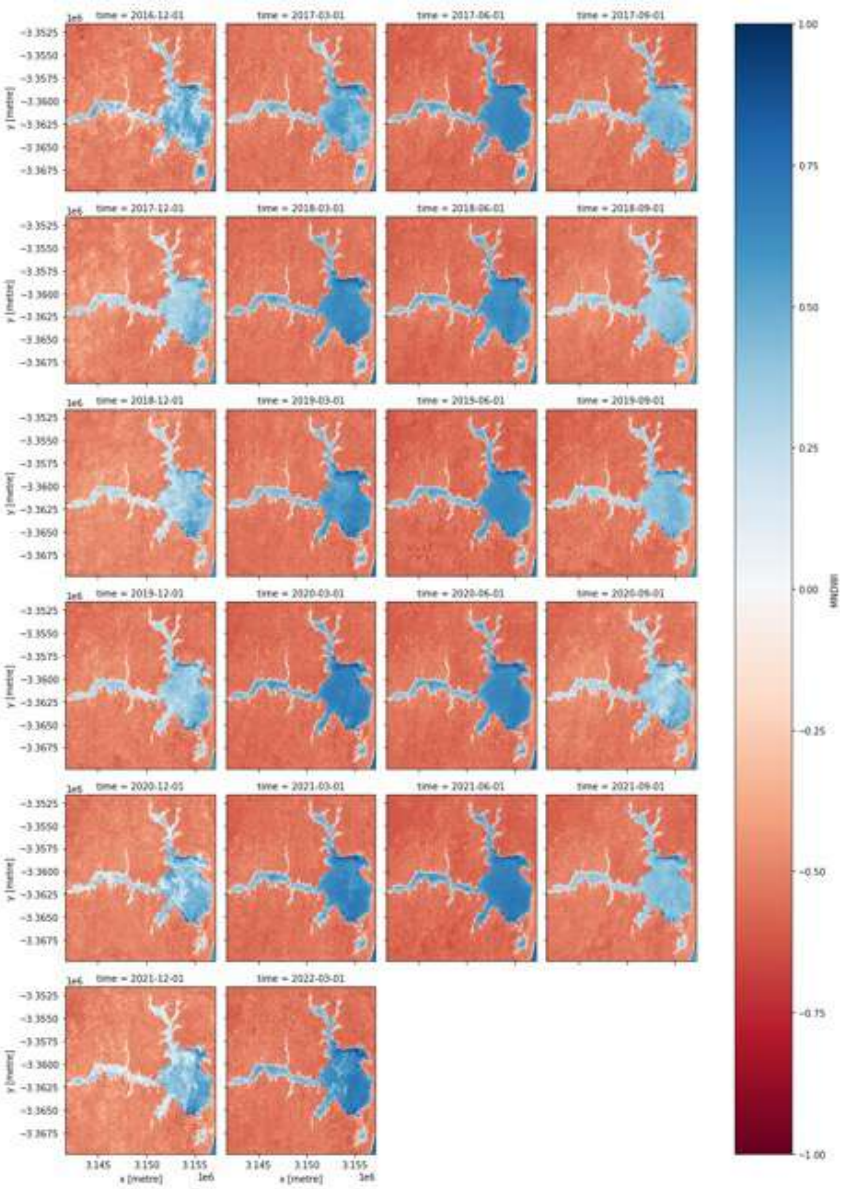
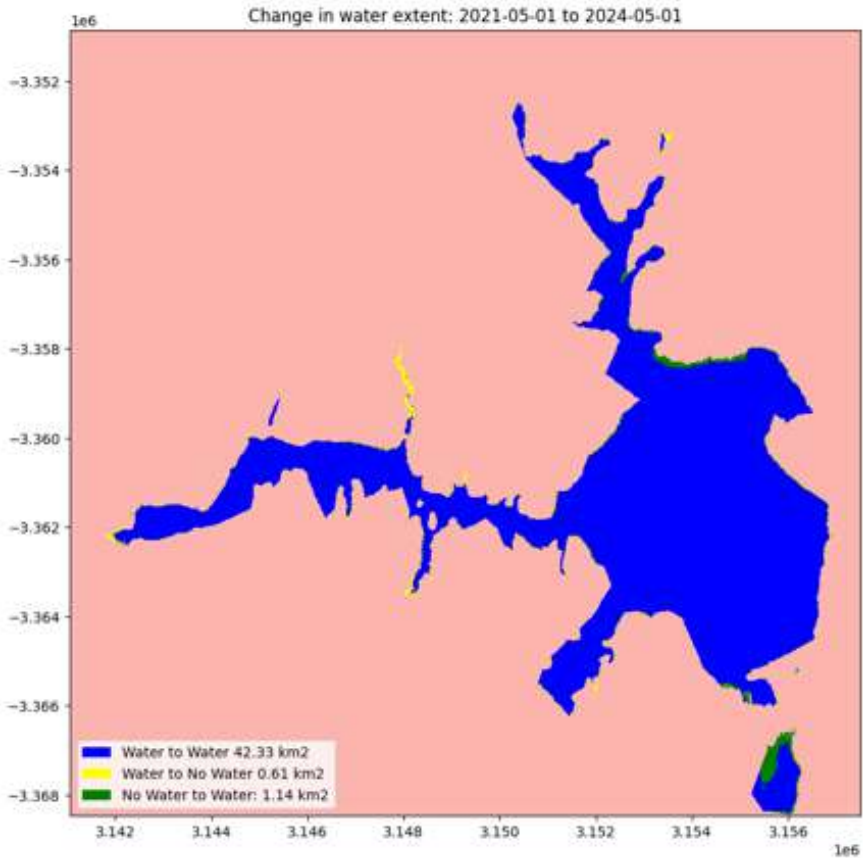
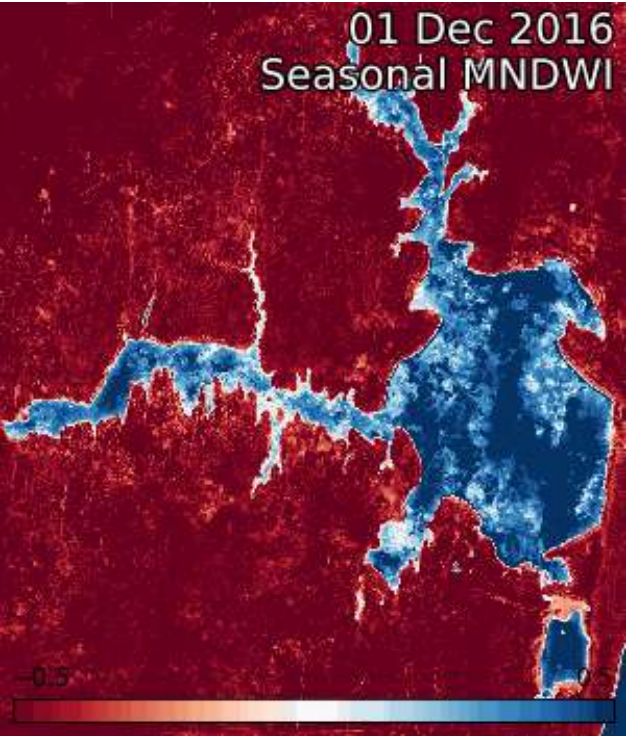
Sentinel 2 images showing Table Mountain National Park before and after the recent fires in Cape Town. The images were taken on 21 March 2021 and 20 April 2021.

