Digital Earth
AFRICA

Unlocking the promise of Tomorrow

Monitoring of mining sites and related impacts on natural vegetation using DE Africa platforms

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Digital Earth Africa

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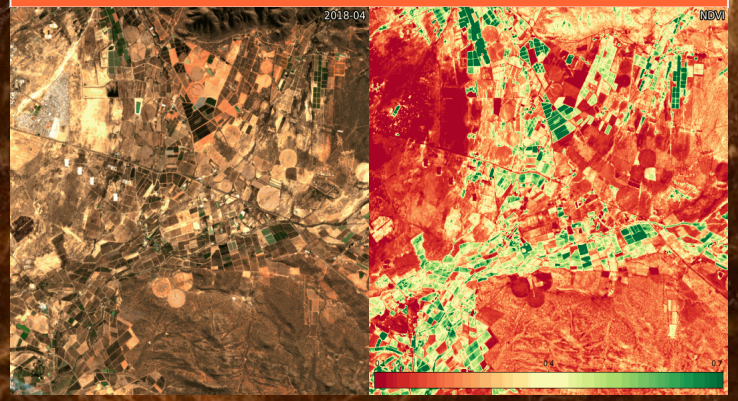
01

What is Digital Earth Africa?

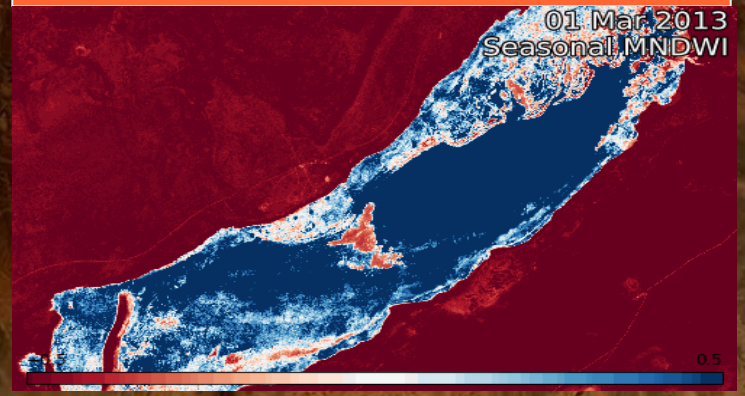
Our Vision

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.

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UNLOCKING THE PROMISE OF TOMORROW FROM PATTERNS OF THE PAST

Digital Earth Africa could bring $2.3 billion per year to African industry.

– *World Economic Forum*

$500 million
Earth Observation industry accelerated growth

$900 million
Effective regulation of gold mining activity

$900 million
Agricultural productivity boost

Visit: **digitalearthafrica.org** Tweet: **@DEarthAfrica**

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02

Datasets and accessibility

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

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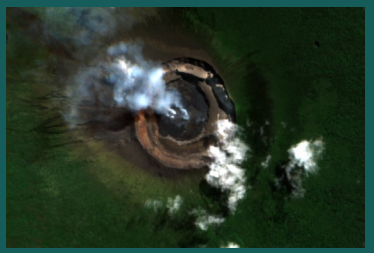
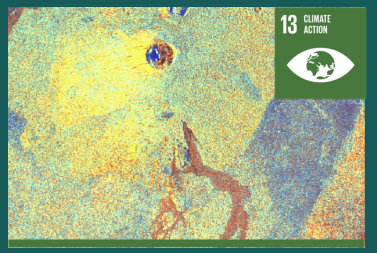
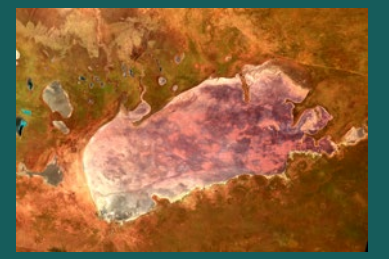
Studying the Tanzanian Coastline with GeoMAD, 2019, RGB

Monitoring crops in Egypt 2001-2020, Landsat, RGB

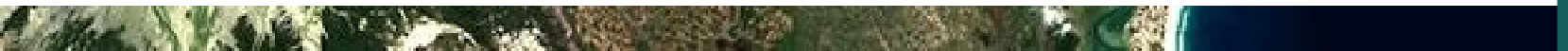




Monitoring Mount Nyiragongo, 2018 Sentinel-2 RGB and 2021 Sentinel-1



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



From Satellites to Insights

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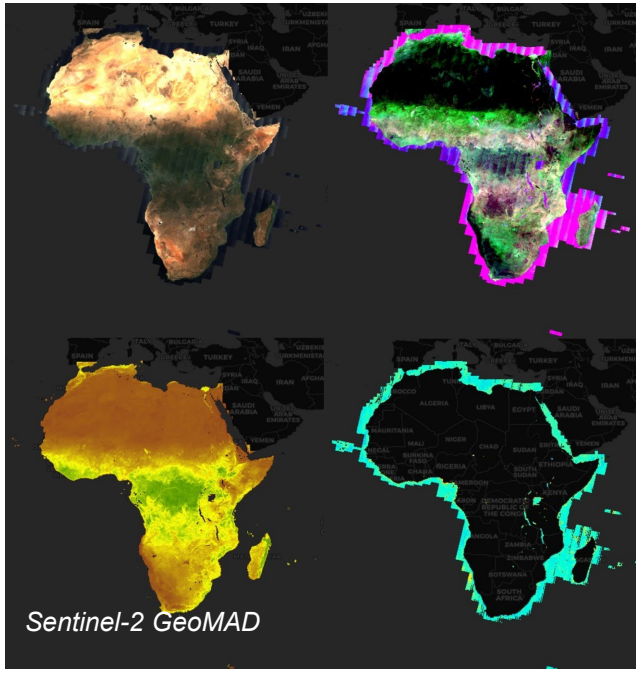
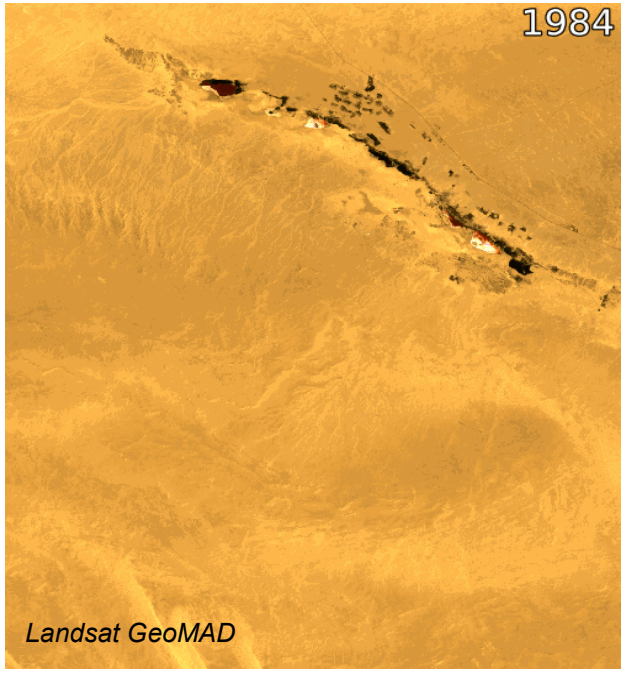
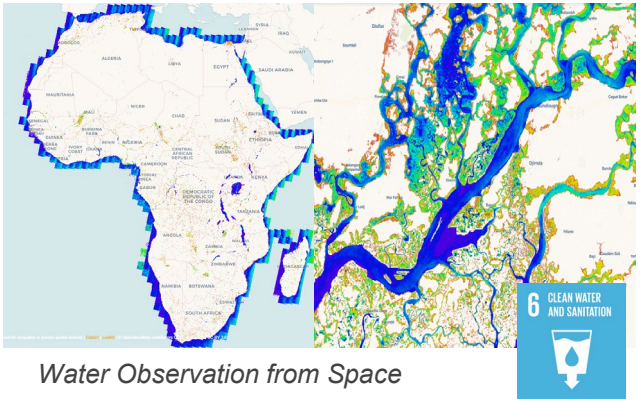
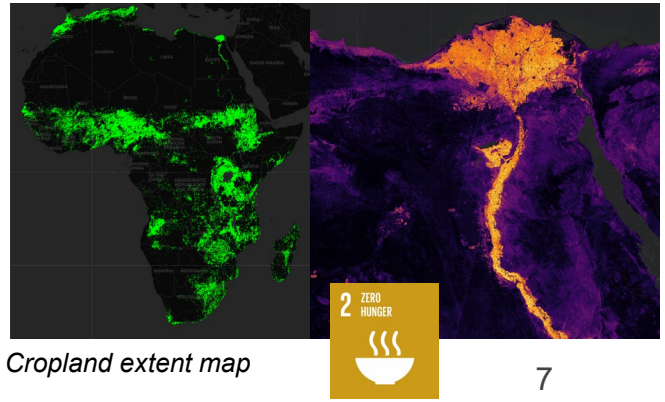
- Satellites capture information over the entire globe, with free and open access
- Through DE Africa, now available from Cape Town, targeting the SDGs
- DE Africa produces continental scale services - showing change through time of vegetation, land, water, coasts and cities; capturing the *patterns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







