Digital Earth AFRICA

Unlocking the promise of Tomorrow from the patterns of the past

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Digital Earth Africa

Platform and services provide free, open and accessible analysis ready satellite data.

End users: governments, industry and decision makers can use the Digital Earth Africa to track changes across the continent in unprecedented detail. This provides valuable insights for better decision making across many areas, including:

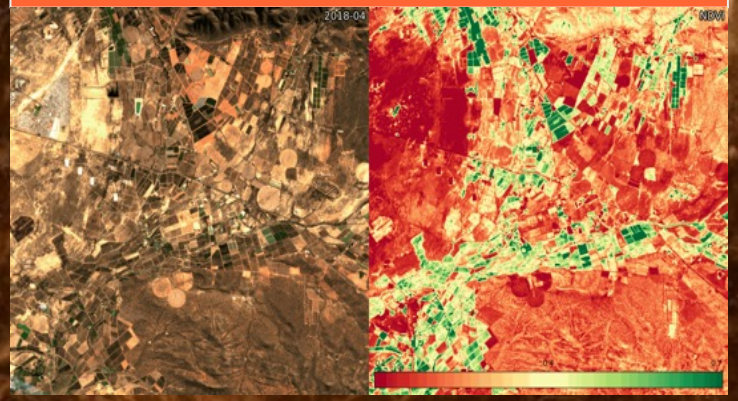
- Flooding
- Drought
- Soil and coastal erosion
- Agriculture
- Forest cover
- Land use and land cover change
- Water availability and quality
- Changes to human settlements

Gender equality today for a sustainable tomorrow

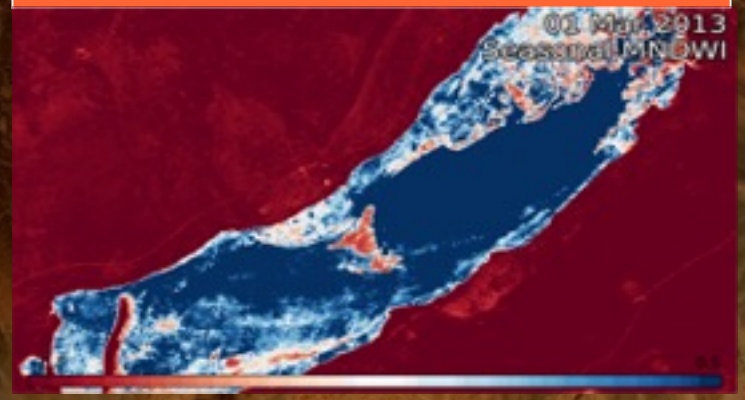
Our Vision

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

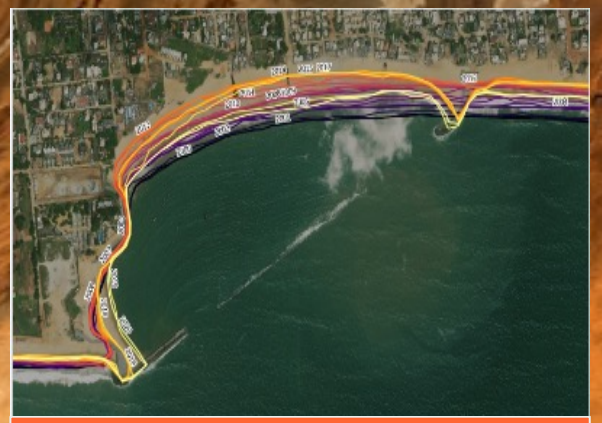


Water resources and flood risks



Land degradation

Urbanisation



Coastal erosion

Eye of Sahara: Credit: Contains modified Copernicus Sentinel data 2021, processed by Digital Earth Africa.

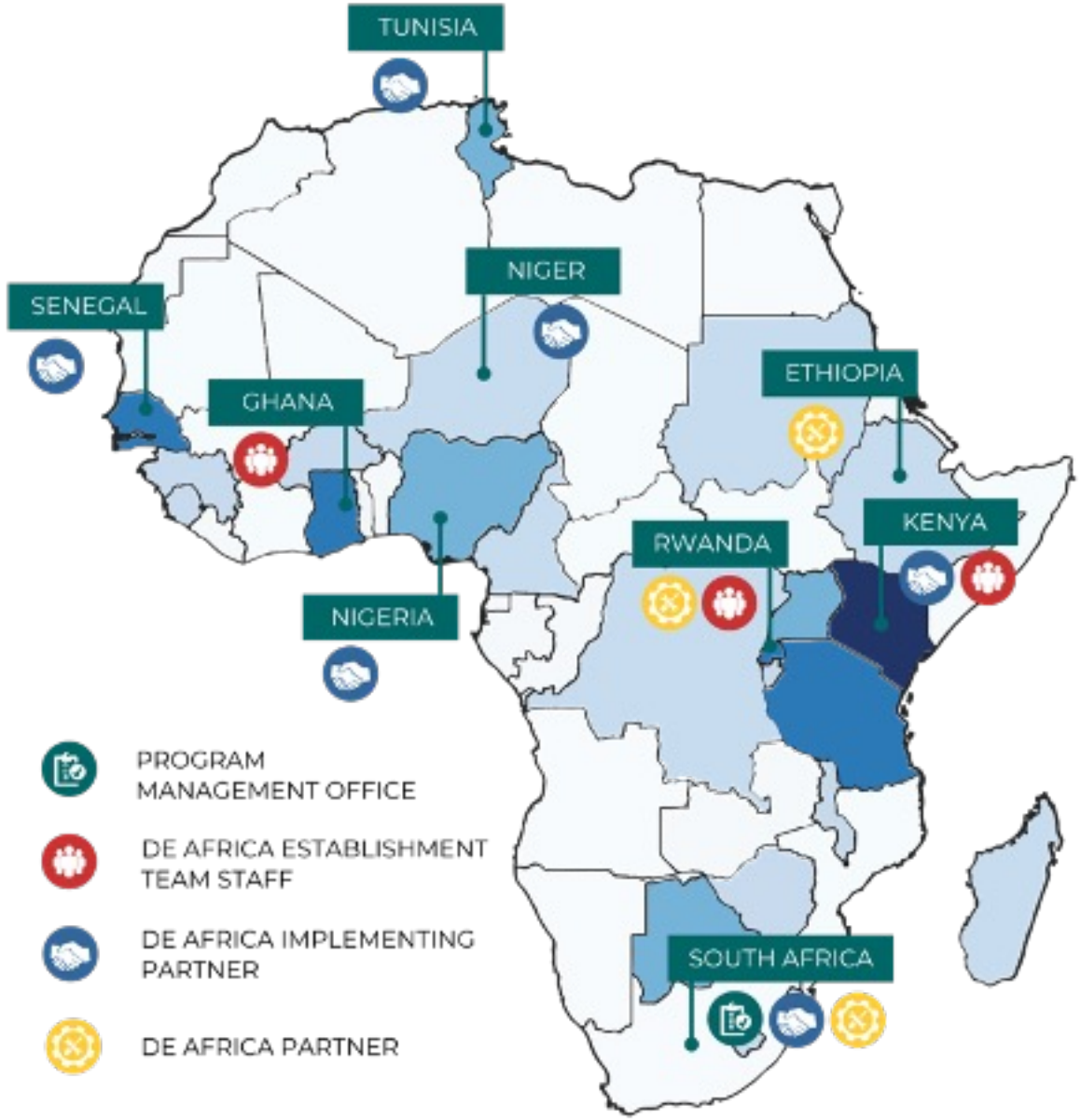
Digital Earth AFRICA

Activating a continent-wide community

> “ Digital Earth Africa is helping provide the data that is required, which was already a gap before. With the various partnerships we engaged, with the various governments in Africa, they asked for more. And we are able to deploy these for the 54 countries in Africa, so that we leave no one behind."

Dr. Kenneth Mubea

Capacity Development Lead
Digital Earth Africa



Satellite data available through
Digital Earth Africa

Space Agencies

Analysis Ready Data

COGS/STAC
AWS S3
Cape Town

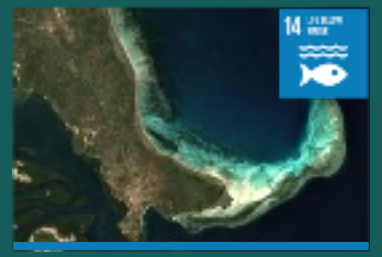
OPEN DATA CUBE

Digital Earth AFRICA Explorer

Digital Earth AFRICA Jupyter Sandbox

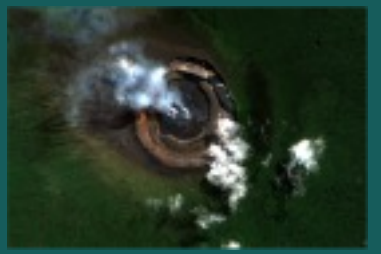
Digital Earth AFRICA Map

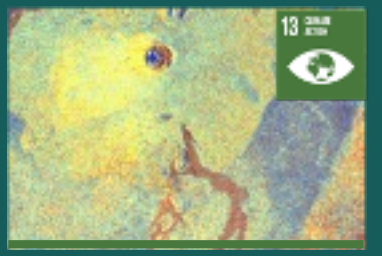
Digital Earth AFRICA



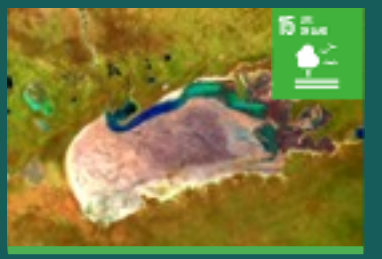
Studying the Tanzanian Coastline with GeoMAD, 2019, RGB

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

Added value of satellite data and products available through Digital Earth Africa

Space agencies → Analysis ready Data

- Free access, even for commercial purposes, to 3.1 petabyte of optical and radar data captured by 7 satellite missions, centralised on the African continent, at Cape Town AWS Hub
- Analysis-ready data optimised for remote research, discovery and analysis, updated regularly. no need to download data.
- Continental derivative services ready for decision-making and adapted to the challenges of Africa, for monitoring water, land and the coastline
- Full visibility into the generation of continental services
- Data available through interactive or programmatic interfaces in French and English, or via GIS software
- Complex analyses on a specific topic supported by a large library of open source SDG-oriented tools
- A large network of institutional partners in Africa and experts allowing capacity building and the dissemination and use of services
- Free learning and support platforms in FR and ENG

