March 2021

Digital Earth
AFRICA

2020 Annual Report

About this Report

This Annual Report covers the period 1 January 2020 to 31 December 2020. The Annual Report, and Score Card (Annex I) have been prepared by the DE Africa Establishment Team for the Digital Earth Africa Governing Board, Technical Advisory Committee, Stakeholder Community Group, funding partners, and other stakeholders. It provides a summary of progress made through 2020 highlighting key achievements, and an overview of key challenges, and future priorities. The report has been informed and shaped by inputs from across the DE Africa Establishment Team - through December 2020, the team took part in a series of rapid reflect and progress review workshops, which allowed for sharing of information and reflections across the different (technical, capacity, and management) units within the team.

Version Date	*4th March 2021*	*Endorsed by the DE Africa Technical Advisory Committee*

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Cover image credit: Bazaruto Archipelago, Mozambique. Contains modified Copernicus Sentinel data 2020, processed by Digital Earth Africa.

Foreword

A message from Adam Lewis, Managing Director, Digital Earth Africa Establishment Team

2020, our second year in the establishment of Digital Earth Africa, has truly been a year like no other. While our stakeholders and partners around the world have been faced with immense challenges, they have also demonstrated incredible resilience, working together to contribute towards the ongoing growth and success of Digital Earth Africa. On behalf of the Establishment Team, I would like to extend my thanks to our partners and the entire Digital Earth Africa community for their important contribution.

The COVID-19 pandemic caused us some setbacks. We could not hold face-to-face meetings and consequently we have experienced delays in securing institutional hosting arrangements and a loss of networking opportunities. Perhaps even more importantly, it has slowed the development of personal relationships and networks that come only through in-person meetings.

Despite the great challenges of 2020, we have made very significant progress across all aspects of the program. Overall DE Africa remains on track, our vision and mission are unchanged, we are progressing well toward our goals and our community and partnerships have grown in breadth and depth.

In 2020, Digital Earth Africa has made great steps towards delivering a free and open data infrastructure for Africa. Our work is democratising the ability to analyse satellite data, allowing for better-informed decision-making across the continent. We are excited about the progress made in delivering technical infrastructure; products and services for food security and access to water; outreach and engagement initiatives; and the start of a capacity development program to increase uptake across Africa.

The New Year will see the Digital Earth Africa Establishing Team increasing its strategic emphasis on the transition of capabilities and functions to Africa and sustainment, in terms of governance, management and resources. We will also aim to “grow the ecosystem of users”, which means continuing to deliver Earth observation products that meet development needs and supporting application to real world development challenges.

We are proud of the achievements made this year and look forward to what 2021 will bring. We look forward to a safe and productive year where we work together to continue to build a sustainable and operational platform for the African continent.

Best regards

Dr Adam Lewis, PSM, GAICD
Managing Director, Digital Earth Africa Establishment Team

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Executive Summary

Digital Earth Africa (DE Africa) is establishing, for the first time, a continental scale, free and accessible Earth observation platform to support more effective and efficient decision making for sustainable development. Through 2020 DE Africa has made significant progress in establishing a truly continental Earth observation program that brings together stakeholders around a free and open data infrastructure. The DE platform now provides a range of data and products to help address pressing natural resource management and development challenges, including in relation to water and food security. Partnerships and capacity support are driving increased uptake across Africa. For the beginning, DE Africa has been driven by the collaboration of dedicated Earth observation and development professionals and has now become the world's largest Open Data Cube, providing free and open-source data and products for the entire African continent.

With support from The Helmsley Charitable Trust and the Australian Government Department of Foreign Affairs and Trade, since March 2019 DE Africa Phase II (2019-2022) has made significant progress towards establishing DE Africa as a sustainable Africa-based and managed operational data platform for decision-making. 2020 has been a period of accelerated delivery and progress towards the end-of-establishment-phase outcomes. This is despite the significant challenges presented throughout the year, including the COVID-19 pandemic which restricted opportunities for engagement.