Water Observation from Space



Cropland extent map

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/

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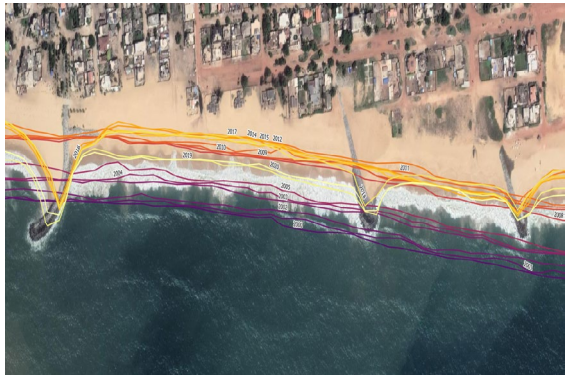
03

Impacts

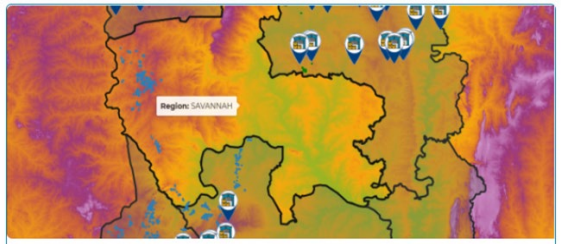
Making an impact use cases

- 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

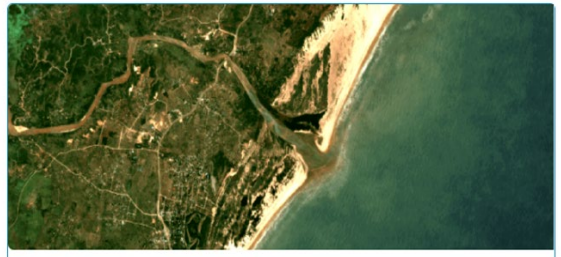


Coastlines in Africa

Mangroves in Zanzibar

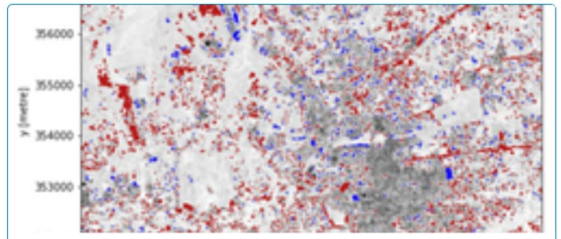


Using satellite data to monitor agriculture in Ghana - The GAIMS platform from Big Data Ghana.



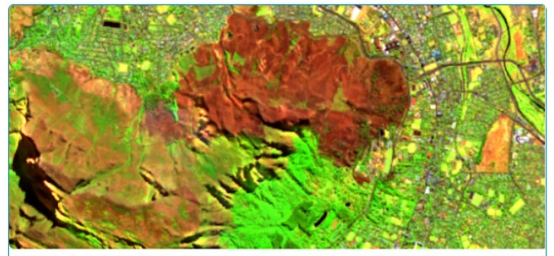
Using Earth observation to protect and conserve wetlands in Kenya

Rising Lakes in the Rift Valley in Kenya

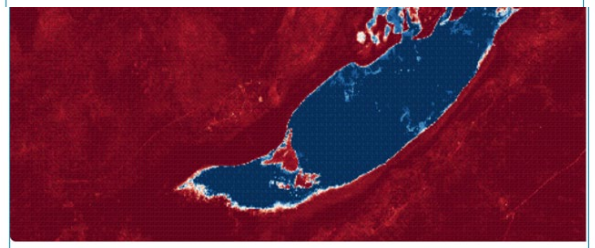


Monitoring urbanisation in Gulu City, Uganda

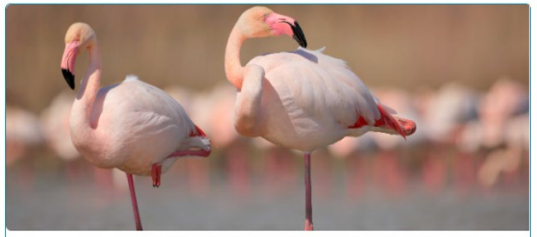
EO for conservation: rehoming giraffes on Lake Baringo, Kenya



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

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04

Monitoring of mining Sites

Why to monitor mining sites?

- Surface mining contributes to a country's source of revenue
- Removal of the land surface to access the minerals below.
- Collect sand, gravel, stones, coal, iron and other metals.
- Legal vs illegal exploitation
- Conflicts with agricultural land, forests and water bodies.
- Government officials are working to identify areas of these mining activities.
- Need for robust monitoring tool
- EO is a better option: time series, large areas, inaccessible areas, replicability of the methodology

Effective governance of resource extraction

- Better detection, monitoring, governance and control of unregulated mining or artisanal and small-scale mining (ASM) for governmental institutions that can prevent $billions in economic damages and limit negative environmental impact.

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https://maps.digitalearth.africa/#share=s-eLGxGfvLbDZVzcNyfe5kqHGv4gd

Transparent Independent authoritative source for site compliance and approval

Free and open DE Africa EO is a truth dataset accessible by all actors in the resource ecosystem that allows a common and shared understanding and tracking of site evolution, supporting the establishment of tractable regulatory standards at national levels.