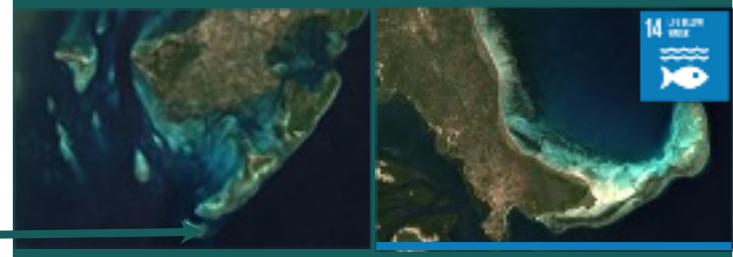
OPEN DATA CUBE

STAC

COG

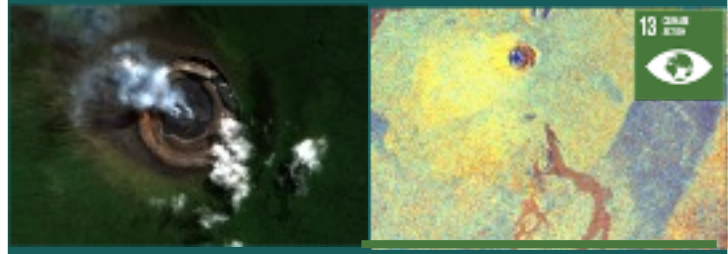
Digital Earth AFRICA

Find out more technical detail in Digital Earth Africa Docs

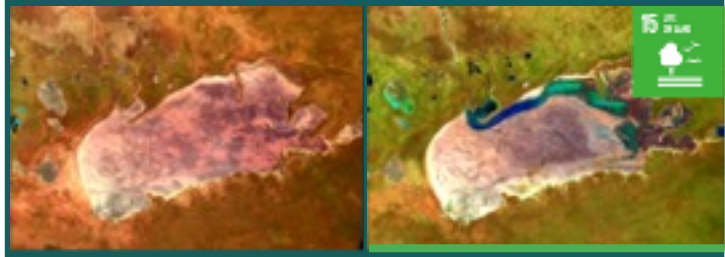


Study of the coast of Tanzania with GeoMAD, 2019, RGB

Crop monitoring in Egypt 2001-2020, Landsat, RGB



Mount Nyiragongo monitoring, 2018 Sentinel-2 RGB and 20 Sentinel-1



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

Over 3 PB of free and accessible data

Digital Earth AFRICA

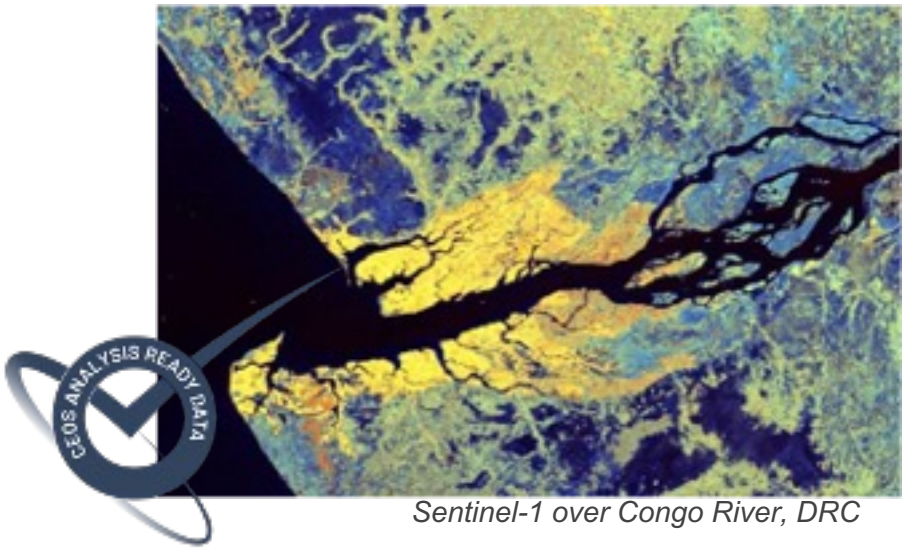
Operational Analysis Ready Data

- Landsat 5, 7, 8 & 9 - surface reflectance & surface temperature (1984 - present)
- Sentinel-2 surface reflectance (2017 - present)
- Sentinel 1 radar backscatter (2018 - present)

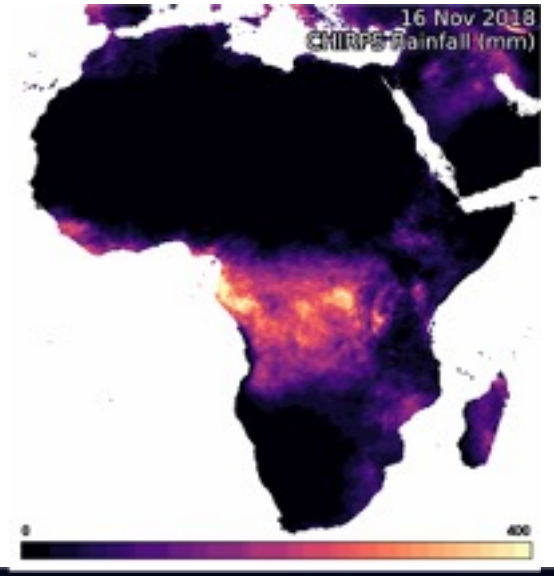
Additional datasets

- ALOS PALSAR annual mosaics
- Digital elevation models (SRTM, NASADEM, Copernicus DEM)
- Chirps daily and monthly rainfall data
- ESA Climate Change Initiative Land Cover
- Copernicus Global Land Service Land Cover
- Global Mangrove Watch
- ESA WorldCover
- ESRI Land Use/Land Cover from Microsoft's Planetary Computer
- More coming ….

DE Africa Continental Services

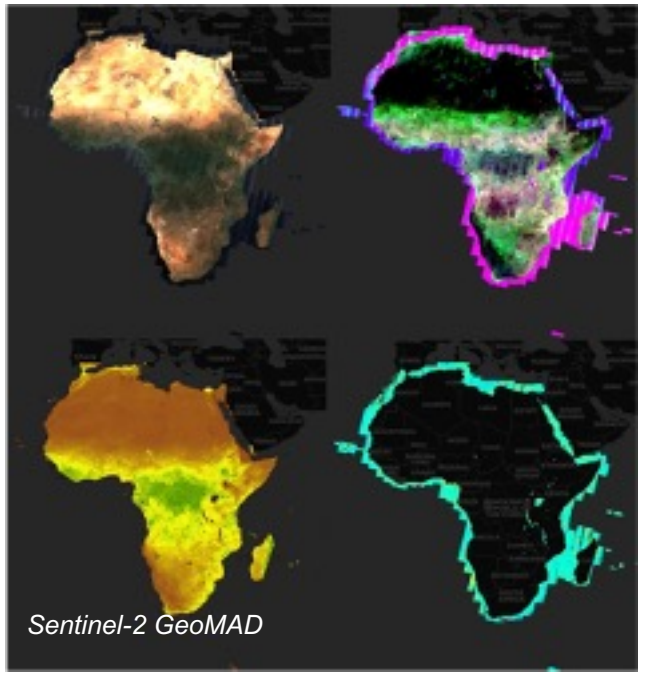


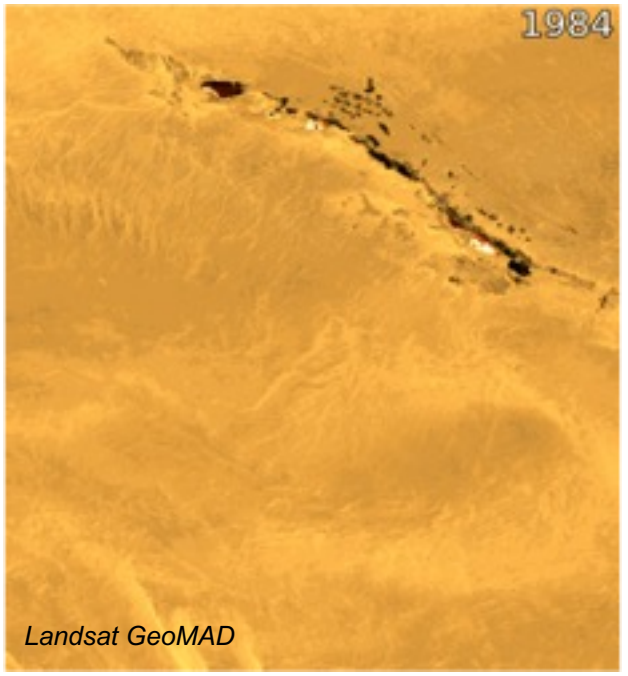
Sentinel-1 over Congo River, DRC



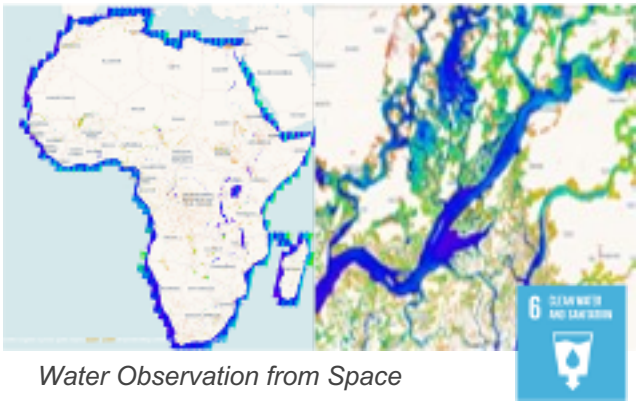
From Satellites to Insights

- Satellites capture information over the entire globe, with free and open access
- Through DE Africa, now available from Cape Town, targeting the SDGs
- DE Africa produces continental scale services - showing change through time of vegetation, land, water, coasts and cities; capturing the *patterns of the past*
- > 100 analysis tools supporting 7 sustainable development goals
- Free online learning platform, analysis environment & helpdesk