In 2020:

We have established an Africa-based technical infrastructure, continental scale and real time data sets, and decision ready products. In collaboration with Amazon Web Services (AWS) Sustainability Data Initiative, DE Africa established the infrastructure to store and process data at the AWS Africa (Cape Town) Region, enabling a secure, stable and high performing platform for African users. We have established the first continuously updated analysis-ready data sets for all of Africa, accessing data from the Sentinel-2 satellite constellation, with Sentinel-1 and Landsat soon to follow. We have delivered continental scale, quality assured and locally validated data products that support planning and decision making on water management and food security. A continental scale 10 m resolution cloud free image-product will follow early in 2021. The processing required to produce this image is in the order of 100 times that needed to produce the first Earth Observation data cube products in Australia in 2013, making it a significant technical achievement in its own right (Figure 1).

We are building stakeholder buy-in and growing our user community by implementing targeted engagement and capacity support initiatives that address priority development challenges across the continent. The World Economic Forum analysis released in early 2021 "Unlocking the potential of Earth Observation to address Africa's critical challenges" has found that the potential economic value of DE Africa products could be up to $2 billion (USD) a year from 2024. We are working with our base of technical users to make this potential a reality through the development of products to address development priorities across agriculture and food security, water and flood risk (water extent and quality), land degradation and coastline management (coastal erosion, mangrove monitoring and intertidal bathymetry) and urban planning.

We raised the profile of the Program in the Earth observation community, and strengthened and formed new partnerships and collaborations with national, regional and international stakeholders. During 2020 we formed a range of technical, capacity support and delivery partnerships that will facilitate delivery and use of the DE Africa platform. Active participation in

international Earth observation forums has connected us with global initiatives. A highly collaborative approach between DE Africa and our regional and national stakeholders is building buy-in and ownership at the early product development phase, establishing the foundation for ongoing inter-regional collaboration. We have worked to extend the reach of our key communication messages, encouraging engagement and uptake with the Program.

We built institutional foundations to underpin transition of DE Africa to an Africa-based and managed entity. This included convening three Technical Advisory Committee (TAC) meetings; recruitment of the first Africa-based technical staff; endorsement of key program strategies; and progressing institutional hosting arrangements while pivoting to a distributed operational model that regionalises DE Africa, spreading and deepening leadership and commitment across several regional implementing-partner organisations. This model enables growth while staying close to the issues, needs and priorities within sub-regions and countries. The groundwork done and progress made in 2020 positions the program to accelerate delivery and outcomes through 2021 and the remainder of the DE Africa establishment phase.

***Figure 1** - A cloud-free image of all of Africa produced by combining tens of thousands of satellite images collected throughout an entire year. The new AWS data centre in Cape Town stores millions of images, making these new products possible.*

DIGITAL EARTH AFRICA 2020 AT A GLANCE

TECHNICAL INFRASTRUCTURE, PRODUCTS AND SERVICES

DATA STORAGE ESTABLISHED AT AWS AFRICA (CAPE TOWN) REGION

OVER 2 PETABYTES

STORAGE CAPACITY AND PROCESSING CAPABILITY

THE FIRST CONTINENTAL SCALE DATASETS AVAILABLE

LARGEST OPERATIONAL PLATFORM OF ITS KIND IN THE WORLD

- ✓ Made accessible through the multi-access DE Africa Platform
- ✓ Sentinel 2 satellite continental coverage routinely updated to cloud optimized format

FIRST CONTINENTAL DECISION READY PRODUCTS

WATER OBSERVATIONS FROM SPACE

ALLOWS AFRICAN COUNTRIES TO MAP AND UNDERSTAND WATER AVAILABILITY & TRENDS OVER TIME

- ✓ First product of its kind for Africa
- ✓ Locally validated with partners

The "Cropland Map Product" will help address food security, the team are on track to produce a Beta product in early 2021.