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Historical baselining & Automation of Remote Environmental Monitoring

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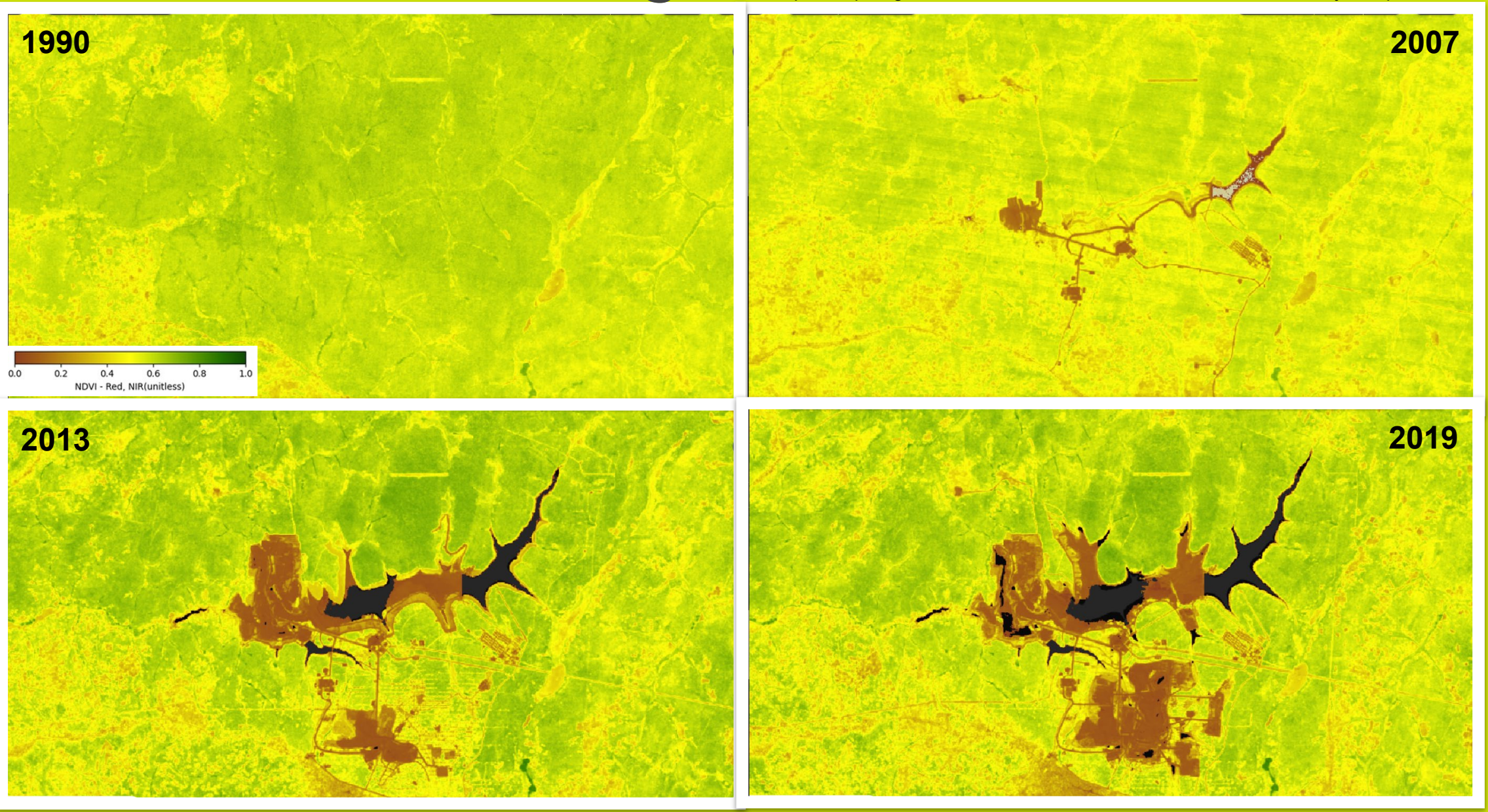

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Historical baselining & Automation of Remote Environmental Monitoring

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Integration in resource, risk, production quantification or modelling workflow

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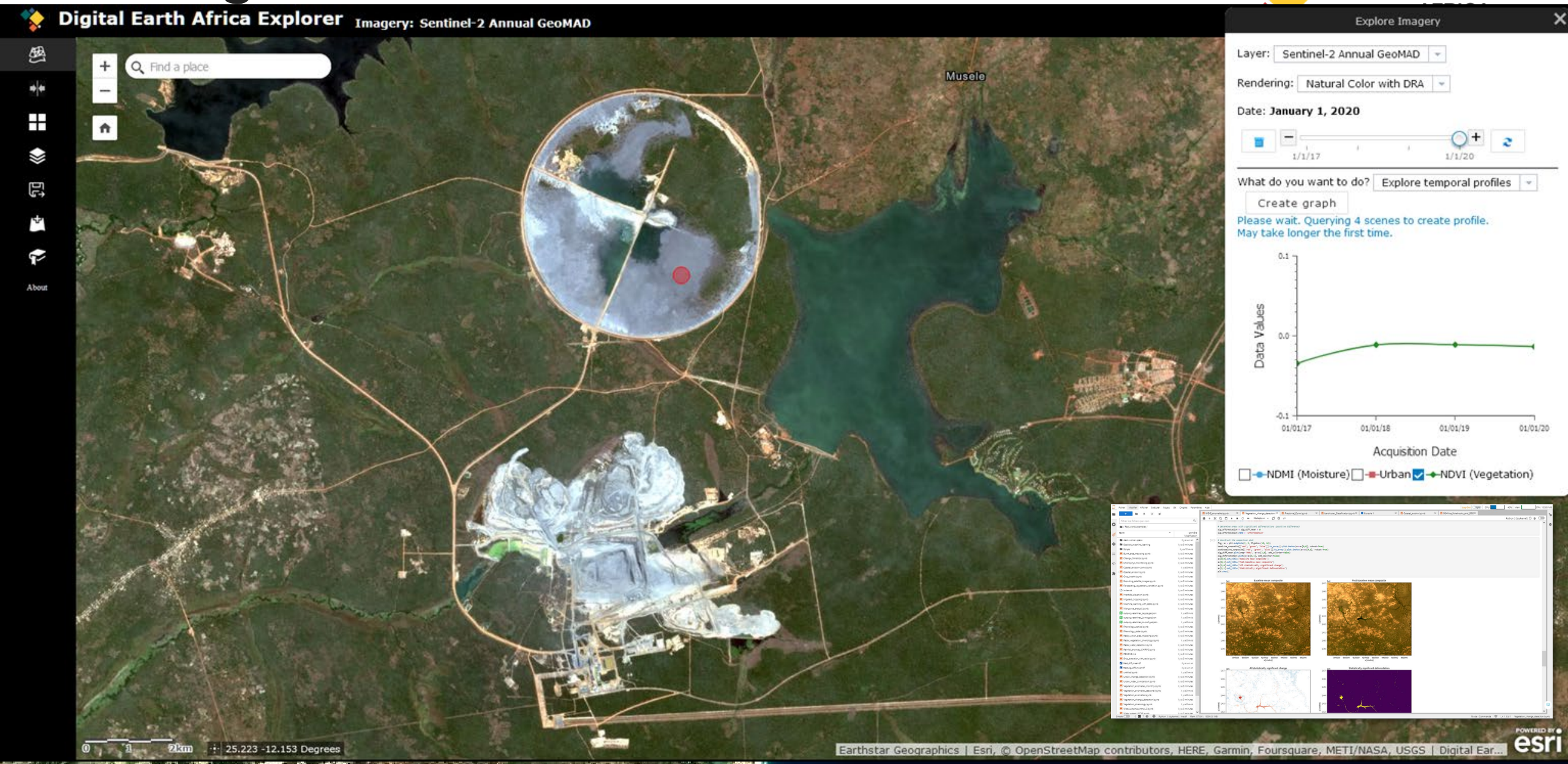