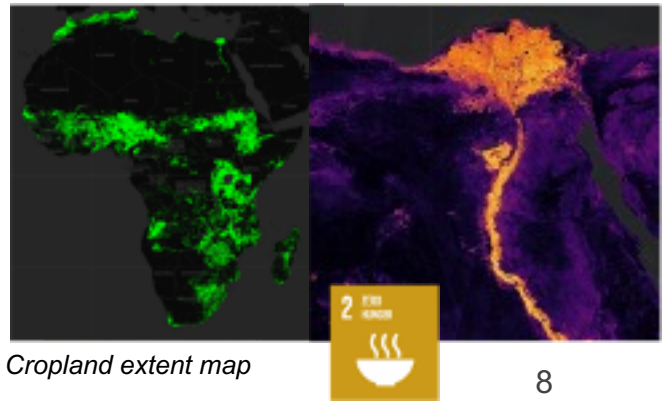

Sentinel-2 GeoMAD



Landsat GeoMAD

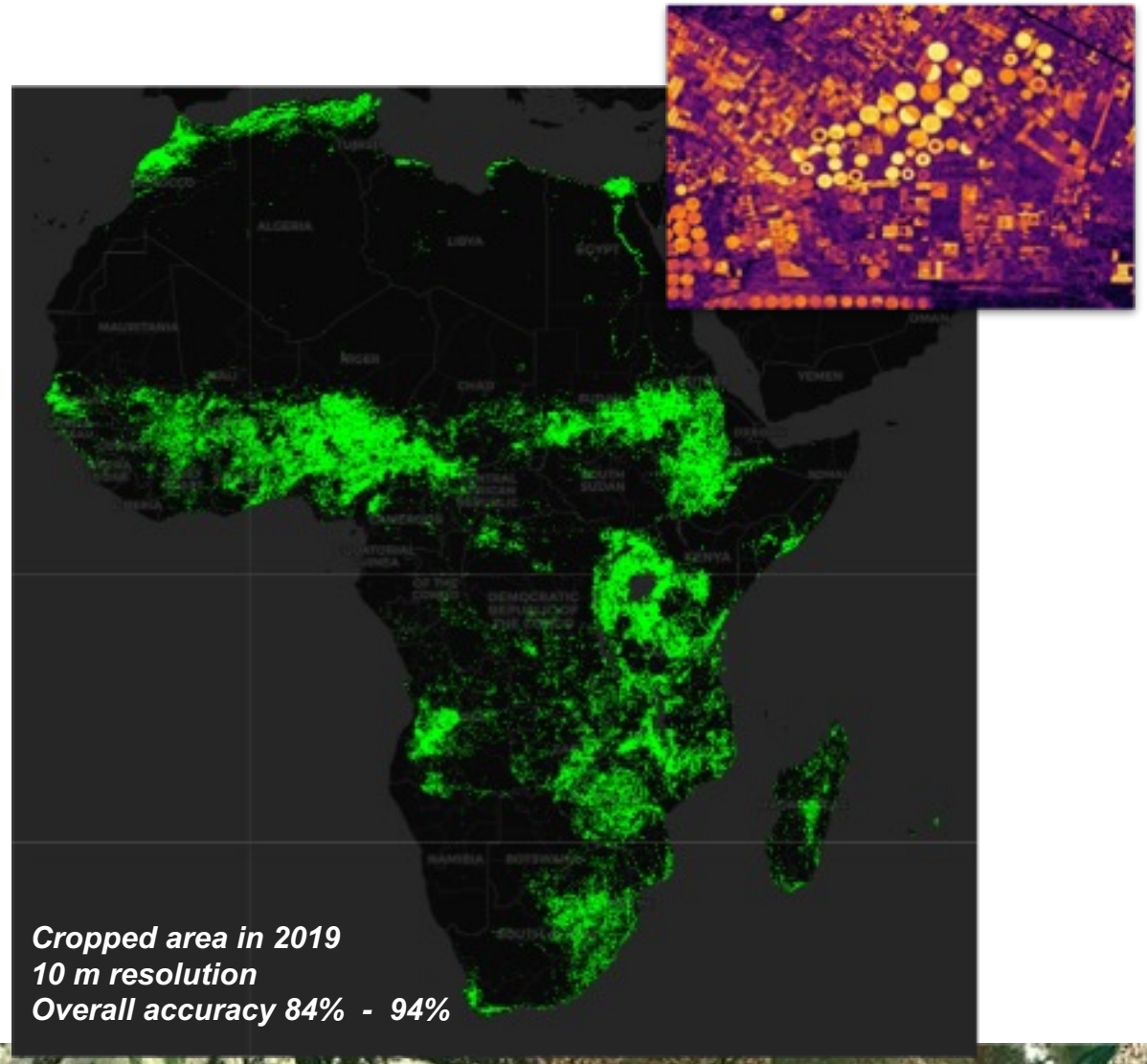


Water Observation from Space



Cropland extent map

Continental Cropland Extent

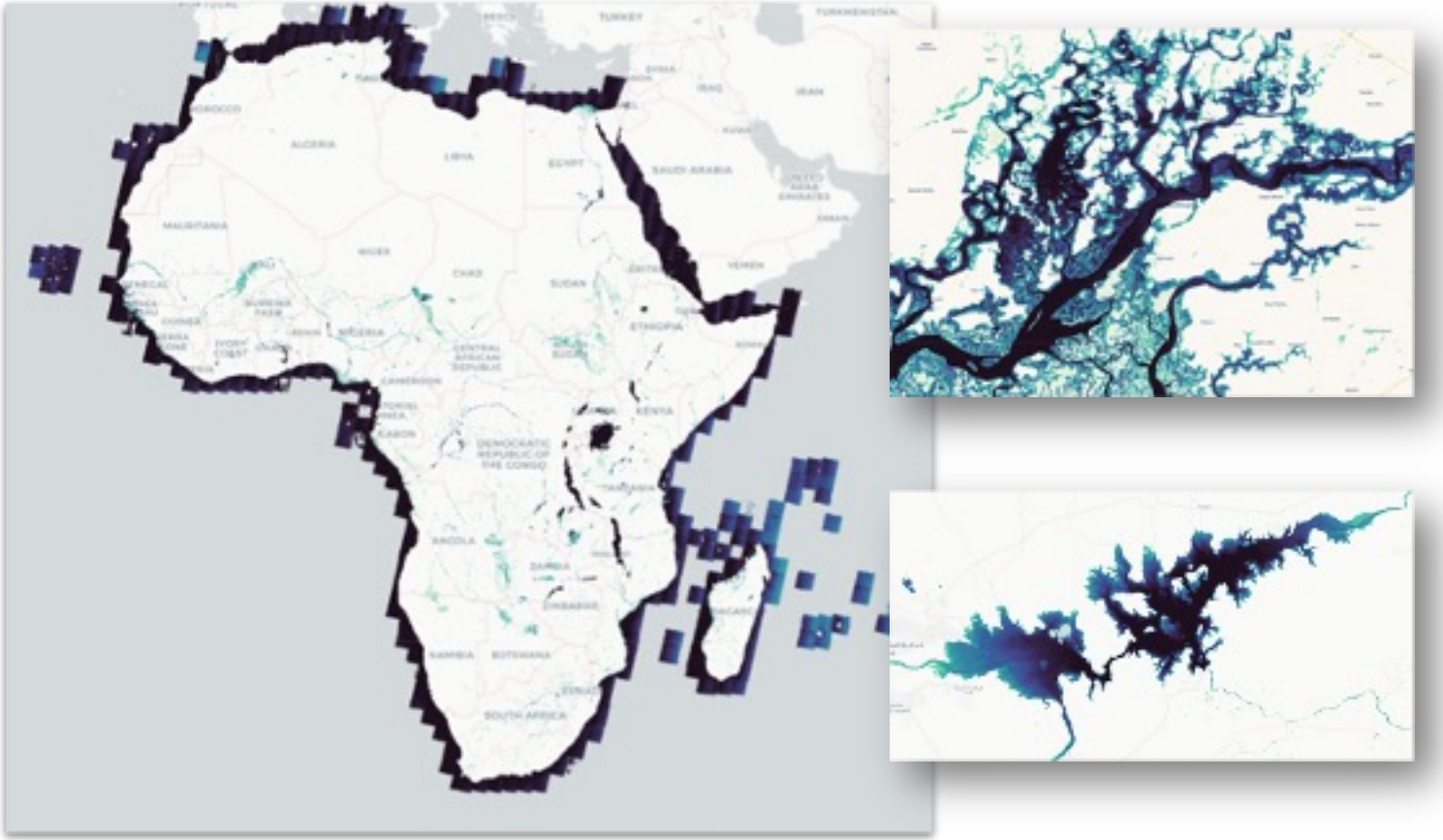


- Co-designed and co-developed with partners across Africa including RCMRD (Kenya), AfriGIST (Nigeria), OSS (Tunisia), NADMO (Ghana) and AGRHYMET (Niger)
- Open source code and reference data: https://github.com/digitalearthafrica/crop-mask
- Used more than 30,000 training and validation data points, collected with partners, submitted to Radiant MLHub
- Input data include Sentinel-2 6 monthly composite statistics, band indices, and ancillary datasets
- Random Forest classification produces pixel-based mask
- Image segmentation and majority vote produces object-based mask

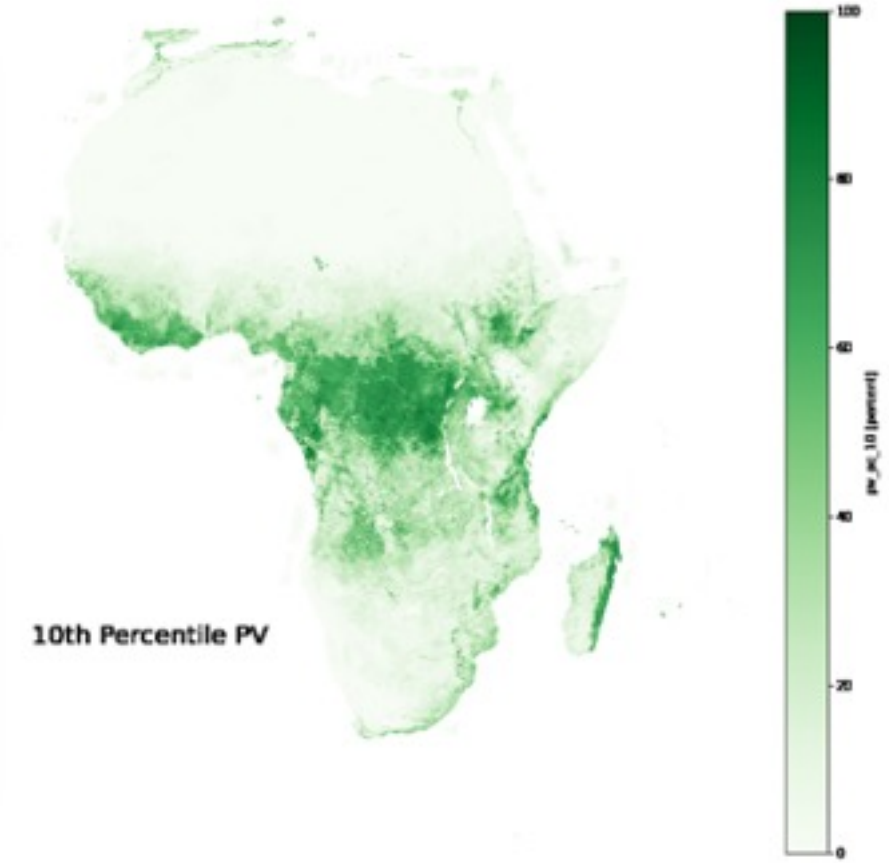
Other Continental Services

Digital Earth AFRICA

Water Observations from Space (WOfS): a dynamic water map service for Africa, validated with partners across Africa

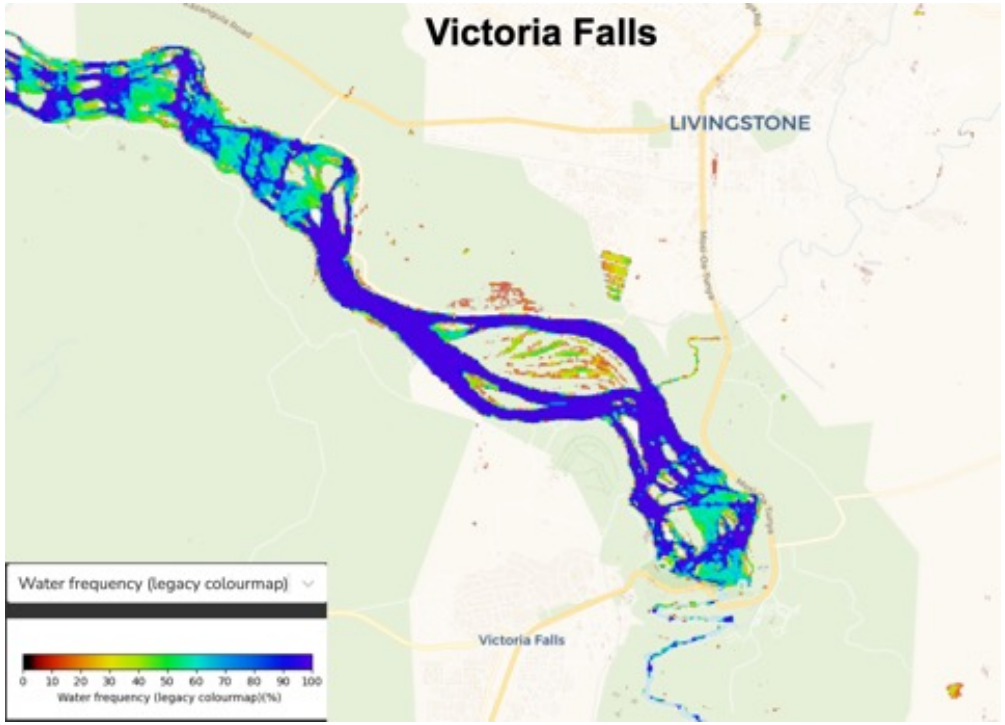


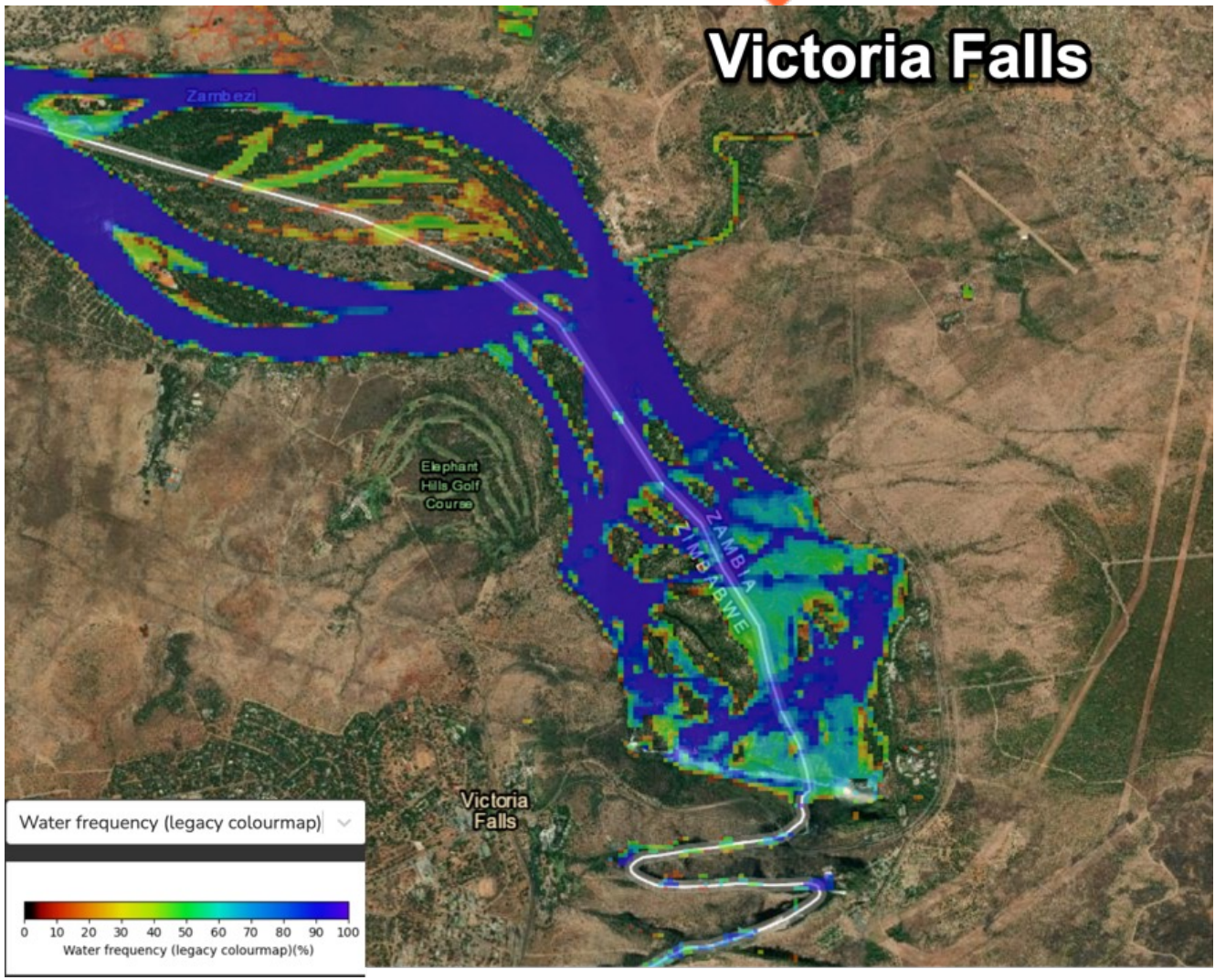
Fractional Cover: dynamic map of green, non-green and bare fractions, and annual summaries (percentiles)