A fire scar is superimposed on the Sentinel 2 image of 20 April 2021 indicating the affected area. The total area destroyed was approximately 622 ha. On the 20th April 2021 active fires were visible on the western side of the fire scar, with a few spot fires in the vicinity of UCT.

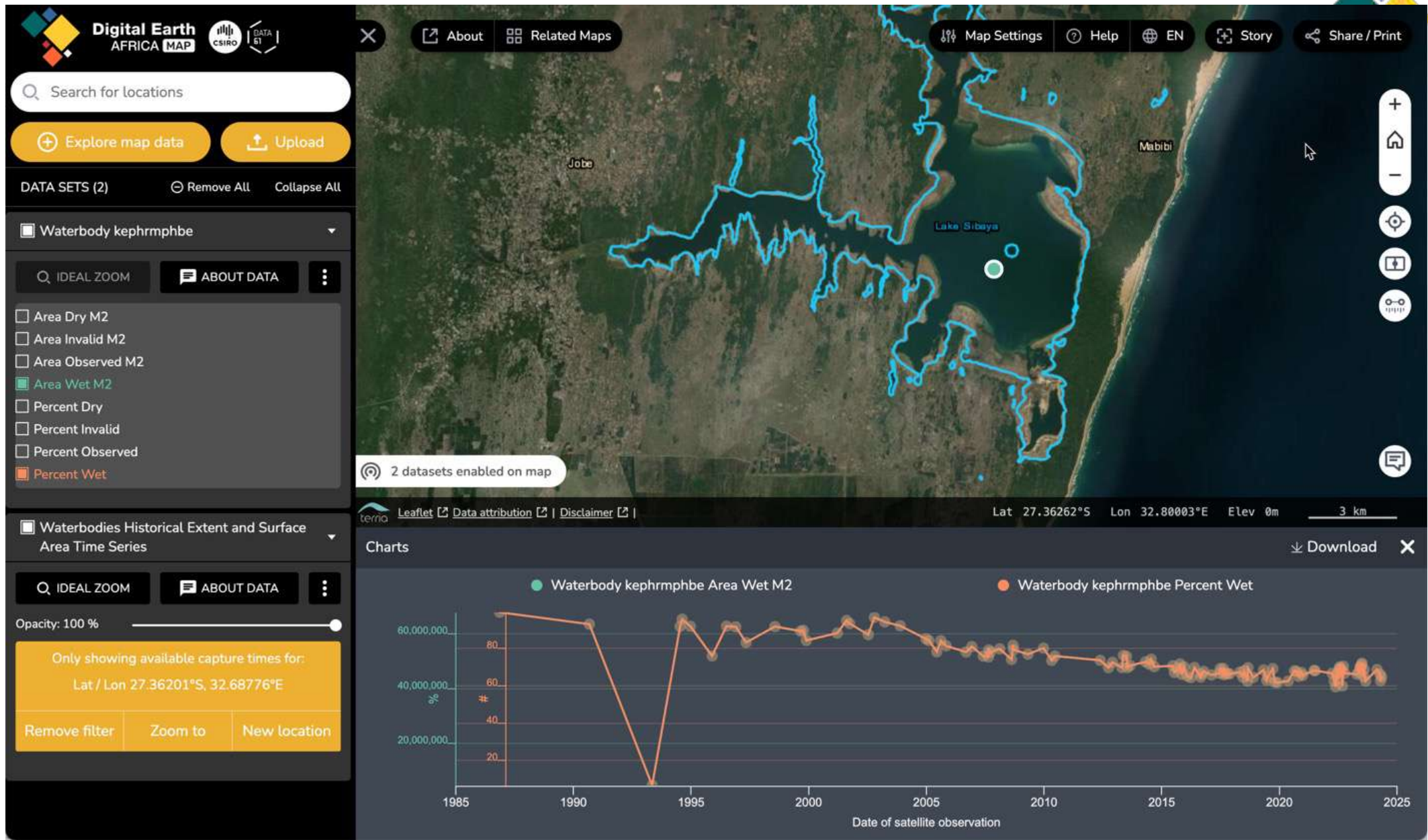


Mapping water extent using Sentinel 2 MNDWI