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Supports organisations environmental, social and governance (ESG) monitoring and reporting

Including social impacts and land use around mine sites and surrounding regions

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05

Mining and environment at small scale

DE Africa approach

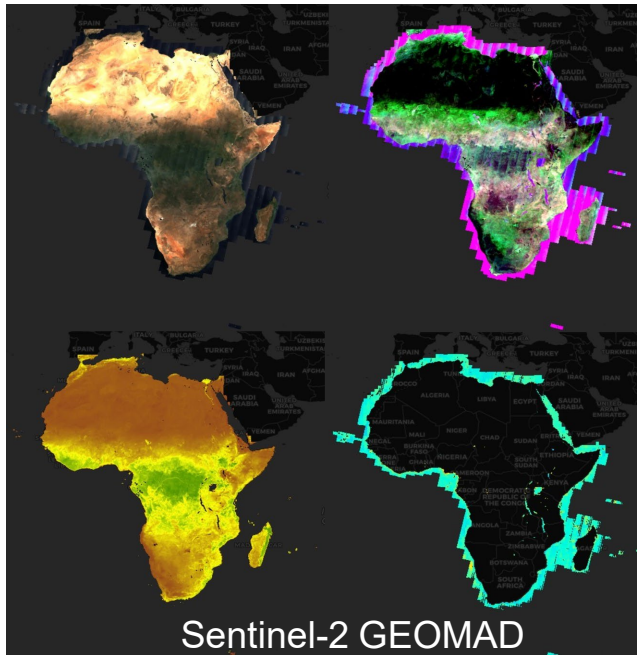
- Python-based notebook developed-available via DE Africa Sandbox and GitHub
- Datasets: Sentinel-2 or Sentinel-1 and WOfS
- NDVI (optical) or the RVI (radar) to determine vegetation and WOfS to identify water.

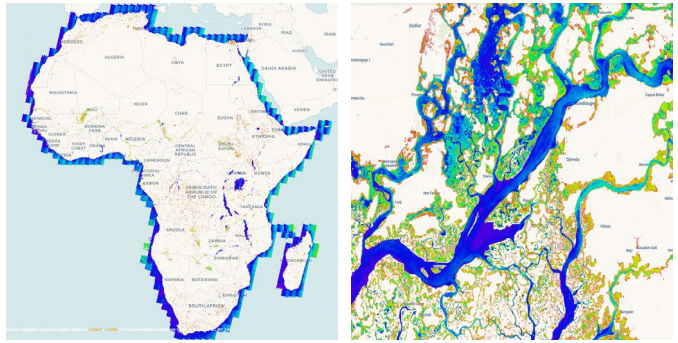
$$NDVI = \frac{(NIR - Red)}{(NIR + Red)}$$

$$RVI = 4*VH/(VV+VH)$$

$$\text{WOfS Summary (frequency)} = \frac{\text{Number of Clear and Wet Observations}}{\text{Number of Clear Observations}}$$

- The final product identifies pixels that exhibit vegetation loss, and the presence of water





Water Observations from Space (WOfS)

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Detecting unregulated mining, Ghana

Changes to the Apamprama Forest Reserve in the Amansie West and Central Districts of the Ashanti region from 2017–2020.

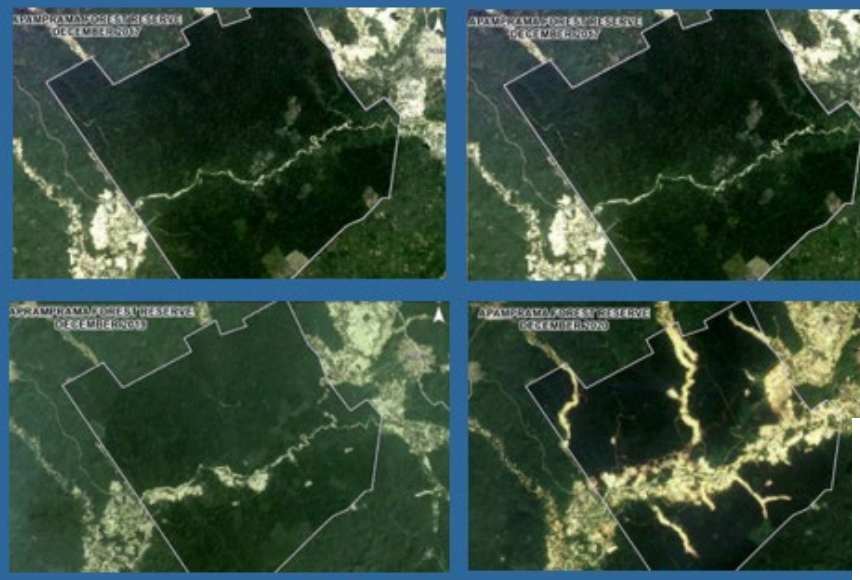
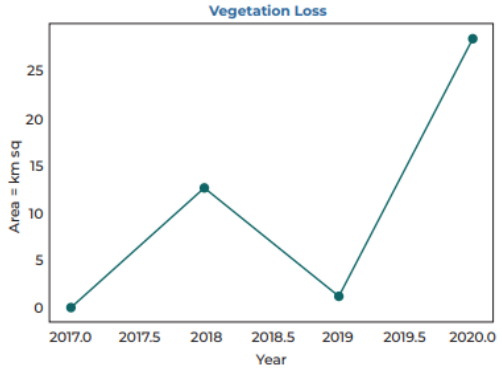


Image Credit: Environment Protection Agency, Ghana and Digital Earth

$900 million
unregulated gold mining detection and prevention

DE Africa data can help detect and prevent unregulated mines, leading to:

1. Reduced environmental impact
2. Less destruction of farmland
3. Protection of forest reserve
4. Improved water quality
5. Preservation of habitats and biodiversity
6. Improved health and quality of life



** World Economic Forum Report 'Unlocking the potential of Earth Observation to address Africa's critical challenges'*

Essen Apam Forest Reserve, Ghana

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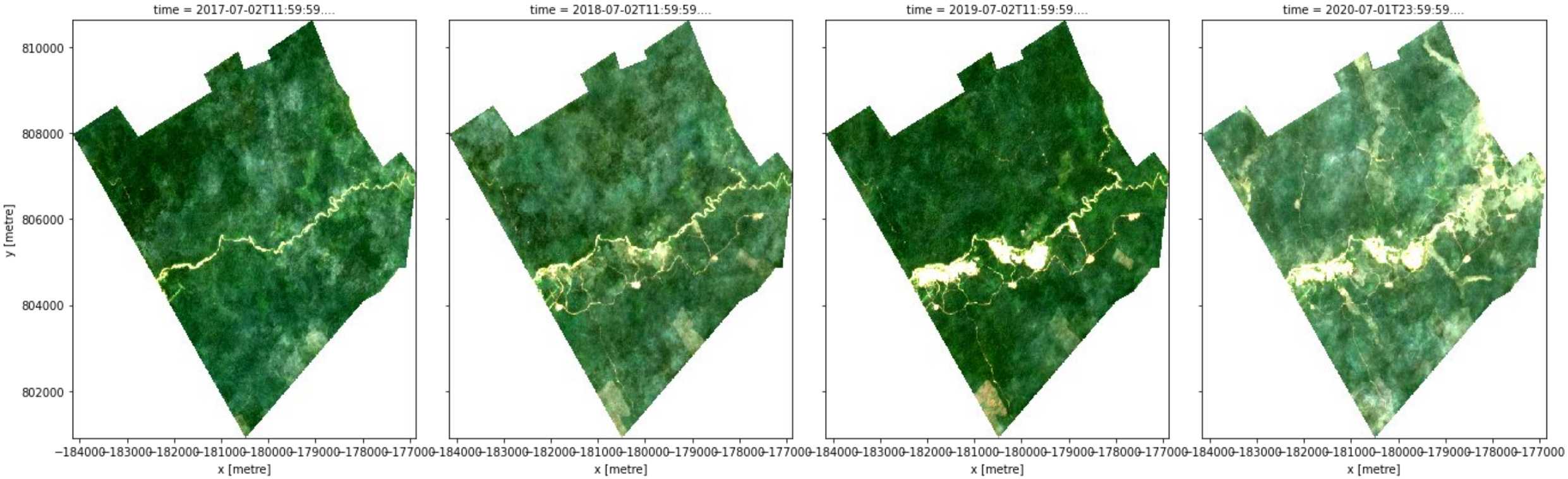