Water resources - Water Observations from Space

- Water Observations from Space or WOfS shows water variability over 30 years.
- Inform integrated water shed management.
- Example: Victoria Falls





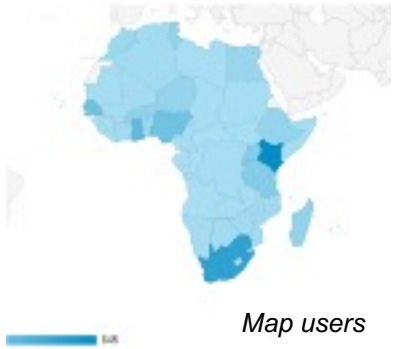
https://maps.digitalearth.africa/#share=s-iDSRyRRAMWr7qJ0E6etyWzXoNnz

Expanding and engaged user community

Digital Earth AFRICA

Capacity development & user support

Growing user community



Map users

- Bilingual Platform, user support and training
- JupyterLab 3.x interface now available in French Worldwide thanks to DE Africa est. team

- Growing user engagement: >2,000 sandbox users; >10,000 unique Terria users
- Bilingual live sessions & awareness sessions

How do I access the 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.digitalearthafrica.org/

Analysis Tools (Jupyter Notebooks)

Digital Earth AFRICA

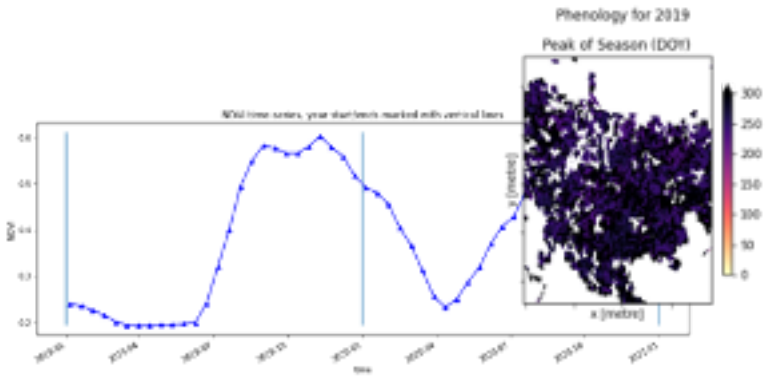
100 Open-source notebooks

7 Main Topics

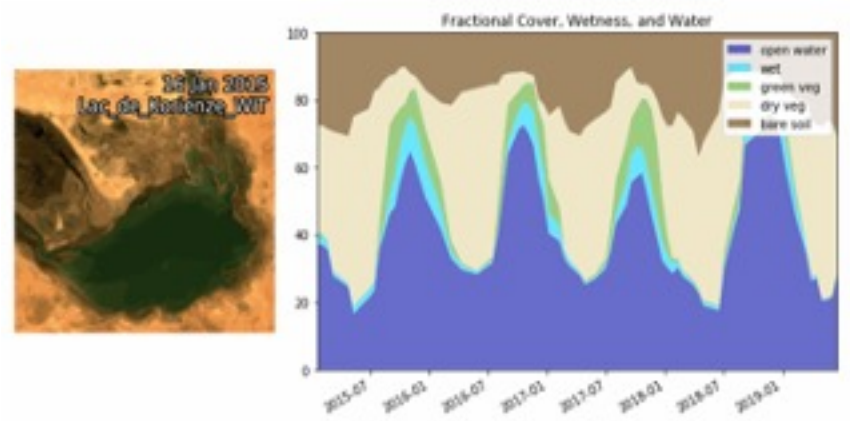
7 SDG Indicators Supported

From beginners to advanced users

- Agriculture and food security
- Water resources and flood risk
- Vegetation
- Urbanisation
- Land degradation, land cover and accounting
- Coastal and marine environment
- EO data, ML & Open Data Cube



Crop and vegetation phenology using optical and radar data

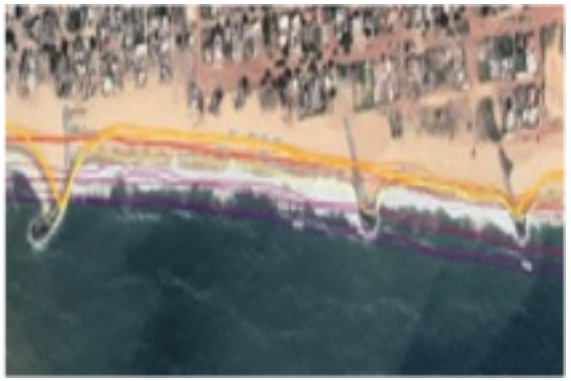


DE Africa Wetland Insight Tool - an interactive notebook

Monitoring coastal erosion along Africa's coastline

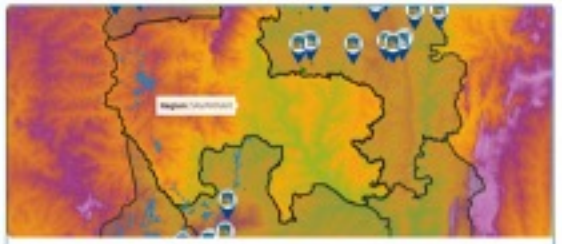
Making an impact use cases

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



Coastlines in Africa

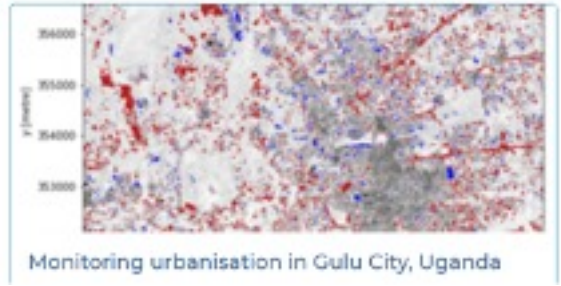
Mangroves in Zanzibar



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

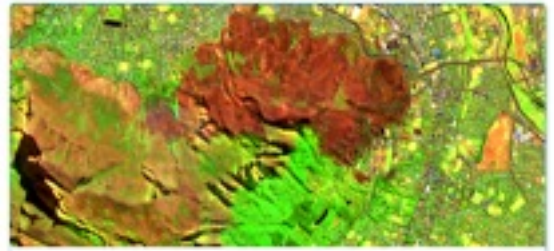
Using Earth observation to protect and conserve wetlands in Kenya

Rising Lakes in the Rift Valley in Kenya

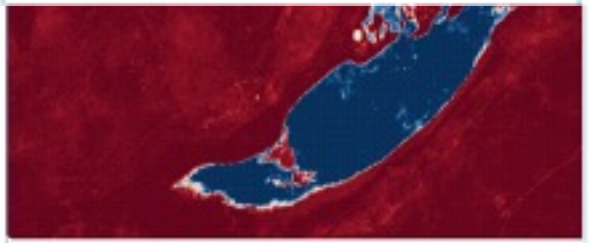


Monitoring urbanisation in Gulu City, Uganda

EO for conservation: rehoming 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

Institutional Strengthening

Government agencies and ministers are critical decision-makers, and direct engagement is vital to build relationships, capacity and awareness and to ensure that information from DE Africa is relevant and effective for governments.

DE Africa is already exploring the 'how' of 'country-level' approaches through projects with GPSDD (Somalia), ASARECA (East Africa)), the FAO (Lesotho, Rwanda) and Tetra-Tech (Zambia).

We will work directly with Government Ministries - Statistics, Agriculture, Climate & etc. - to build in-country knowledge and skills, to tailor DE Africa information to specific national needs, and to ensure that the delivery of information from DE Africa is effective (e.g., information is delivered through the appropriate national institutions).

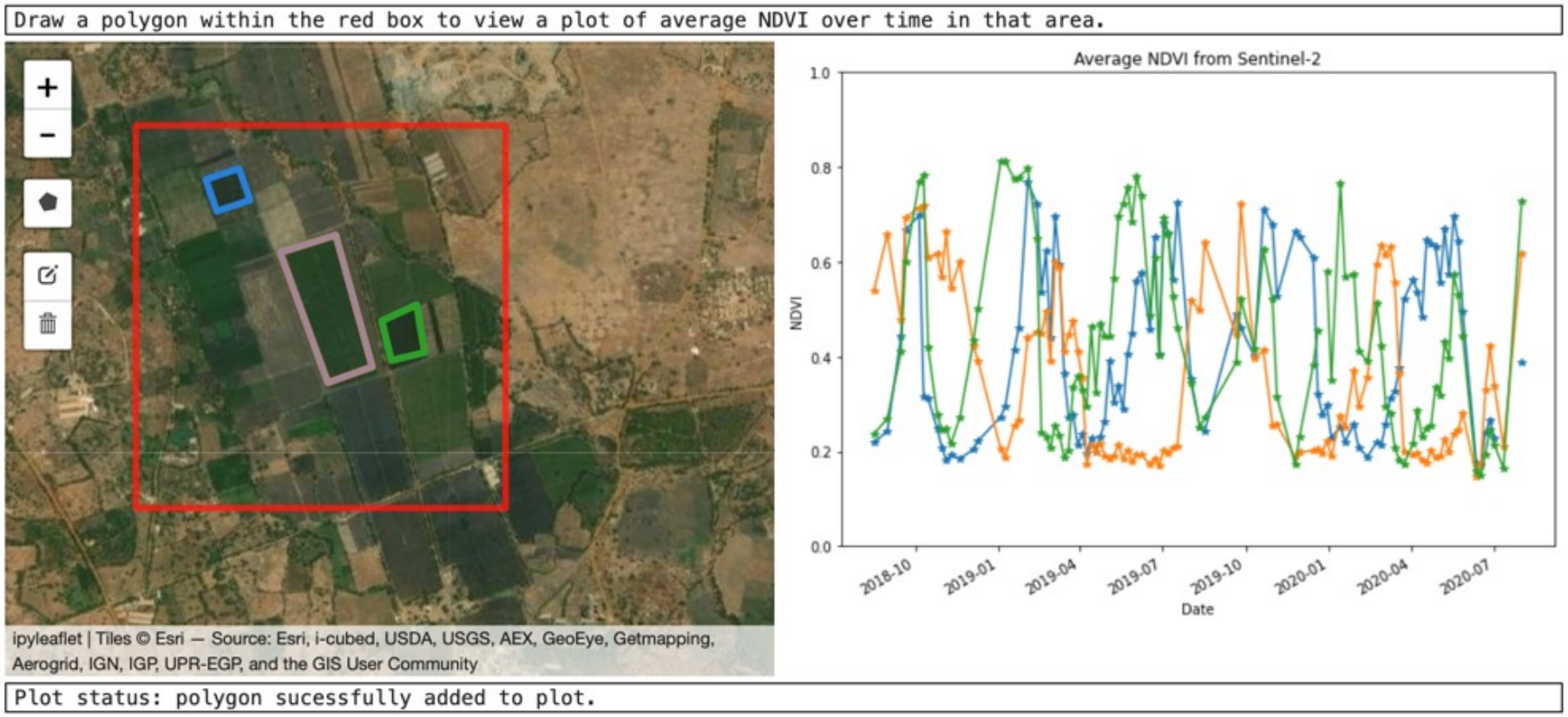
Tanzania *Minister of Finance and Planning Dr Phillip S Mpango, NaneNane2020.*