Lake Sibaya



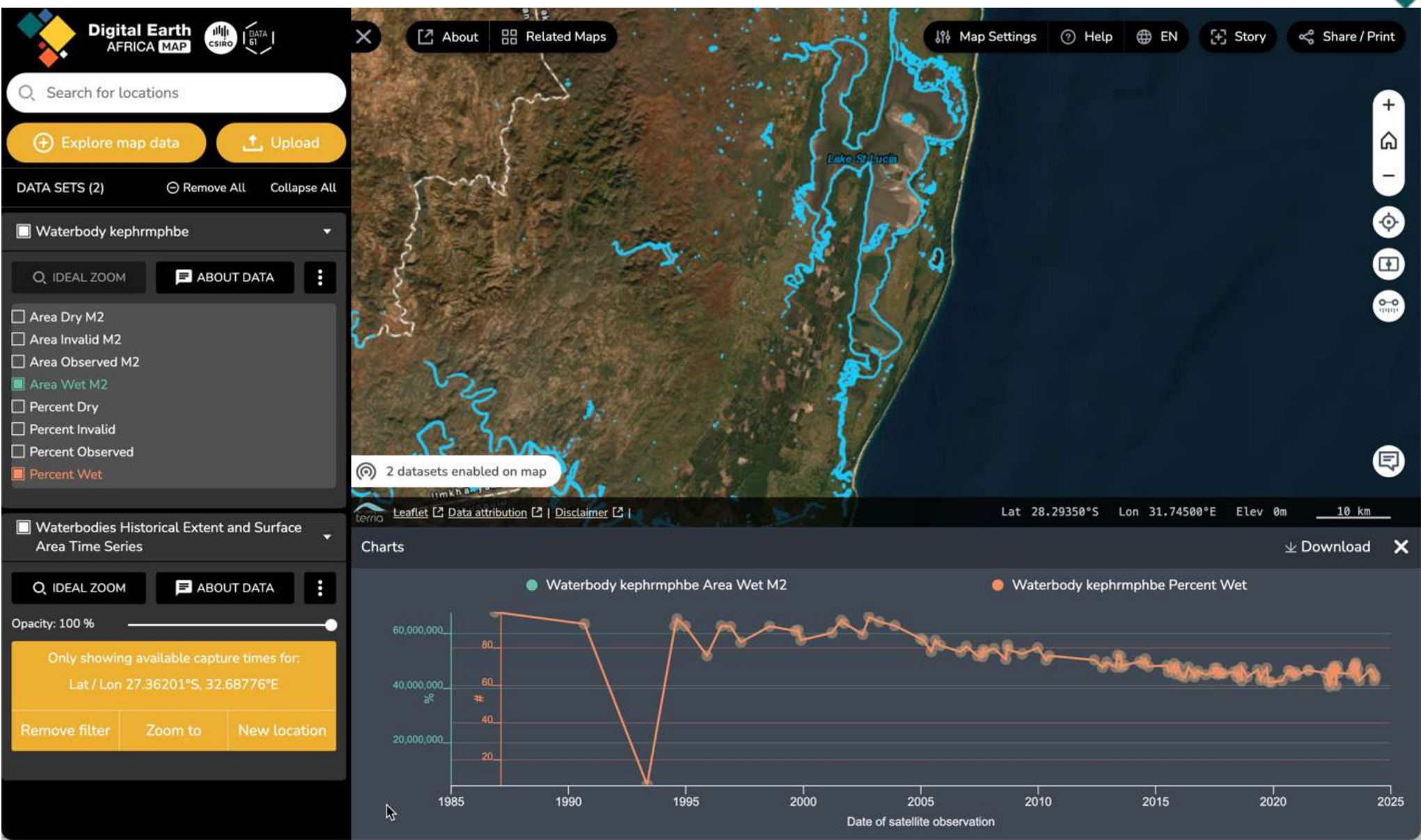
Water bodies – Lake Sibaya



Digital Earth
AFRICA

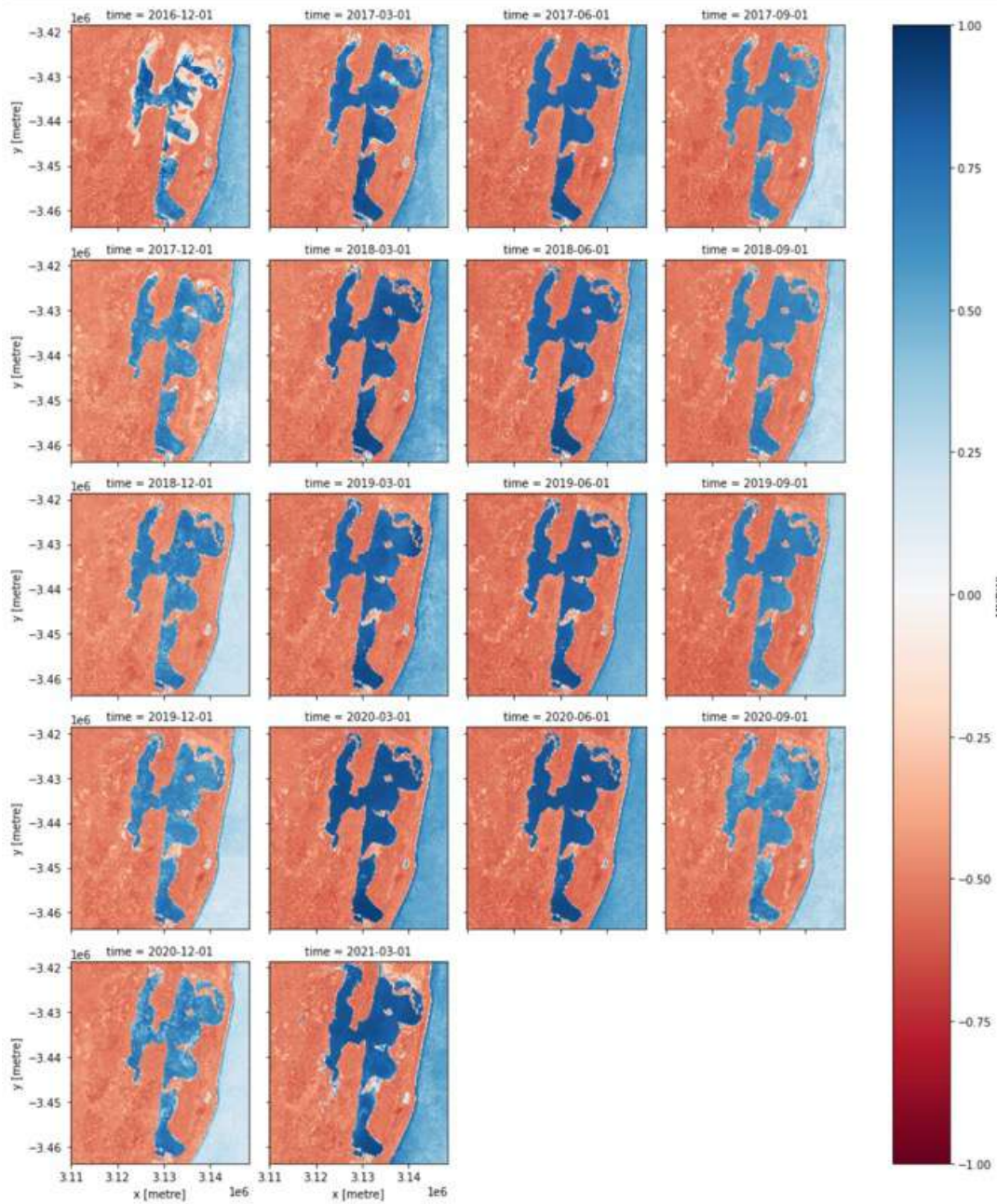