Essen Apam Forest Reserve, Ghana

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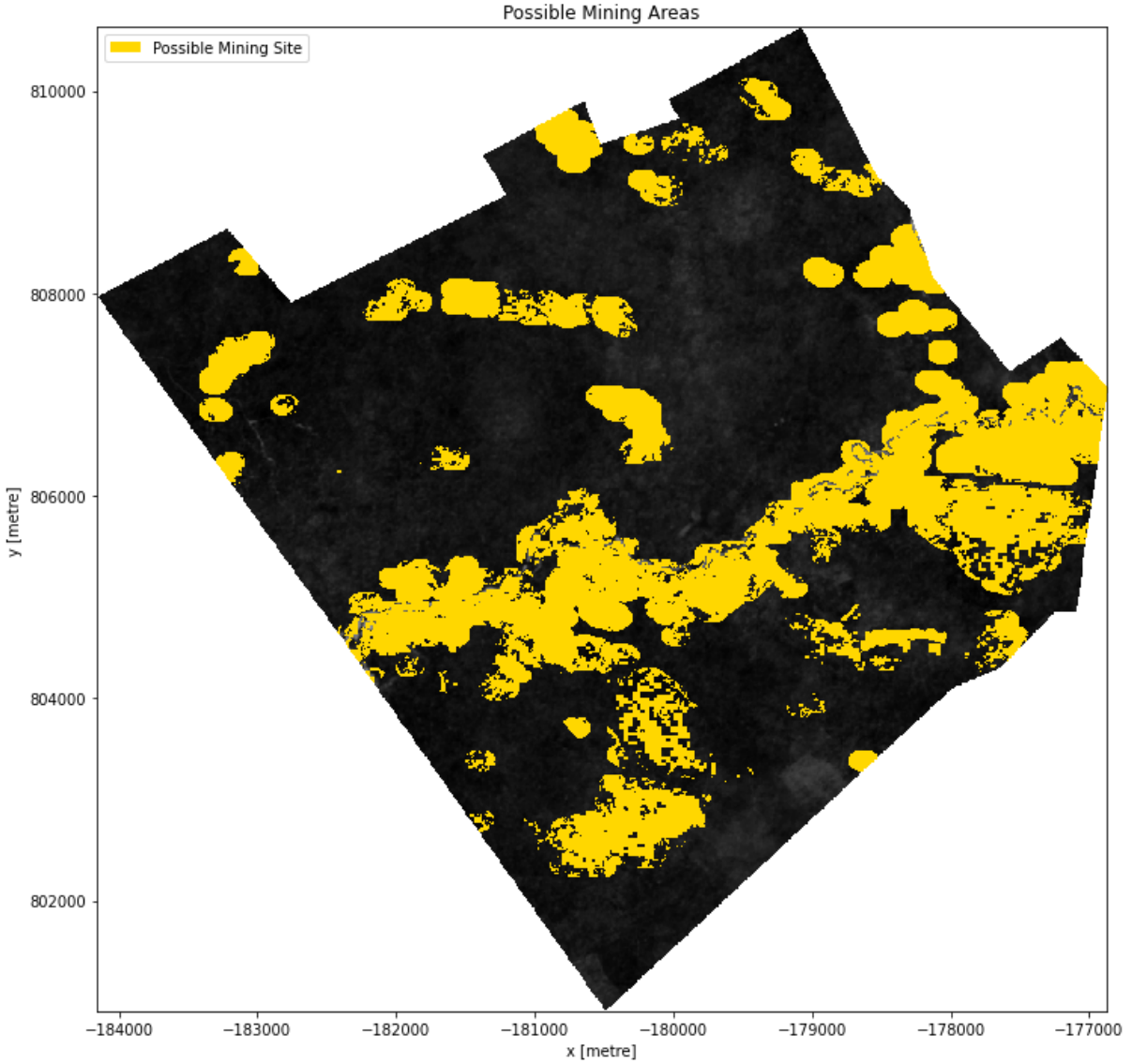