Measuring crop health/Mesurer la santé des cultures

Digital Earth AFRICA

Crop_health.ipynb

Study area: Croplands, Senegal
lat = 14.789064
lon = -17.065202
buffer = 0.005
date = '2020-08-01'



Measuring vegetation phenology/Mesure de la phénologie de la végétation

Digital Earth AFRICA

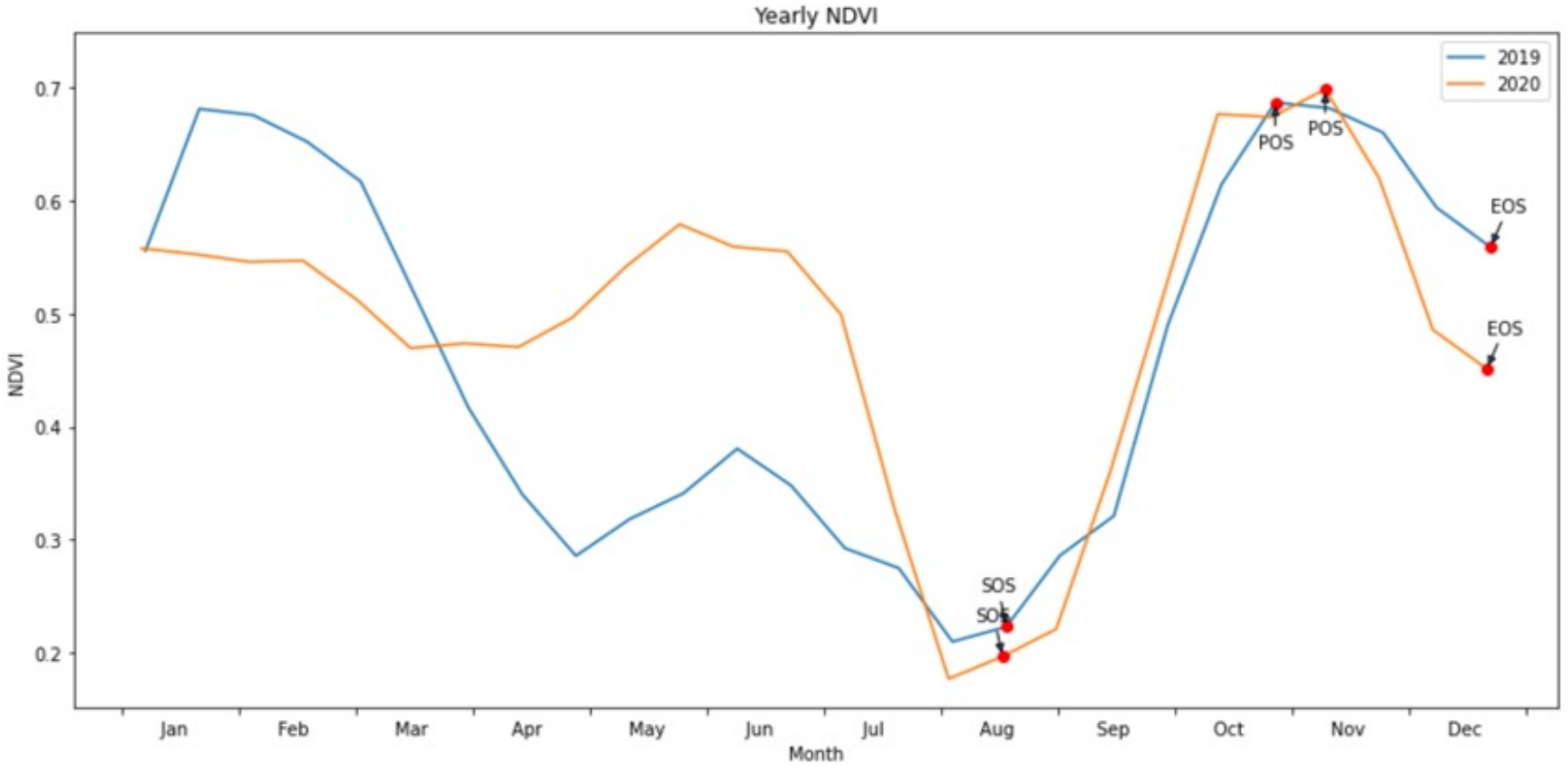
Phenology_optical.ipynb

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. La fonction xr_phenology de DE Africa peut calculer un certain nombre de statistiques sur la phénologie de la surface terrestre qui, ensemble, décrivent les caractéristiques du cycle de vie d'une plante.

```
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 units)
ROG = Rate of greening
ROS = Rate of senescence
```

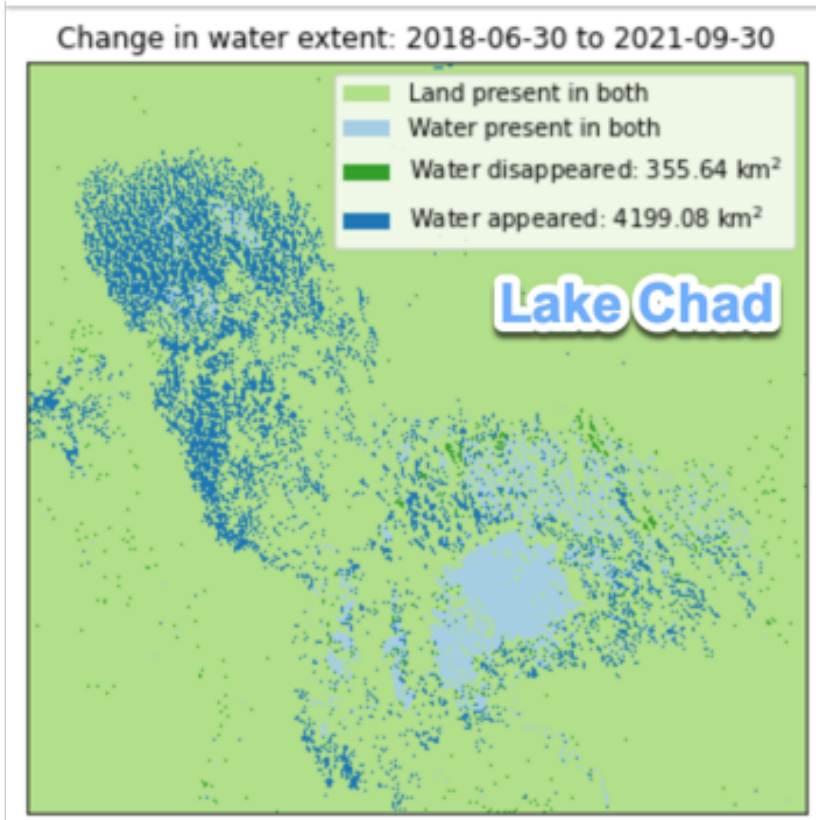


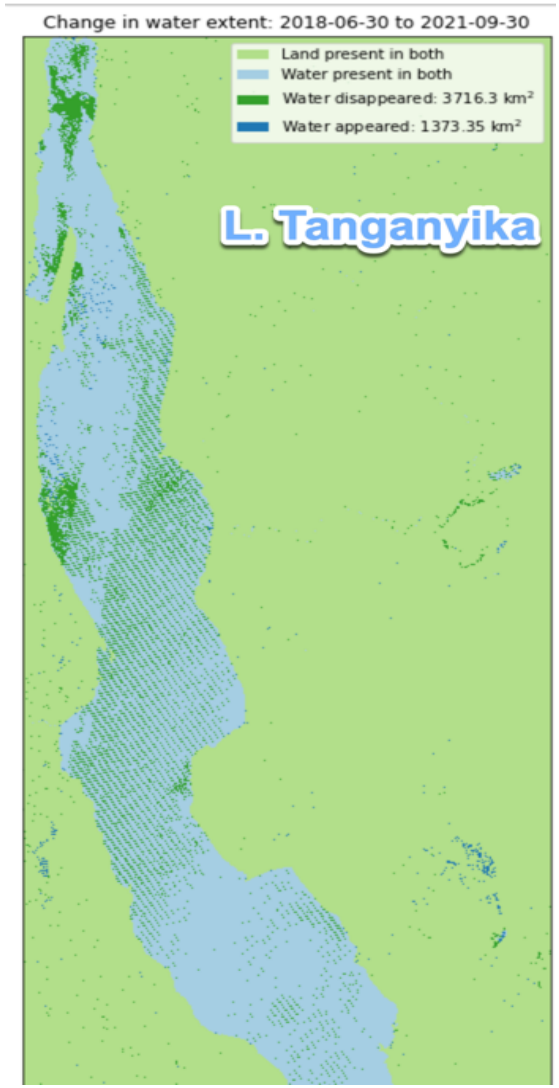
Mapping water extent using WOfS/ Cartographie de l'étendue des eaux

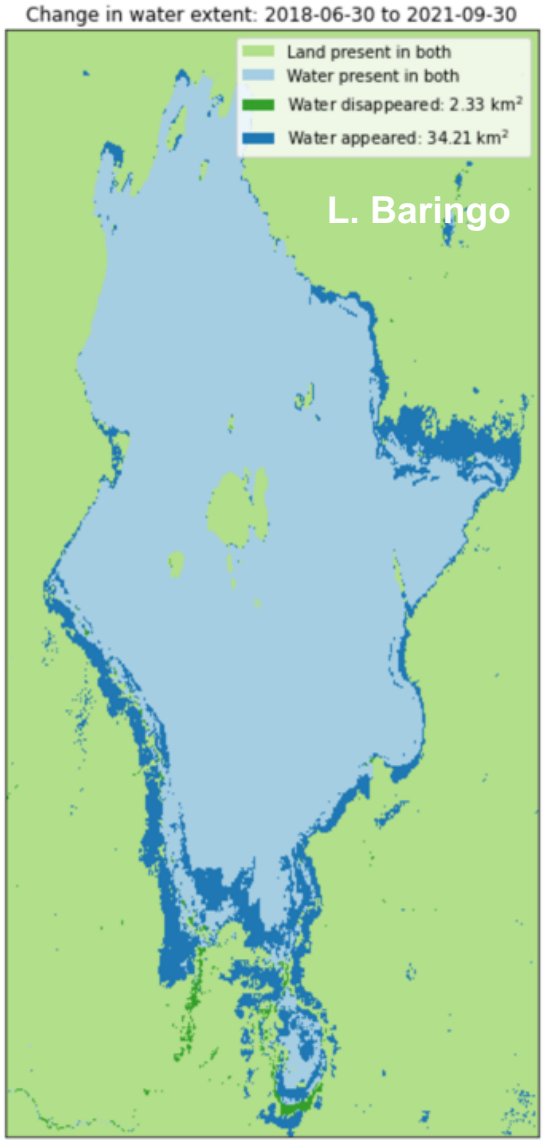
Digital Earth AFRICA

Monitoring_water_extent_WOfS.ipynb

Compare water extent



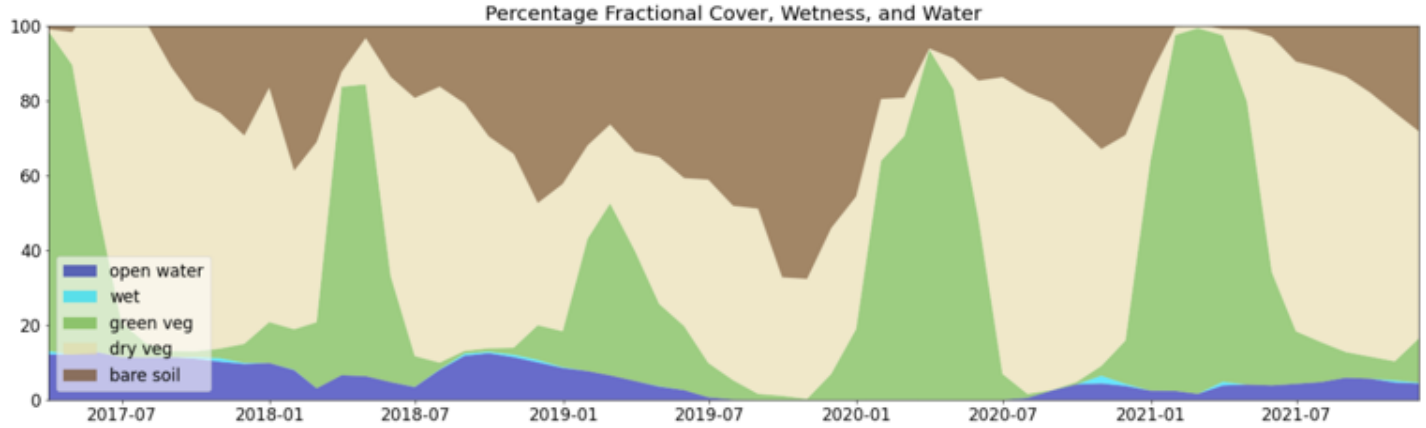




Wetlands Insight Tool – Lake Ngami

The Wetlands Insight Tool (WIT) provides insights into a wetland's seasonal and interannual dynamics. WIT is a spatiotemporal summary of a wetland that combines multiple datasets derived from the Landsat archive held within DE Africa.