GROWING DEMAND AND UPTAKE

POTENTIAL ECONOMIC BENEFITS BY THE NUMBERS

$2.3BN

Even under conservative assumptions the potential economic benefits of DE Africa could exceed USD 2 billion a year by 2024

$500M	$900M	$900M
EO industry accelerated growth	Agricultural productivity boost	Unregulated gold mining detection and prevention

USER APPLICATIONS SUPPORTING SDGS

A GROWING PORTFOLIO OF USE CASES ARE BEING DEVELOPED IN THE NOTEBOOK REPOSITORY TO SUPPORT SDGS

USER ENGAGEMENT AND TRAINING

45 **ADVANCED** USER TRAINING PARTICIPANTS

21 **AWARDED** COMPLETION CERTIFICATES

>300 **REGISTERED USERS** IN SANDBOX

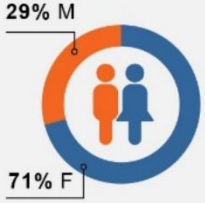
PARTNERSHIPS AND OUTREACH

ESTABLISHED OVER 17

TECHNICAL, **STRATEGIC** AND **DELIVERY** PARTNERSHIPS WITH NATIONAL, REGIONAL, AND INTERNATIONAL ORGANISATIONS.

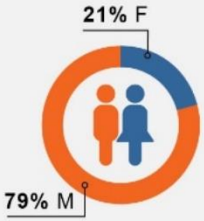
INSTITUTIONAL FOUNDATIONS

THE GOVERNANCE FRAMEWORK IS ESTABLISHED AND THE GOVERNANCE MEMBERS IDENTIFIED



GB

57% of Governance Board members are from African countries



TAC

12 African countries are represented on the Technical Advisory Committee

1060

SCG

1060 participants in the Stakeholder Community Group

About Digital Earth Africa

Digital Earth Africa (DE Africa) aims to improve the lives of Africans by providing planners and policy makers with crucial Earth observation information to support better decision making, and through enhanced access to satellite data to progress sustainable development outcomes.

DE Africa Vision: To 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.

***Figure 2** - DE Africa's Guiding Principles are a fundamental part of the program's governance framework, and continue to inform program planning, strategy, and delivery.*

DE Africa Mission: To process openly accessible and freely available data to produce decision-ready products. Working closely with the AfriGEO community, DE Africa will be responsive to the information needs, challenges, and priorities of the African continent. DE Africa will leverage and build on existing capacity to enable the use of Earth observations to address key challenges across the continent.

The long-term **DE Africa Goal** is: **DE Africa improves the lives of Africans through access to tailored information for decision making**. This encompasses:

- **Livelihood strengthening –** Earth observation (EO) data will support more informed decision making at government, sectoral and other levels, contributing to direct and indirect benefits for individuals and communities.
- **Development effectiveness –** DE Africa will support enhanced understanding of development challenges and solutions, and in so doing, strengthen collective impact and ability to assess progress towards national priorities, Agenda2063 and the Sustainable Development Goals.
- **Digital transformation –** through industry uptake and innovations, DE Africa will help fuel ongoing evolution of the digital economy in Africa.
- **Economic development and job creation** – through access to data for commercial products and services development, DE Africa will support new business development and employment opportunities.

The DE Africa (Phase II) Results Framework establishes three End of Phase (II) Outcomes (EOPOs), and corresponding Indicators and Milestones against which planning, monitoring and reporting processes are aligned. The DE Africa 2020 Scorecard (Annex I) provides a summary of progress against individual Outcomes, Milestones, and Indicators.

***Figure 3** - DE Africa Results Framework - End of Phase II Outcomes*

Technical Infrastructure, Products and Services

DE Africa is establishing a sustainable, Africa-based platform that delivers high-quality, free and relevant Earth observation data and products.