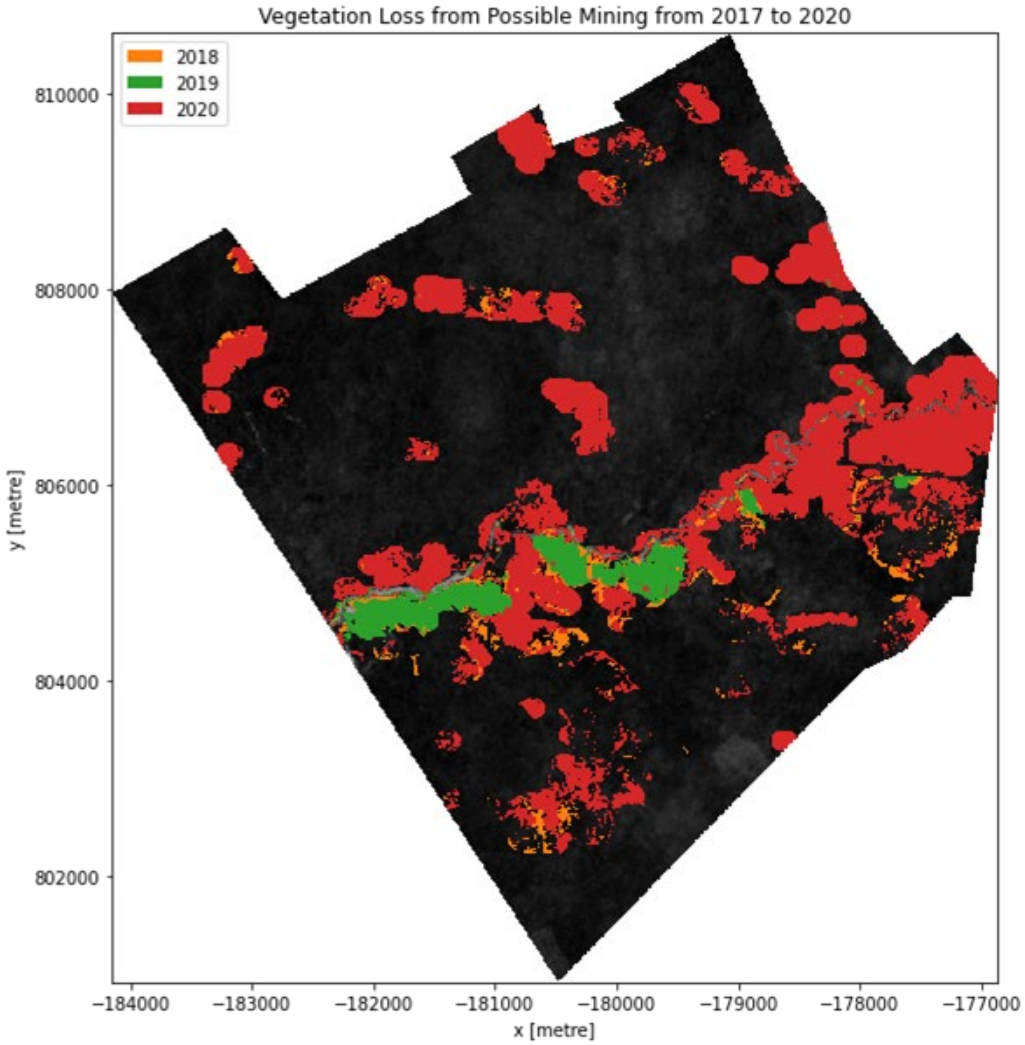
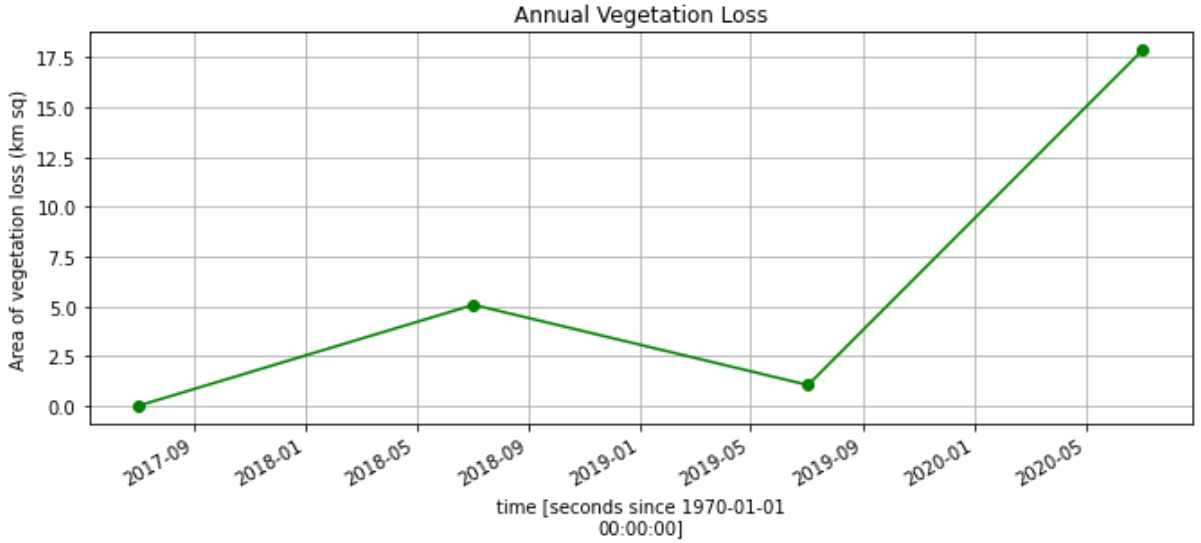
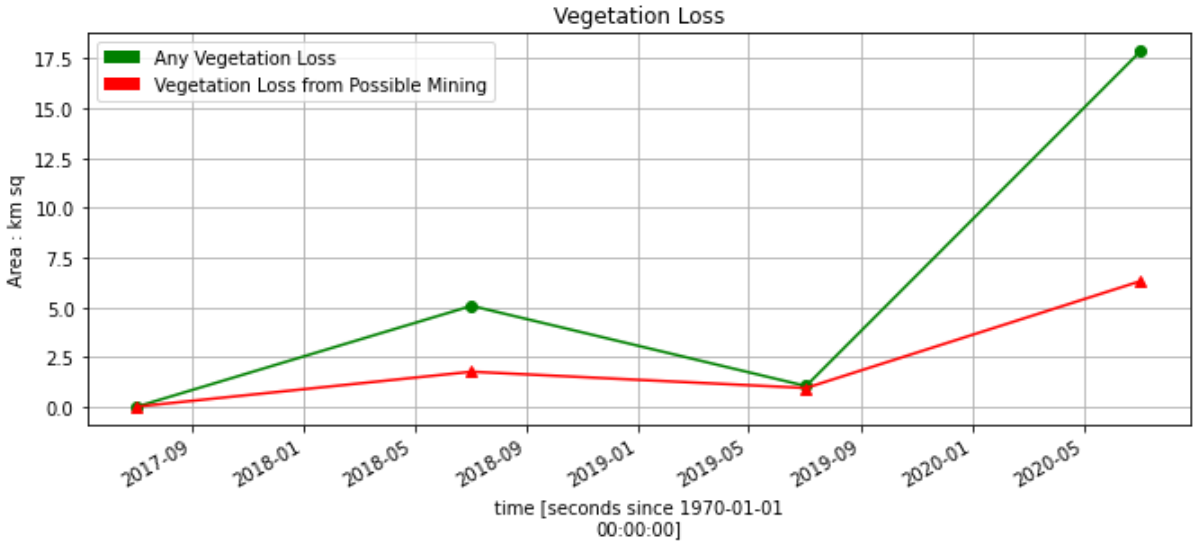