Example Lake Ngami, Botswana.



Real_world_examples / **Wetlands_insight_tool.ipynb**

Total polygon area: 626.05 km^2

Area falls within recommended limit

Map Overlay:

Sentinel-2 Gec

Start Date:

01/01/2017

End Date:

12/12/2021

Minimum Good Data:

1

Resampling

Frequency:

1M

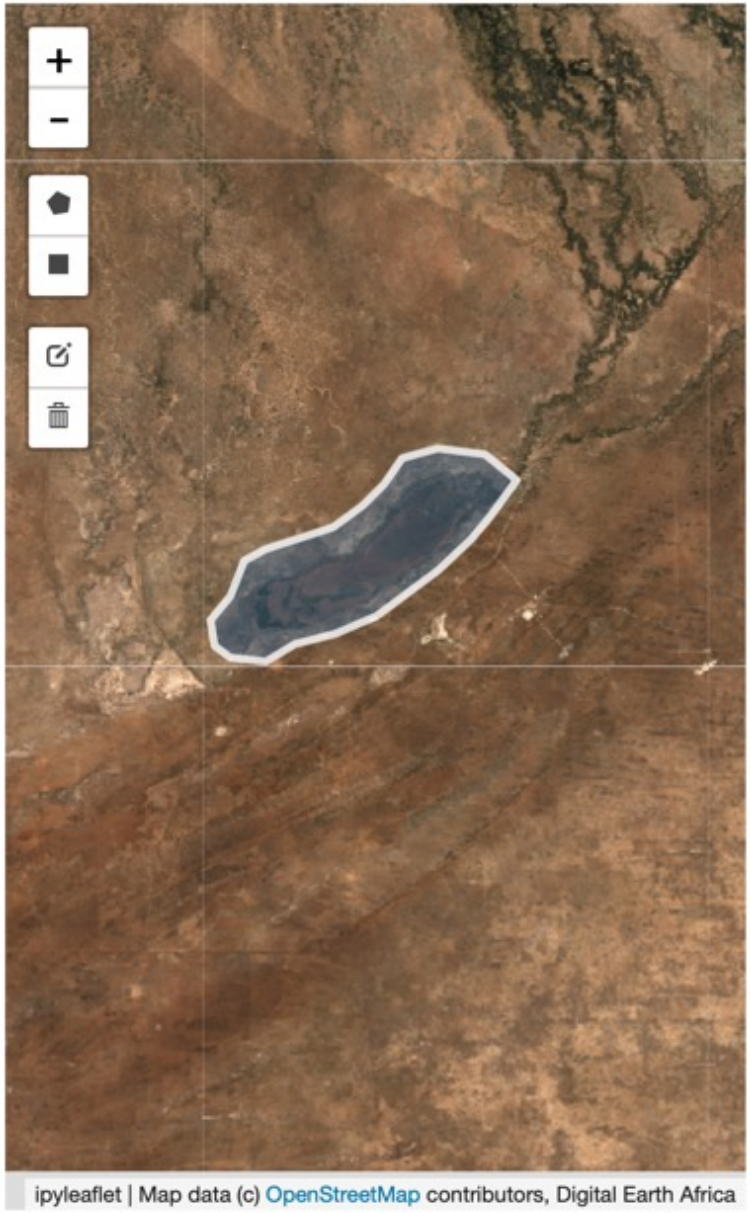
Output CSV:

example_WIT.csv

Output Plot:

example_WIT.pn

Run

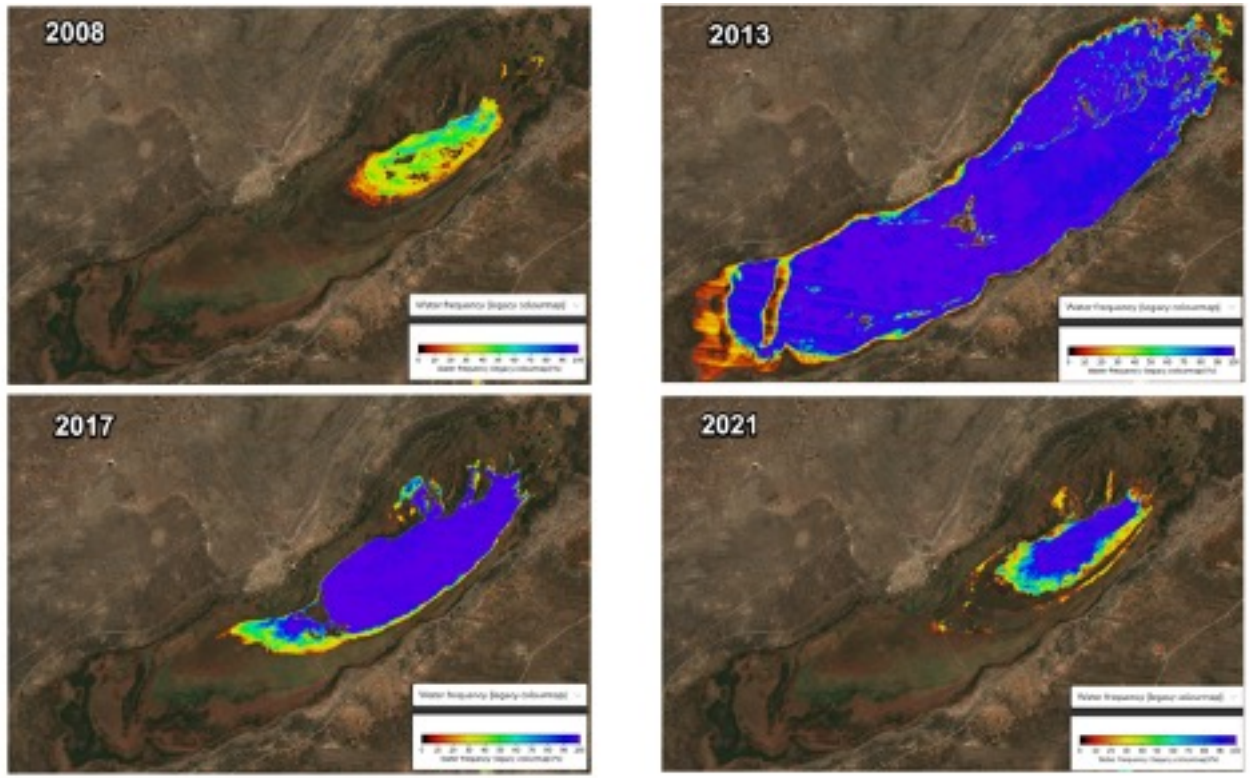


Water Assessment and Monitoring in the Lake Ngami, Lower Okavango Delta

- Lake Ngami is located at the western part of the lower Okavango Delta and an indicator for environmental change and climate variability in the Okavango Basin.

- Digital Earth Africa (DE Africa) provided the Water Observation from Space (WOfS) to evaluate water variability in Lake Ngami, Botswana from the year 2017 to 2021.

- The results for Lake Ngami indicate the need for an integrated watershed plan that encompasses the Okavango Delta.

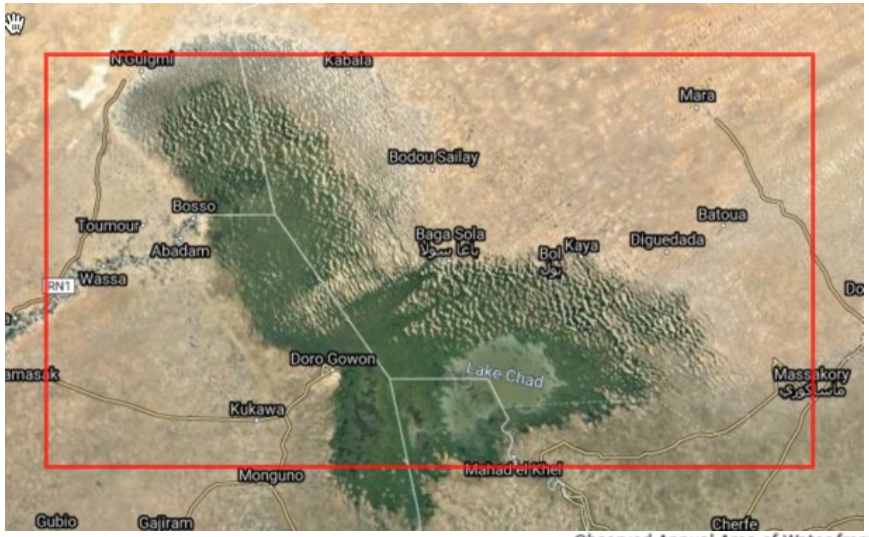


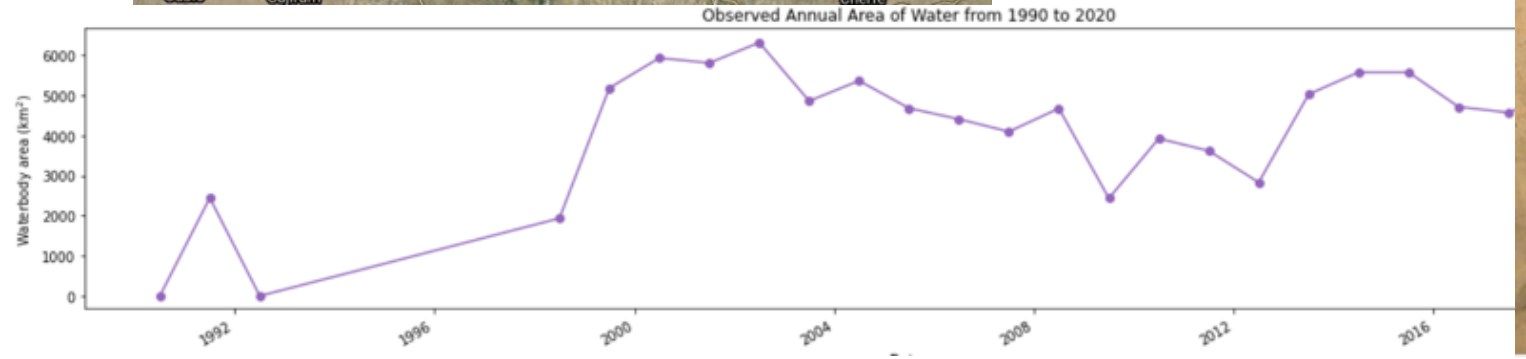
Dr. Kelebogile B. Mfundisi is currently working as a Research Scholar in Physical Geography at the University of Botswana Maun Campus, Okavango Research Institute, Maun, Botswana. Dr. Kelebogile can be reached on email: kmfundisi@ub.ac.bw