In 2020 DE Africa:

- Established the infrastructure to process and store data at AWS Africa (Cape Town) Region, enabling a more secure, stable and better performing platform for African users, in collaboration with the Amazon Sustainability Data Initiative.
- Progressed implementation of the DE Africa Technical Road Map by establishing its first free and open, analysis ready, continuously updated satellite dataset for all of Africa, accessing data from Sentinel-2 satellites. Sentinel-1 and Landsat datasets are on track to follow early 2021.
- Significant progress has been made in the development of continental scale, quality assured and locally validated data products that support planning and decision making around water management (Water Observations from Space), food security (Cropland Map) and a cloud-free, 10 metre resolution image of all of Africa (Geomedian). Products are being co-developed with representatives from 5 African organisations.
- Made products and services available through a range of DE Africa platform interfaces ensuring ease of access to a diverse range of users, from those with no technical expertise, to highly qualified systems developers with the ability to create and share their own products.

Africa-based infrastructure

In 2020 DE Africa established the infrastructure to enable reliable and faster access to EO data and products. Working with Amazon Web Services (AWS) and the Amazon Sustainability Data Initiative (‘a tech for good program’), DE Africa is now supported and delivered through secure cloud-based technologies, as part of a flexible, scalable and secure global cloud infrastructure. Recognising the value of DE Africa, AWS has provided access to the Cape Town AWS Region, as an in-kind contribution to the project. This includes over 2 petabytes of storage and processing capacity.

With data centres located in Africa, the infrastructure will provide for a secure, stable and better performing DE Africa based on infrastructure that is physically on the African continent. This arrangement also provides potential to leverage advanced AWS technologies to help drive innovation. This is a major milestone towards a sustainable and reputable DE Africa platform. (Read more here).

Continental scale, real-time, analysis ready datasets

In 2020 Digital Earth Africa progressed implementation of the Technical Roadmap by establishing its first-ever, continuously updated satellite datasets at the continental scale for Africa.

- DE Africa has processed millions of scenes derived from the European Space Agency (ESA) Sentinel-2 satellites**.** The dataset is now routinely updated to a cloud optimized format, so anyone across Africa can use it to actively monitor changes to the landscape and environment and undertake analysis to help manage food and water resources. Images captured by Sentinel-2 satellites are available at a high resolution of ten metres and captured every five days.
- For the first time in Africa, DE Africa is on track to routinely process Copernicus Sentinel-1 **radar backscatter data** for the entire continent by early 2021. Radar satellite imagery is important for Africa as it is not affected by cloud cover. The dataset spans back to 2017 and will be updated every 12 days, totalling approximately 50,000 scenes every year. (Read more here).

- Work has also progressed towards the routine processing of United States Geological Survey (USGS) 'Collection 2' Landsat data for all of Africa. Landsat Collection 2 is a keystone dataset that provides consistent observations from the mid-1980s. Although DE Africa received a provisional dataset in late 2019, the final release of Collection 2 from USGS was in December 2020. Collection 2 will be available in DE Africa as an operational dataset early in 2021.

Digital Earth Africa is entirely dependent on 'analysis ready data' or ARD – data that has been processed to meet a minimum set of requirements so that users can focus on analysis, rather than data preparation. Through this approach, a larger range of non-specialist users will be able to explore and apply these datasets. The processing and migration of these data sets to the Africa based cloud-based infrastructure has been made possible through collaboration with international partners Sinergise, Element 84 and the Committee on Earth Observation Satellites (CEOS).

Continental scale, locally validated decision ready products

Digital Earth Africa is delivering the first continental scale decision-ready Earth observation products, working with the Africa-based EO community to validate data and build awareness, capacity and ownership.

Water Observations from Space (WOfS) translates years of Landsat satellite imagery into easy to consume information on the presence, location and recurrence of surface water across the African continent. It allows African countries to map, assess and visualise surface water and understand water availability trends over time at a spatial resolution of 30m by 30m. Working with SERVIR – a joint NASA and USAID initiative – DE Africa has made use of the Collect Earth Online (CEO) image viewing and interpretation tool to conduct collaborative and robust validation assessments, providing an effective solution to assess accuracy and validate DE Africa products and services. Further information on the WOfS product is available here.