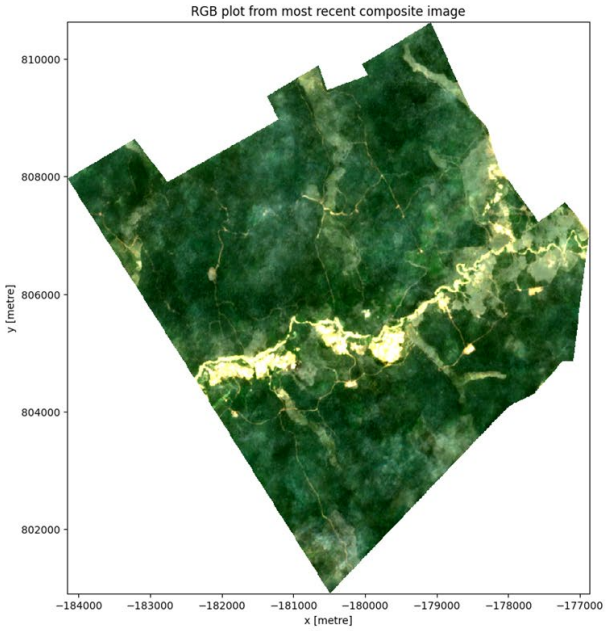
Essen Apam Forest Reserve, Ghana

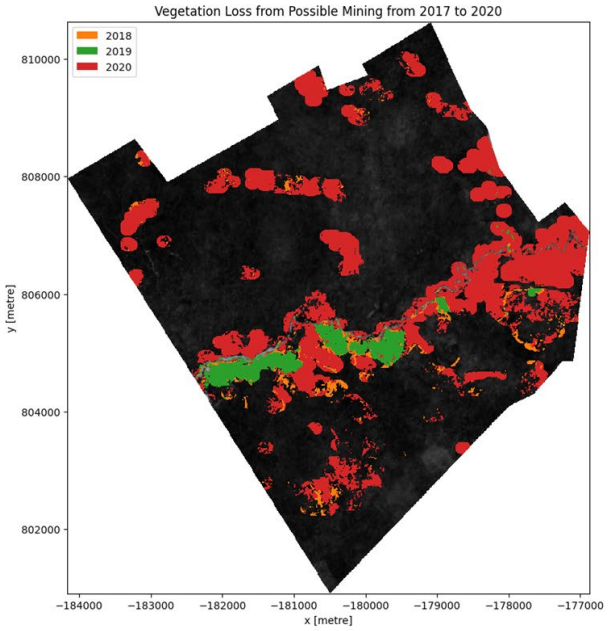




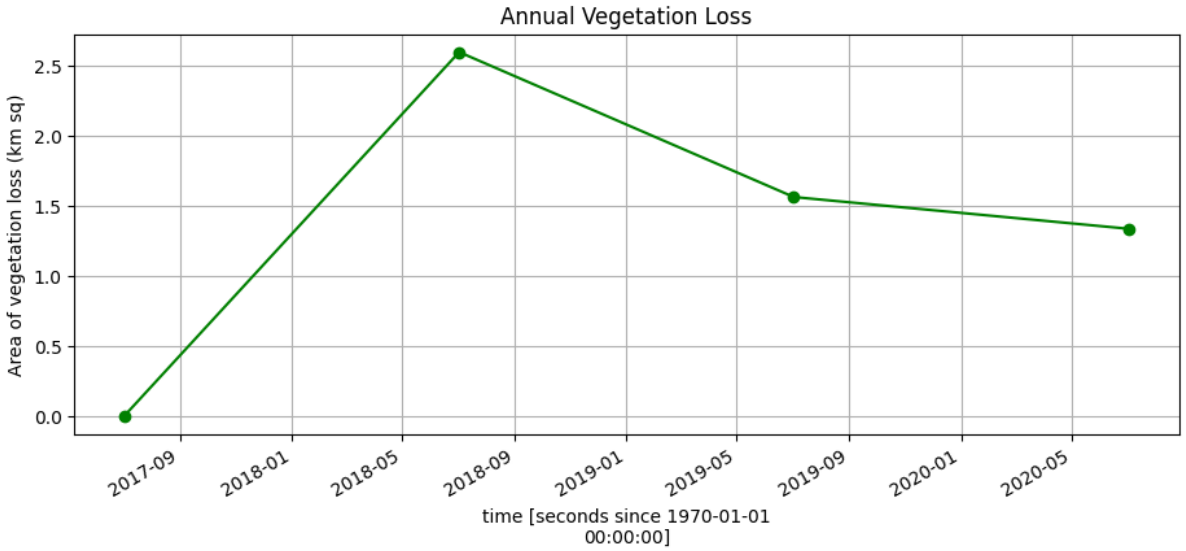
Total Area(kmsq) of the vector file 36.2628

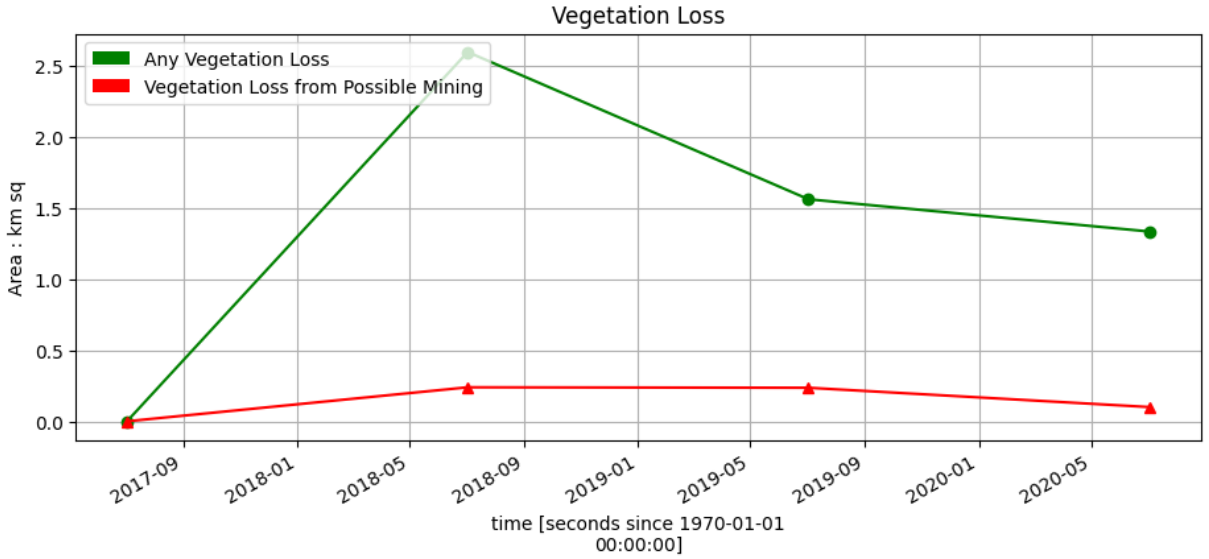
	2017	2018	2019	2020
Any Vegetation Loss(kmsq)	0.0	5.065500	1.032800	17.886900
Any Vegetation Loss(%)	0.0	13.968861	2.848098	49.325755
Vegetation Loss from Possible Mining(kmsq)	0.0	1.753300	0.933700	6.315000
Vegetation Loss from Possible Mining(%)	0.0	4.834982	2.574815	17.414541