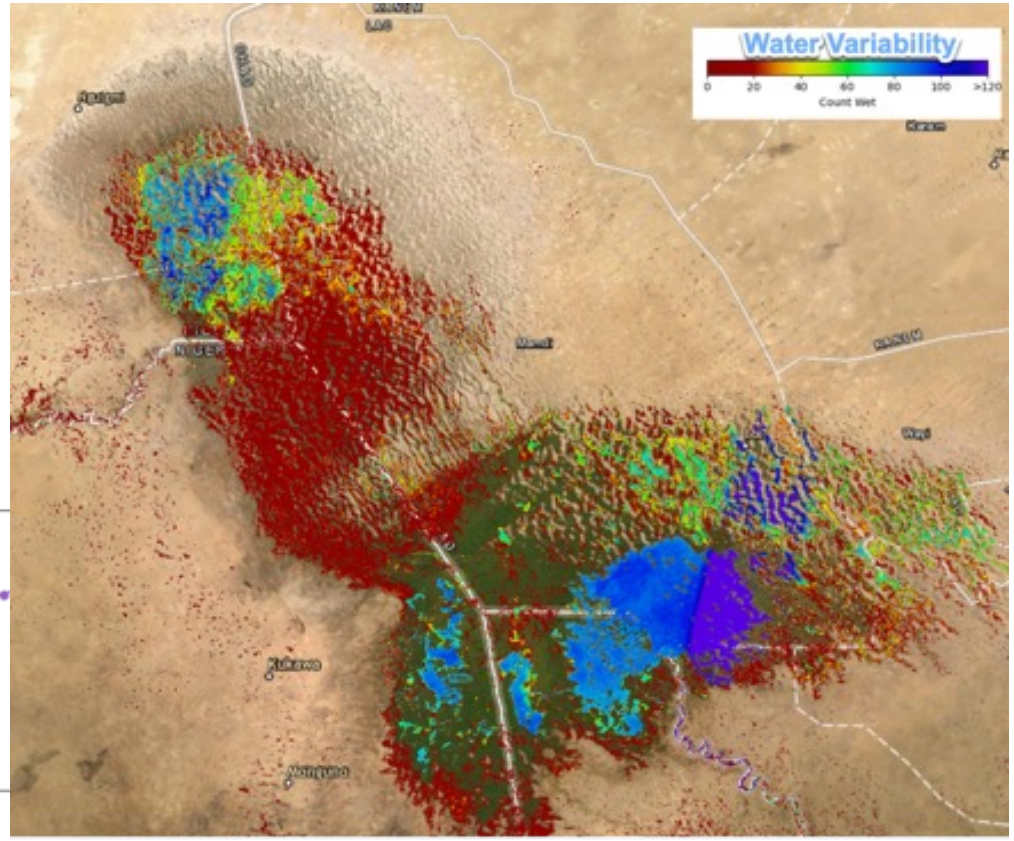
https://www.digitalearthafrica.org/media-center/blog/water-assessment-and-monitoring-lake-ngami-lower-okavango-delta-botswana

Digital Earth Africa helps assess the changes in water levels in Lake Chad

- Lake Chad has experienced low water levels due to climate change.
- AGRHYMET is using Digital Earth Africa (DE Africa) to provides insights into Lake using the Water Observation from Space (WOfS) to evaluate water variability the from the year 1990 to 2021.
- Need for an integrated water shed plan. Niger, Cameroon, Chad and Nigeria .







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

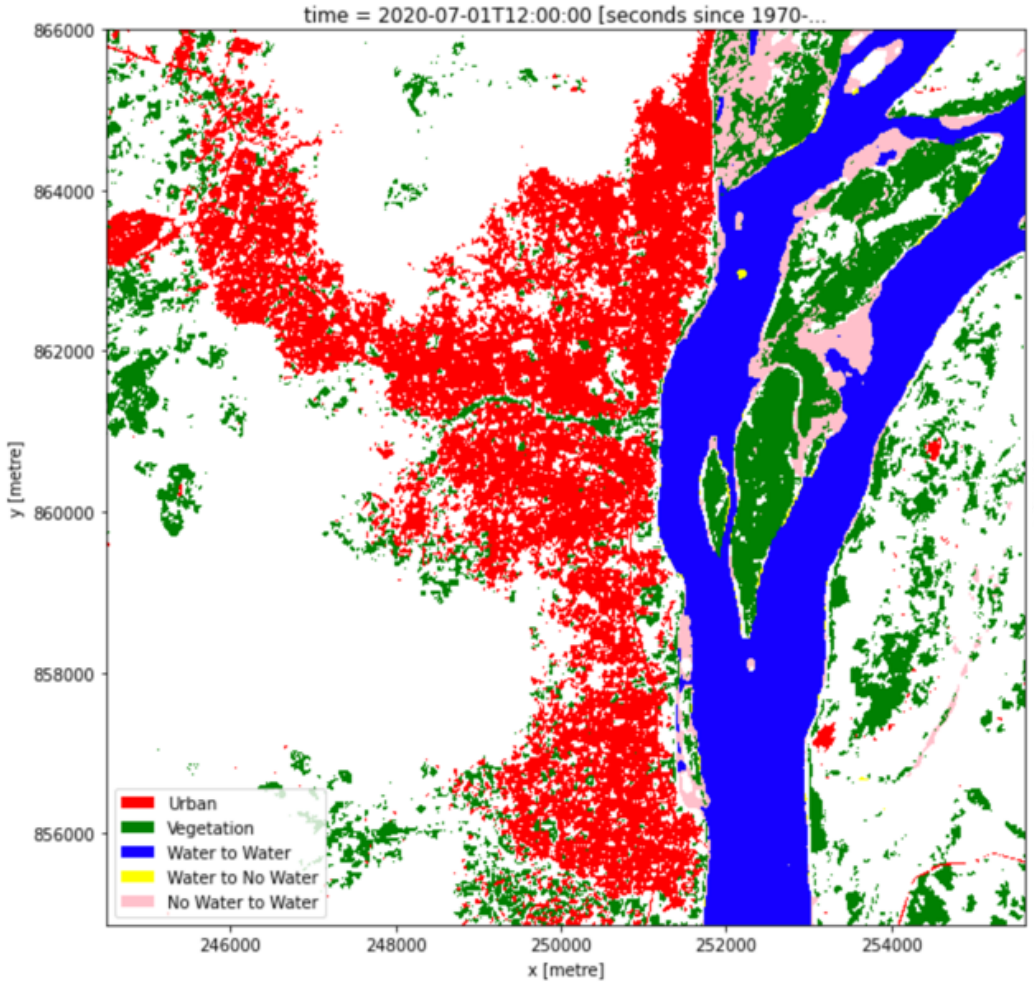
latitude = 7.78
longitude = 6.73
time= ("2022-07", "2022-10")

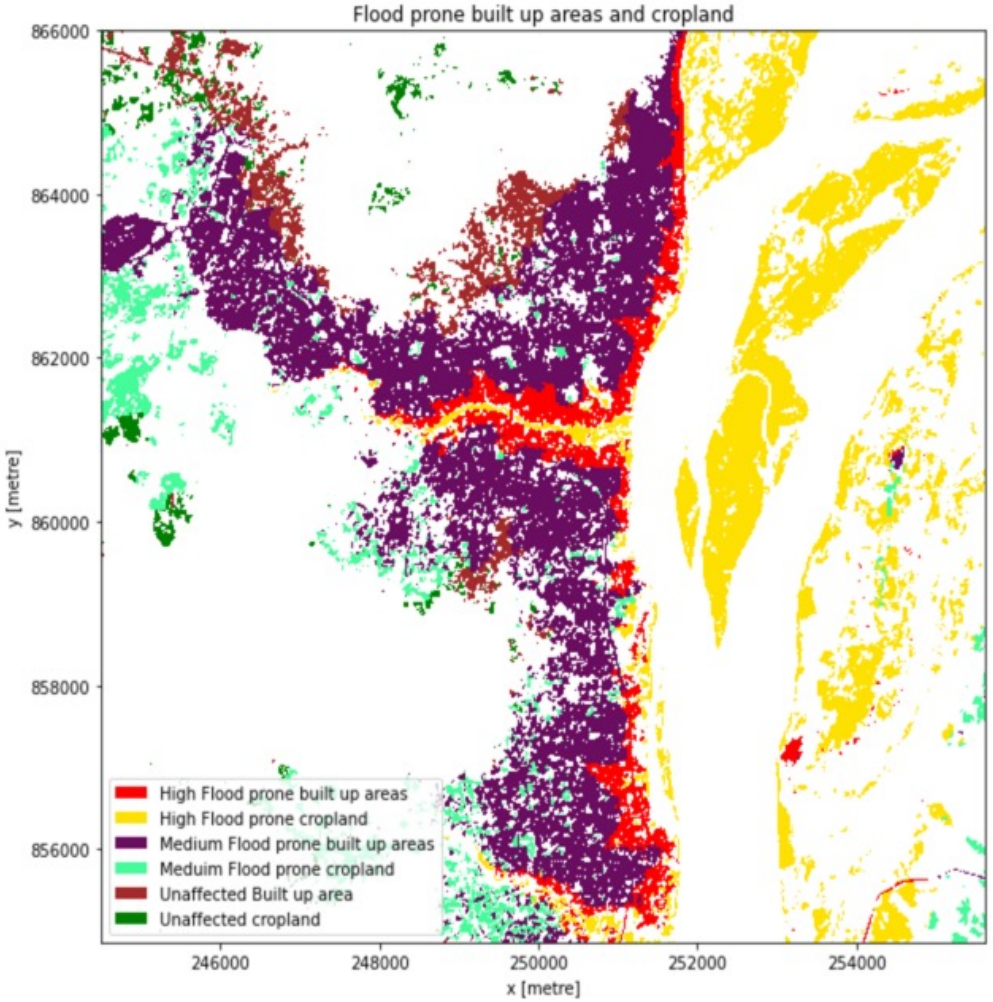
- Load Sentinel 1
- Water threshold
- Classification
- Flood assessment

Online module will be available
https://learn.digitalearthafrica.org

Scripts: here

Video: https://youtu.be/b74fDdlD_kw





Monitoring coastal erosion at Saly Portudal resort, Mbour-Senegal

Digital Earth Africa and partners, are developing a continental coastline service, which will inform an integrated coastal management plans.

Annual evolution of coastal erosion in Saly Portudal between 2002 and 2021. Some areas have suffered a decline and others, an accretion. Recent construction work on the breakwaters is said to have contributed to the reduction of coastal erosion.

Centre de Suivi Ecologique (CSE) in Senegal in collaboration with DE Africa and partners, are developing the DE Africa coastlines service at the continental scale, i.e. covering the whole African continent coastlines, across Africa to ensure it is fit for purpose for potential users across the entire continent.

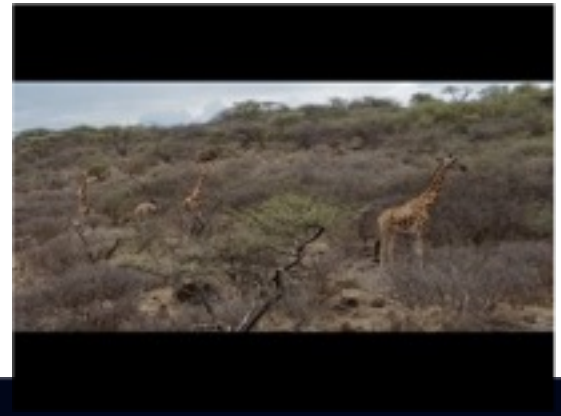
The service will enable users to analyse coastal erosion and growth trends on an annual basis at both local and continental scales.

The service will support decision-making in diverse infrastructure and livelihood-threatening situations and will contribute not only to the Sustainable Development Goals but also the 2063 agenda of the African Union.

Earth Observation for conservation

This story shows how communities have been using DE Africa to support their effort to rehoming endangered giraffes due to raising Lake levels.

In 2021 WOfS was used during the rescue of 9 Rothschild Giraffes stranded by rising waters of Lake Baringo in Kenya.



Rehoming giraffes on Lake Baringo due to rising water levels

Story Map from Data 4 SDGs

https://youtu.be/zCbcoVYpsOo

How data and community can save Zanzibar’s mangroves

Digital Earth Africa is helping Zanzibar fight the effects of climate change and protect the island's precious mangrove habitat.

Link: https://youtu.be/FVmcEaemfmA

The story is also part of a new documentary series, Climate Next https://www.aboutamazon.com/news/aws/climate-next-how-data-and-community-can-save-zanzibars-mangroves

Digital Earth Africa and the Zanzibar researchers using the service to help fight the effects of climate change.