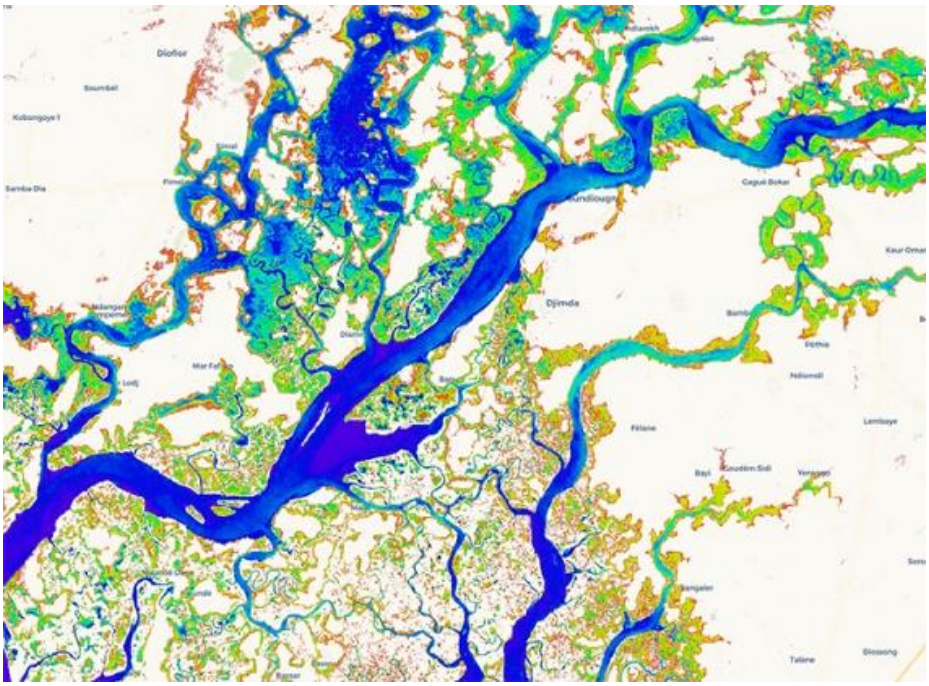


***Figure 4** - WOfS summary for an area in Senegal from 2013 to 2019. Colours indicate the percentage of times water is detected.*

The Cropland Map co-development team has progressed validation work to support development and uptake of a continental Cropland Map. The Cropland Map service will help address food security issues by providing an accurate, high-resolution and regularly updated cropland area map for Africa, which delineates where agriculture is taking place across the landscape. The team are on track to produce a *beta* product ready for use in February-March 2021. Further information on the Cropland Map Product is available here.

Easily accessible platform, web service and applications

DE Africa data and services are accessible through multiple pathways, enabling use by a diverse range of people, from those with no technical expertise, to a highly qualified systems developer who can access live code to create and share their own products. Products are accessible to everyone through the DE Africa platform, web services and applications, including:

- DE Africa Map - a website for map-based access to spatial data providing easy access to DE Africa decision ready data for non-technical users.
- Africa GeoPortal (Esri) - web GIS and geodatabase management application supplying DE Africa data
- DE Africa Sandbox – a cloud-based user computational platform that provides advanced users with access to data and analysis tools, for regional scale analysis.

Other avenues for engagement established include: the Notebook repository; DE Africa Metadata Explorer; Open Geospatial Consortium (OGC) Web Services; a Public Data Bucket and Slack Channel where users can share and collaborate with one another.

In Focus: Collaborative and locally led validation

All continental scale products are being co-developed with African partners, guided by the fit for purpose **DE Africa Validation Strategy.** Partners include the Regional Centre for Mapping of Resources for Development (RCMRD, Kenya); the Group on Earth Observations Global Agricultural Monitoring (GEOGLAM, representative based in Uganda), African Regional Institute for Geospatial Information Science and Technology (AFRIGIST, Nigeria), AGRHYMET (Niger) and the Ghana National Disaster Management Organisation (NADMO).