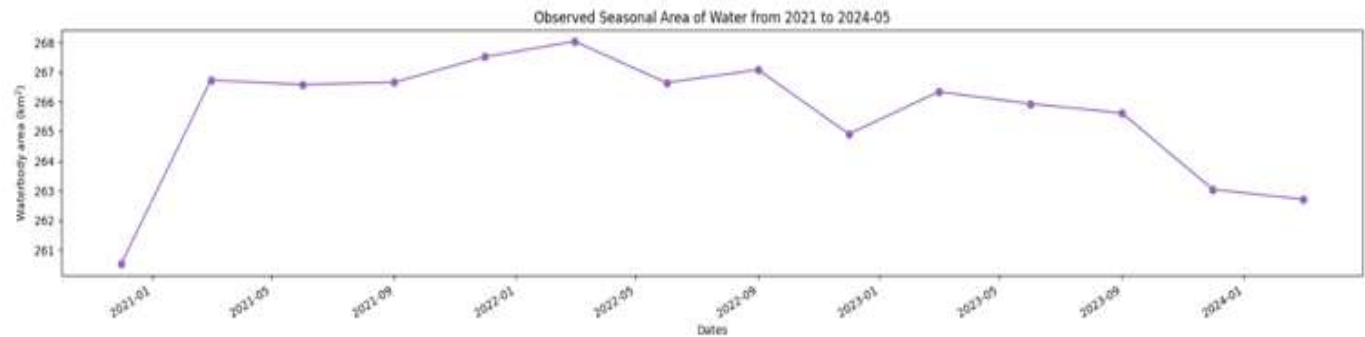
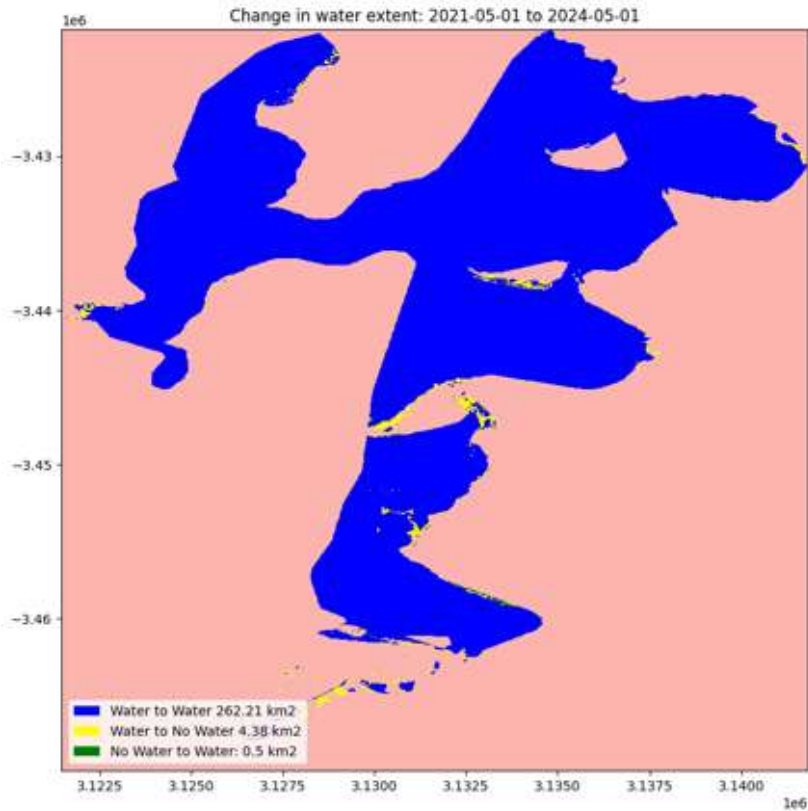
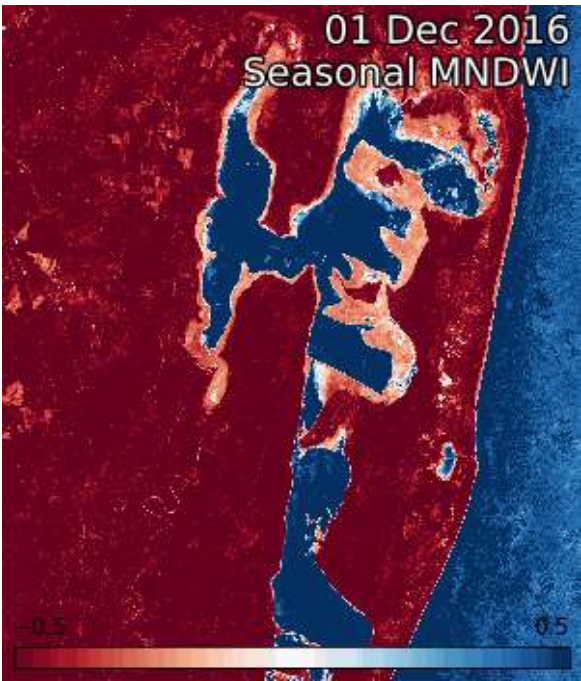
<https://maps.digitalearth.africa/#share=s-cuttefGJJegO4iY2JAROTvmo8pj>