Khairiya Massoud,
State University of Zanzibar

DE Africa Maps https://maps.digitalearth.africa/

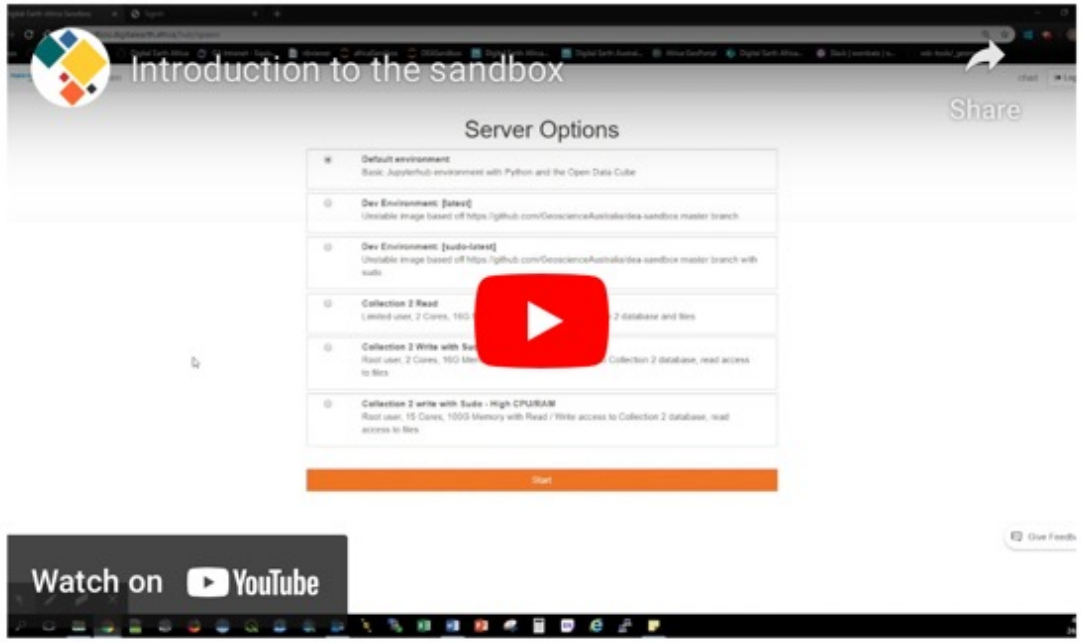
The Digital Earth Africa (DE Africa) Map is a website for map-based interaction with DE Africa products and services. Through the Map we aim to provide users with the tools to explore our data and products and visualise the African continent with satellite images to understand its geographic diversity and how it changes through time.

https://maps.digitalearth.africa/

Sandbox https://sandbox.digitalearth.africa/

Sandbox

The DE Africa Sandbox is a cloud-based computational platform that operates through a Jupyter Lab environment. It provides a limited, but free compute resource for technical users and data scientists to explore DE Africa data and products. It enables access to remote-sensing data and analysis tools for ad-hoc report generation and rapid development of new algorithms. This analysis environment is continuously improved to meet the needs of users.



https://youtu.be/ecVjlmPy2_A

Notebooks https://github.com/digitalearthafrica/deafrica-sandbox-notebooks

Notebook repository

A repository of readily available notebooks (user computational workflows and code) will allow users to use, interact and engage with the DE Africa Sandbox. Available from the GitHub and loaded by default in the Sandbox, users will be able to use these notebooks to readily load, process, analyse and visualise DE Africa datasets. The repository grows continuously as new notebooks are developed by DE Africa team and the user community.

https://github.com/digitalearthafrica/deafrica-sandbox-notebooks

Sandbox Tutorials

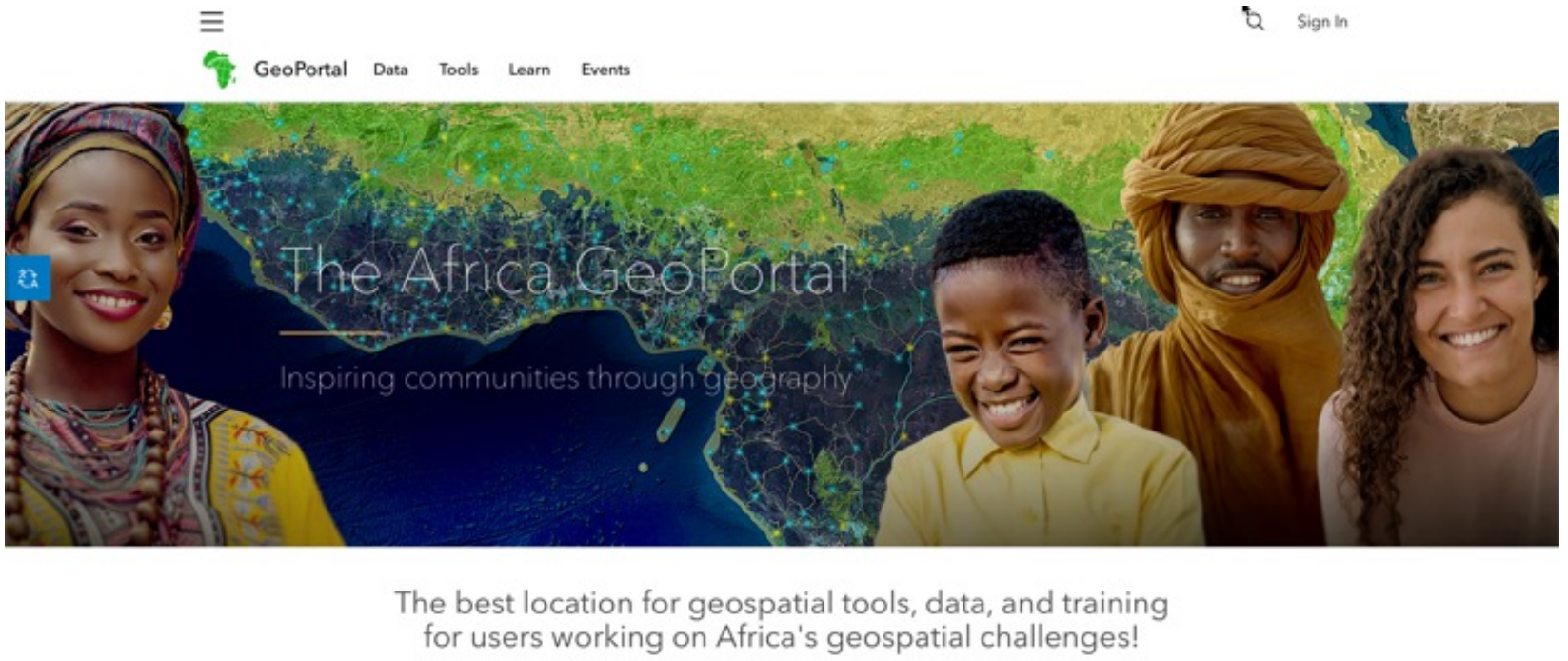
	English	French
Flood risk management	https://youtu.be/b74fDdlD_kw	https://youtu.be/OUqpykcHoB8
Drought index	https://youtu.be/nQchJpGAzh4	https://youtu.be/mGa15ZcvY1g
Crop health	https://youtu.be/wgHCRrxSkhE	https://youtu.be/VcO9-c4Efz0
Soil moisture	https://youtu.be/OLCROpovoIE	https://youtu.be/dj_ZcC6DvsM

DE Africa Tutorials: https://www.youtube.com/channel/UCBasD3Dz-TdQTRoyG30kVVw

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

https://www.africageoportal.com

Other Access

Other Access

DE Africa Metadata Explorer

The DE Africa Metadata Explorer 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.

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.

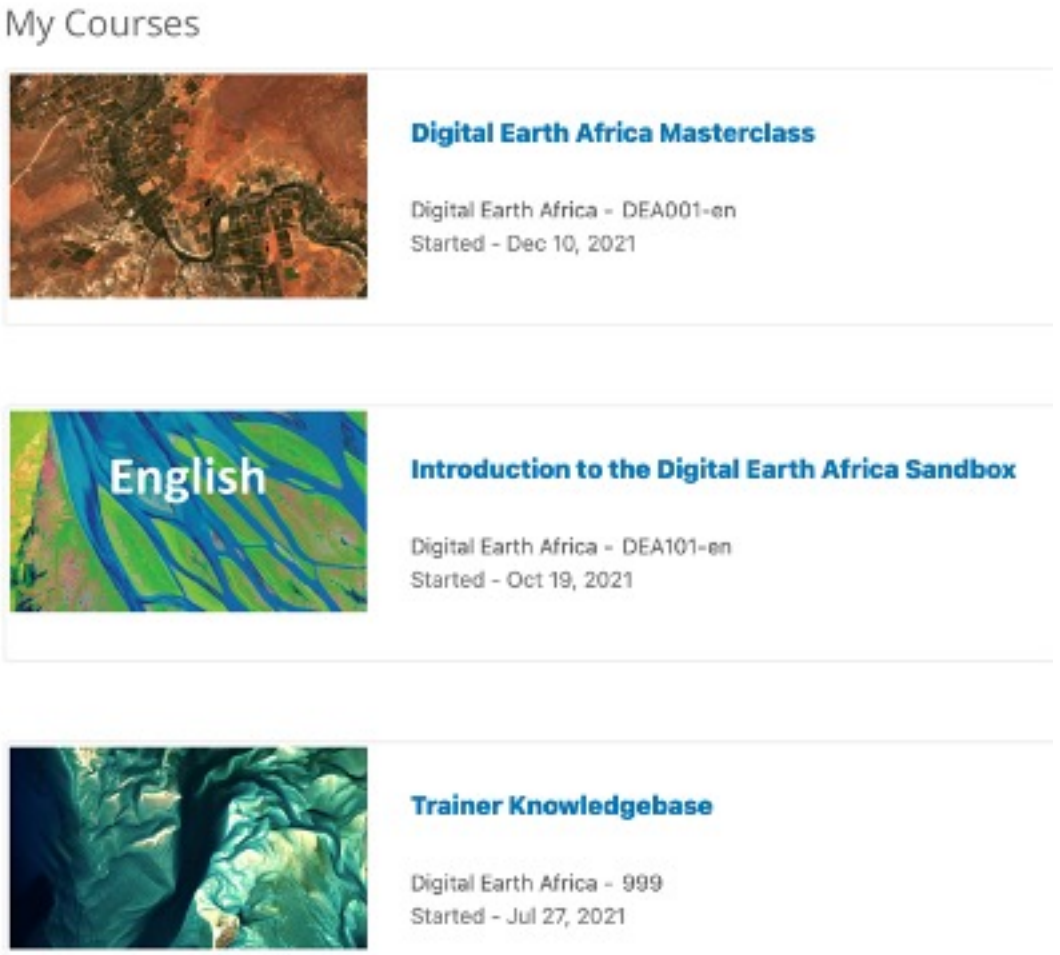
https://explorer.digitalearth.africa/products

How do I complete the DE Africa training course?

- **Sign up! (details to be provided)**
- **Enrol in “Intro to Sandbox”, “Master Class”**
- **Self-paced, free-to-access, fully online:**
  - Videos, recorded tutorials, manuals
  - Hands-on exercises
  - English and French versions
- **Certificate of Completion is awarded upon completion of exercises**

https://learn.digitalearthafrica.org/

Email: training@digitalearthafrica.org



https://learn.digitalearthafrica.org/

Connect with DE Africa

- Website https://www.digitalearthafrica.org
- The opportunity to subscribe to the DE Africa community to receive quarterly newsletters and invitations to attend events https://helpdesk.digitalearthafrica.org and user guide https://docs.digitalearthafrica.org/
- Free learning course https://learn.digitalearthafrica.org
- How to sign up to the DE Africa weekly Live Learning Sessions: every Wednesday at 11am, GMT zero) - ask questions and connect: https://forms.gle/DjumuaNgQfm1wEV98
- Email address info@digitalearthafrica.org

Digital Earth
AFRICA

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United Nations Economic Commission for Africa
RCMRD
CILSS AGRHYMET
sansa South African National Space Agency
Global Partnership for Sustainable Development Data
Ghana Statistical Service
AFRIGIST
Sahara and Sahel Observatory
Université d'Antananarivo
Thunderbird School of Global Management
CSE Centre de Suivi Ecologique
Bill & Melinda Gates foundation
esri
aws
dLab Tanzania Data Lab
COOi studios
World Economic Forum
CEOS Committee on Earth Observation Satellites
Open Data Cube
ITC
IWMI International Water Management Institute

Thank you Merci obrigada

Asante. E ṣeun. Murakoze.

Amesegnalaw. Weebale.

Jërëjëf. Kea leboga. meda wo ase

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