DE Africa also held its first webinar focused on ‘Continental Data Validation’. The webinar discussion panel consisting of representatives from RCMRD, Observatory Sahara Sahel (OSS), AGRHYMET and AFRIGIST, covered the importance of building confidence in data products and how the first DE Africa continental service, Water Observations from Space (WOfS), can be applied.

There were **94 attendees, with representation from 19 African countries**, and active participation and questions from many.

Growing User Demand and Uptake

DE Africa is building ownership and buy-in though implementation of targeted engagement and capacity support initiatives. A growing community of users are discovering new ways of working together to address priority development challenges across the continent.

In 2020 DE Africa:

- Worked with the World Economic Forum to undertake an analysis of the potential economic value of Digital Earth Africa products (see below).
- Transitioned 45 African Regional Data Cube (ARDC) users from 6 countries to the DE Africa platform following a self-paced six-week training program and successfully decommissioned the ARDC.
- Attracted over 300 registrations in the DE Africa Sandbox – the technical and collaborative user platform and workspace that allows new applications to be developed.
- Supported the development of Use Cases that apply DE Africa to real world development challenges, including water and food security, illegal mining and urbanisation.

Demonstrating value and real-world application

In 2020 DE Africa collaborated with the World Economic Forum to undertake an analysis of the potential economic value of Digital Earth Africa products. Released in early 2021, the report: *"Unlocking the potential of Earth Observation to address Africa's critical challenges"* provides, for the first time, some quantification of DE Africa's potential impact. It found that even under conservative assumptions, DE Africa could contribute up to USD 2 billion a year from 2024, resulting from:

- A strengthened EO industry. Improved use of EO data could lead to an extra USD 500 million in yearly EO sales along with new job opportunities and increased revenue.
- Boosted agricultural productivity. Better data could potentially be worth an extra USD 900 million a year, thanks to water savings and productivity gains for farmers. It could also contribute to reduced pesticide usage.
- Better regulation of mining activity. Data allows countries to track unregulated mining, providing a potential savings of at least USD 900 million from reduced environmental damage and fiscal evasion.

The modelled potential value of DE Africa is promising, and DE Africa is working to demonstrate real-world application and value to the people of Africa. That is why, in 2020, DE Africa has focused on providing user support to apply DE Africa to address priority monitoring, planning and policy needs.

In Focus: Use Cases Supporting the Sustainable Development Goals

In 2020 the range of real world DE Africa 'Use Cases' has grown. The following are examples of where DE Africa is supporting progress towards the Sustainable Development Goals (SDGs). DE Africa will continue to support and track these and other Use Cases, and over time gather richer information on the real-world benefits and impact of DE Africa.

- The DE Africa Crop Health Monitoring product has been used by **Geo M&E (Kenya)** to provide crop phenology statistics and analysis of agricultural fields to farmers in Africa, with a focus on the impact of severe drought on coffee production. Stella Mutai (Kenya) and the Geo M&E initiative earned a Farming by Satellites Prize in 2020. More here.
- The Crop Health Monitoring product is also being applied by Stephen Korir from **Data Driven Agriculture** to develop advice to small scale farmers and governments regarding crop poaching and harvesting regimes in support of Kenya's Big Four Agenda on food security. More here
- **Big Data Ghana** is integrating DE Africa platform data into their Ghana Agriculture Information Management System, an Online Open Data Platform for Agricultural Sector Data Sharing Initiative for Ghana.
- The Water Observation from Space (WOfS) product is being used by **RCMRD** to monitor water levels of the Turkwel Dam which faces pressures from multiple users (power production, irrigation, tourism and fisheries). A better understanding will support proactive and effective management decisions regarding this vital resource.
- **RCMRD** is also using the DE Africa platform to undertake a rapid assessment of burn scarring from fires around Mount Kenya in 2019. The assessment will be useful for the Kenya Forest Service (KFS), which has responsibility for monitoring forest cover and recovery.
- **The National Disaster Management Organisation (NADMO**) in Ghana is using the WOfS product to create flood hazard maps and aims to integrate WOfS based information to inform disaster risk mapping, planning and decision making.
- DE Africa is supporting **Ghana Environmental Protection Agency (EPA)** to use DE Africa data to test and validate the product prior to using at scale to monitor unregulated mining.
- The DE Africa Coastline Mapping application is being used by the **Centre de Suivi Ecologique (CSE)** to identify unregulated construction in protected ecological coastal zones of Senegal.
- **Ghana Statistical Services (GSS)** tested the use of DE Africa to support the 2017-2019 census. A first assessment of the growth of cities in West Ghana has been performed with the intent to proceed with other cities in 2021. The results were presented during the Africa Statistics Day
- DE Africa has provided support to the **Tanzania National Bureau of Statistics (NBS)** to conduct analysis on the water extent of Lake Sulunga, also known as Bahi Swamp. This will support ongoing monitoring and policy making around management of this water body, which is heavily relied upon for drinking water, fishing, agriculture, livestock farming and salt production. More here. NBS has also conducted an environmental assessment of the Simiyu region using the DE Africa Vegetation Change Monitoring Product
- The **State University of Zanzibar (SUZA)** is now using DE Africa analysis-ready satellite data to produce time series for effective analysis and to provide advice on resilience and protection plans for mangroves in the areas of Chwaka Bay and Makoba Bay. More here.