Water bodies – Lake St. Lucia



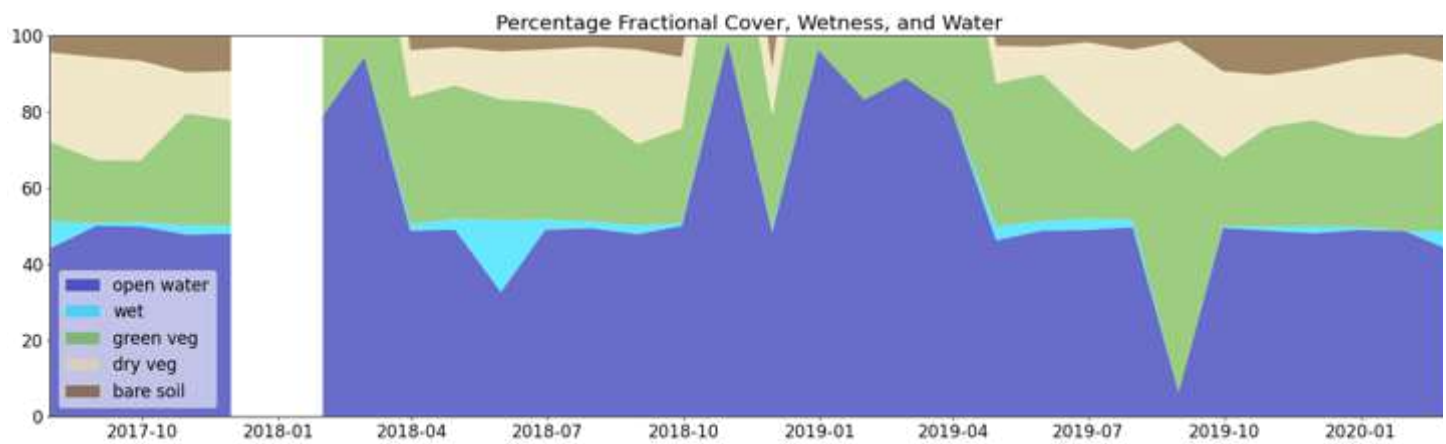
<https://maps.digitalearth.africa/#share=s=AdWyBCW4tPA8NceSwZDfRX4y98j>

Mapping water extent using Sentinel 2 MNDWI



Wetland Insight Tool

Lake Sibaya



Datasets: Landsat, water observation from Space

https://docs.digitalearthafrika.org/en/latest/sandbox/notebooks/Real_world_examples/Wetlands_insight_tool.html

Total polygon area: 97.69 km²

Area falls within recommended limit

Map Overlay:

None

Start Date:

01/07/2017

End Date:

20/04/2022

Minimum Good Data:

0.85

Resampling

Frequency:

1M

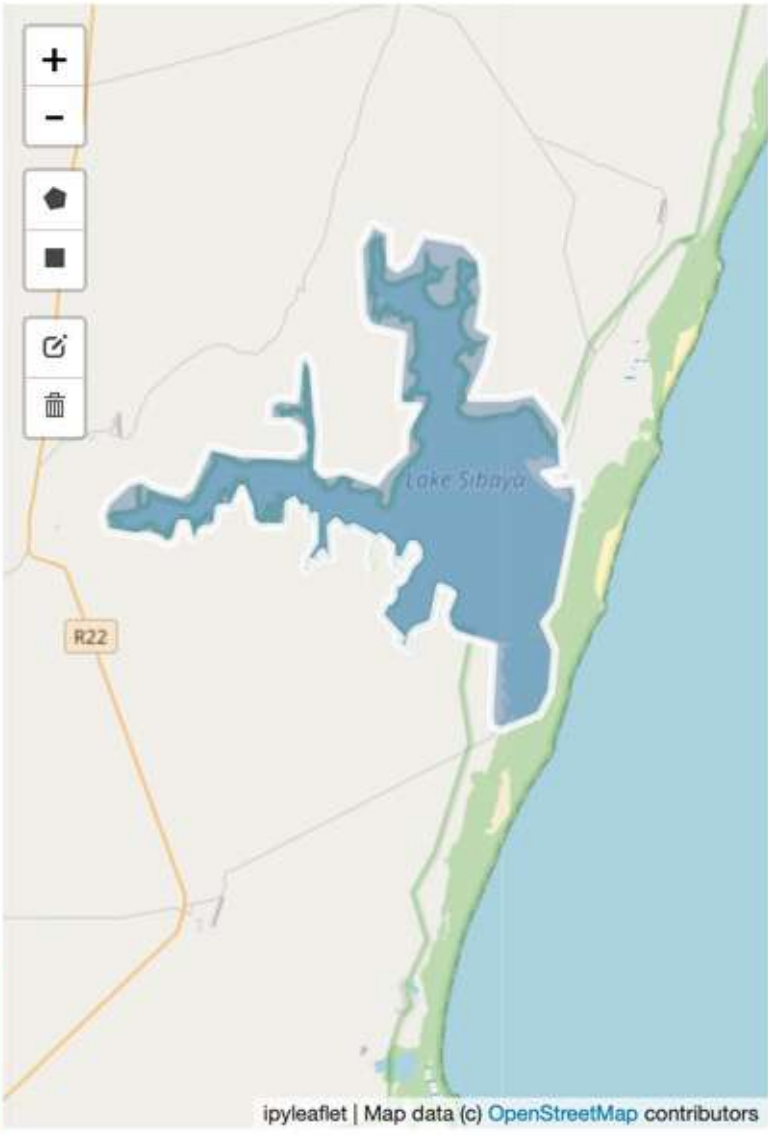
Output CSV:

example_WIT_Lak

Output Plot:

example_WIT_Lak

Run



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<https://learn.digitalearthafrica.org/>



Digital Earth Africa



English

Digital Earth Africa
DEA101-en

Introduction to the Digital Earth Africa Sandbox

Starts: Oct 19, 2021

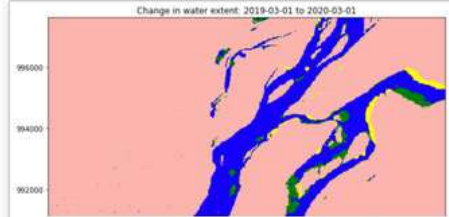


Français

Digital Earth Africa
DEA101-fr

Introduction à la sandbox de Digital Earth Africa

Starts: Oct 19, 2021

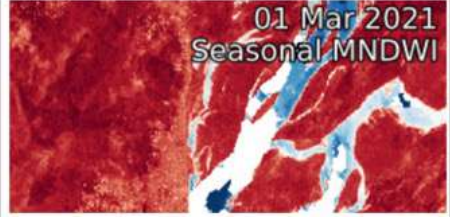


Change in water extent: 2019-03-01 to 2020-03-01

Digital Earth Africa
DEA201-en

Digital Earth Africa Water Resources

Starts: Oct 16, 2022



01 Mar 2021
Seasonal MNDWI

Digital Earth Africa
DEA-202

Digital earth Afrique ressources en eau

Starts: Jan 30, 2023

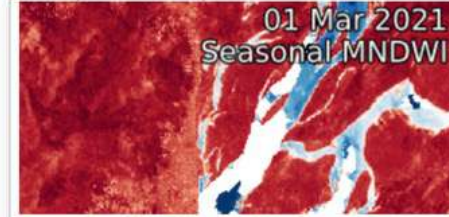


Agriculture and food security

Digital Earth Africa
DEA201-en

Digital Earth Africa Agriculture and Food Security

Starts: Feb 1, 2023



01 Mar 2021
Seasonal MNDWI

Digital Earth Africa
DEA_202_FN

Digital Earth Afrique Agriculture et sécurité alimentaire

Starts: Mar 17, 2023

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- DE Africa online learning <https://learn.digitalearthafrika.org>
- DE Africa weekly Live Learning Sessions: every Wednesday at 11am, GMT zero - ask questions and connect: <https://forms.gle/RbFB4HZ5EgUgCnS47>
- Email address info@digitalearthafrika.org



Survey

Please complete the survey



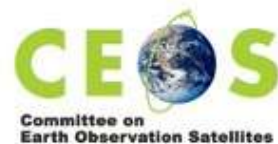
<https://forms.gle/HQYFWeYcsBZz3FE16>

Thank you

Acknowledgements



esri



Thank you Merci obrigada



Asante. E şeun. Murakoze.



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<https://www.digitalearthfrica.org>