Ambatovy-Madagascar





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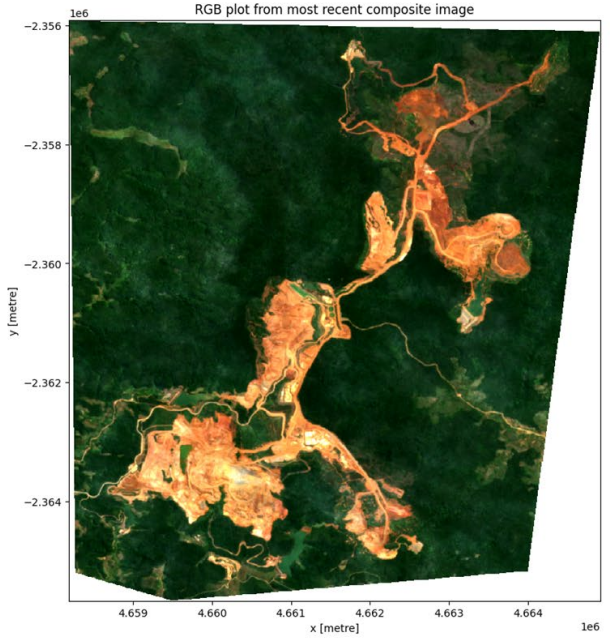
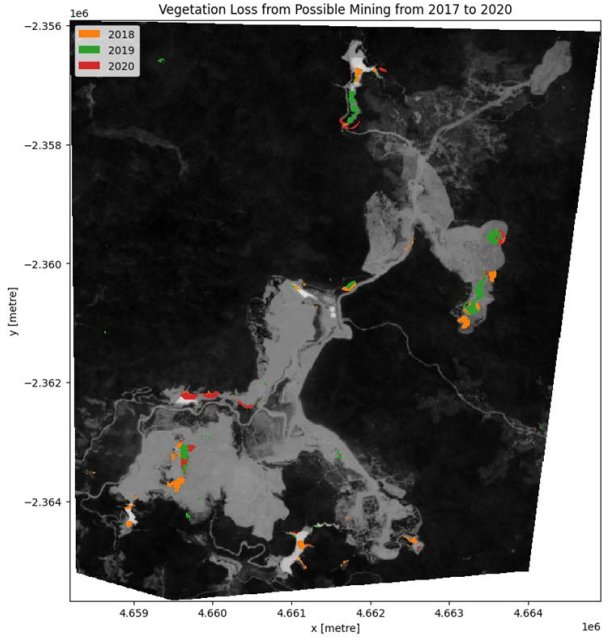
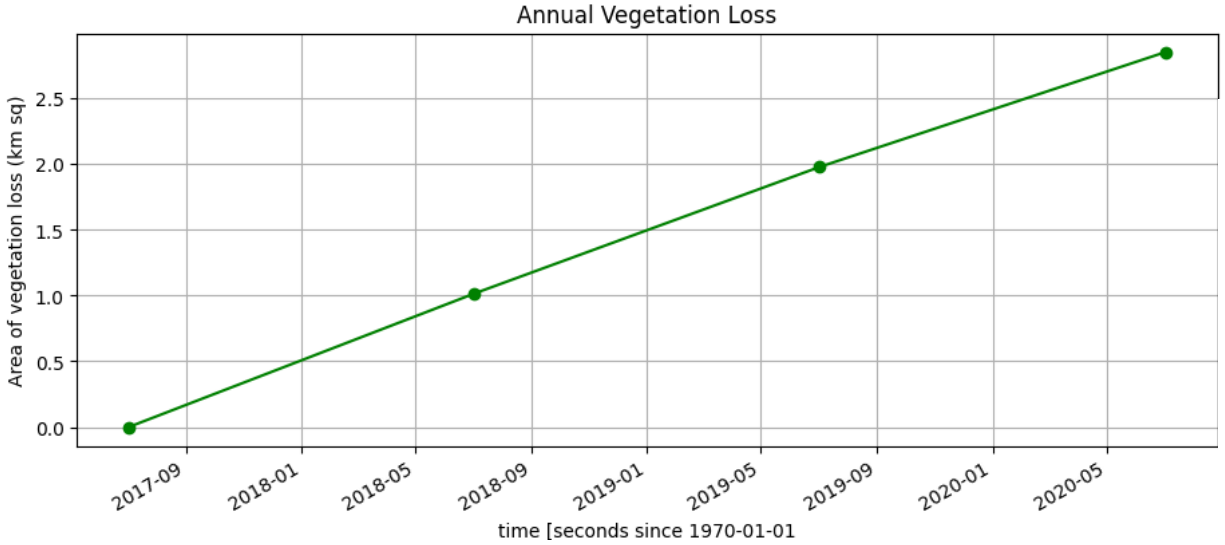
Total Area(kmsq) of the vector file 58.4447

	2017	2018	2019	2020
Any Vegetation Loss(kmsq)	0.0	2.592700	1.559000	1.332300
Any Vegetation Loss(%)	0.0	4.436159	2.667479	2.279591
Vegetation Loss from Possible Mining(kmsq)	0.0	0.238800	0.235500	0.099900
Vegetation Loss from Possible Mining(%)	0.0	0.408591	0.402945	0.170931



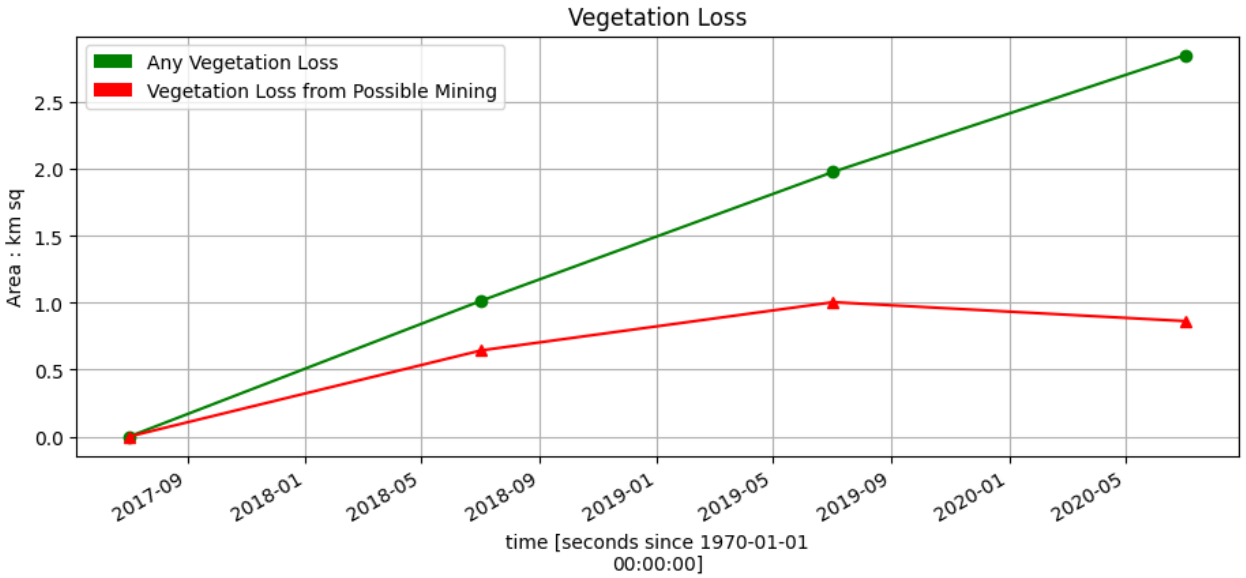


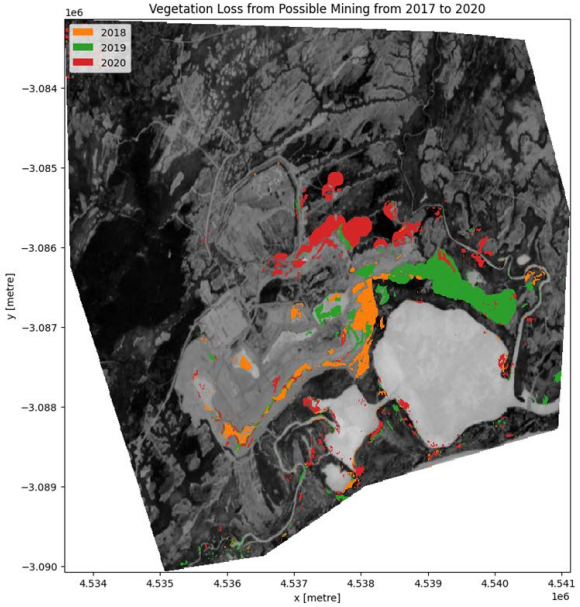
Rio-Tinto/Madagascar



Total Area(kmsq) of the vector file 41.7362

	2017	2018	2019	2020
Any Vegetation Loss(kmsq)	0.0	1.014800	1.977800	2.851200
Any Vegetation Loss(%)	0.0	2.431462	4.738812	6.831480
Vegetation Loss from Possible Mining(kmsq)	0.0	0.643600	1.003900	0.862400
Vegetation Loss from Possible Mining(%)	0.0	1.542067	2.405346	2.066312





Conclusion

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- Possibility to monitor the effect of mining on natural vegetation between 2017 and 2020
- Availability of time series
- Covering large or inaccessible areas
- Replicability of the methodology in tropical forest areas
- Results to be validated by ground truthing

Historical baselines

Monitoring and reporting

Transparency in assessing site compliance and approval

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://zoom.us/j/5890793425 since August 2020. Sessions https://www.youtube.com/@digitalearthafrica4021
- Email address info@digitalearthafrica.org

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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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