Growing the user community, training support, and responsive technical assistance

DE Africa has successfully attracted a sizable group of users to its platforms demonstrating demand for technical data and products. This includes over 300 registered Sandbox users, many of whom are actively engaging with DE Africa to analyse data and develop new analytical codes tailored to address specific needs.

User engagement and uptake is also being driven by the DE Africa Establishment Team, which has developed and delivered a range of instructional and training material to support new users engage and work independently on the DE Africa platform. This has also supported users to transition from the Africa Regional Data Cube (ARDC), which covered five countries, to the continental DE Africa Platform, enabling the ARDC to be smoothly decommissioned after two and a half years of successful operation. This transition is a major step forward for providing open access to Earth observations for the entire continent.

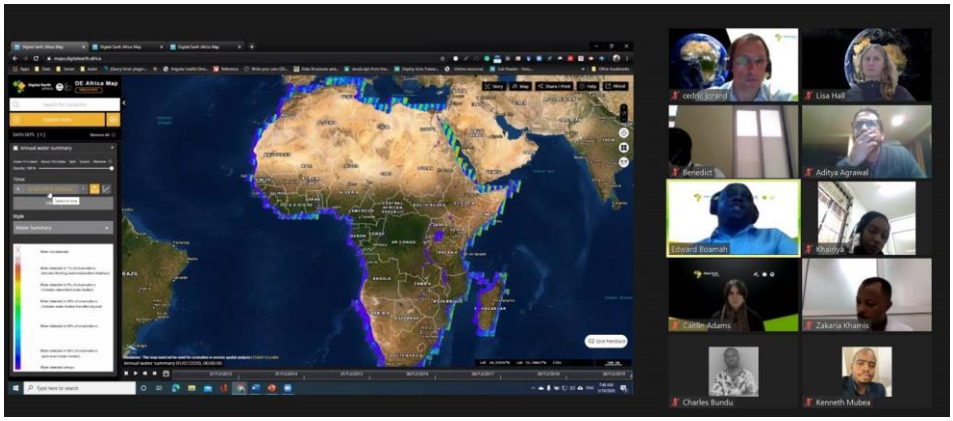


***Figure 5**- DE Africa ARDC virtual transition workshop with Tanzania*

Training and support in 2020 has included:

- Development and delivery of a 6-week self-directed training program to support new users engage effectively with DE Africa data and products, based on input from 45 ARDC Users, who have now undertaken training and fully transitioned from the ARDC to the DE Africa Platform. The training material is available online for all to access, opening the way to a larger scale in-country capacity development program with DE Africa Implementing Partners in Africa.
- Providing weekly 'live sessions' along with tailored user communication and responsive support to active DE Africa platform users; for example via WhatsApp discussion groups. This is supporting user engagement with DE Africa products to address real-world development challenges.

Further, through implementation of the DE Africa Capacity Development Strategy (CDS) DE Africa is progressing efforts to empower key Africa-based partners to effectively engage with and support end-users to access and apply DE Africa products. Collaborating with ITC[2] at the University of Twente, the CDS is applying a *holistic, demand-driven and impact-oriented approach to capacity development*. To date ITC has undertaken a Needs and Capability Assessment of the 6 'Implementing Partners', who will be supported in 2021 to better access and lead on the delivery of technical support to end-users across at least 43 African countries.

[2] ITC is the University of Twente's Faculty of Geo-Information Science and Earth Observation.

In Focus: Gender Equality, Diversity and Social Inclusion

In 2020 DE Africa developed its first Gender Equality, Diversity and Inclusion (GEDSI) Strategy, which gives effect to its Guiding Principle to be an exemplar of diversity and inclusiveness.

The Strategy sets out DE Africa's commitment to ensuring our work advances geographic diversity across the African continent, gender equality, and inclusion of youth and people with disabilities. It outlines the following principles that guide our approach:

- Value diversity and actively involve people from diverse groups and organisations
- Prioritise initiatives that align with DE Africa's strengths and value-add to leverage its organisational expertise
- Collaborate with and support existing initiatives
- Adopt a twin track approach of embedding GEDSI considerations in all our work as well as undertaking targeted activities
- Generate knowledge and learning and share this with partners and across the geospatial science sector.

> 'A diversity and inclusion strategy speaks to nurturing a society that values the contribution of each individual and ensures no one is locked out of opportunities from the start' – Yariwo Kitiyo, Women in GIS Kenya

To put the Strategy into practice, DE Africa is now embedding GEDSI principles within its governance, partnerships, activities and culture to frame how we build skills and knowledge, deliver products and services, and promote diverse leadership. We have begun working with our partners to identify priorities and opportunities to work together to deliver GEDSI outcomes.

In 2020, DE Africa participated in several events to build understanding of how GEDSI outcomes can be advanced through geo-spatial sciences. This included sessions on Gender and Social Inclusion in Climate Data Services and Analyses at the AGU (Advancing Earth and Space Science) fall meeting and Women in Satellite Applications as part of World Space Week. Our blog Harnessing the potential of all people: the benefits of diversity and inclusion featured women leaders in geospatial sciences reflecting on the realities faced by women and diverse groups in the sector and the benefits to be gained through inclusion.

Realising the benefits of working together, DE Africa has begun to establish networks and linkages with groups such as Women in GIS Kenya (@WiGISKe), Women in Science (WiSci), Black Girls Mapp, ZINDI, Women in Geospatial +, Humanitarian OpenStreetMap Team (HOT), Sisters of SAR and Ladies of Landsat, which are inclusive groups that advocate a diversity and inclusiveness message.

Partnerships and Outreach

DE Africa is engaging with international organisations, government agencies, regional bodies, private sector, civil society and development partners to help position Digital Earth Africa as a trusted and valuable partner. We are actively working to align with, inform and leverage opportunities to maximise value and impact.

In 2020 DE Africa:

- Established over 17 technical, strategic and delivery partnerships with national, regional and international organisations.
- Actively raised awareness and profile in the Earth observation community to amplify key communication messages encouraging engagement and uptake. DE Africa has featured in 12 externally authored articles in 2020; established a new blog section on its website to promote articles authored by experts; refreshed our communications network, and maintained an active media coverage and a social media presence for the program.
- DE Africa has participated in over 16 major conferences, events and webinars, has over 2000 Twitter followers, and has had over 9000 unique web views since May 2020.

Enabling Partnerships

The DE Africa Partnership Strategy outlines the high-level approach for mutually beneficial partnerships that help program delivery, amplify benefits and ensure sustainability. It notes that:

"*partnerships will enable DE Africa to deliver as a program; but they will also expand the scale and scope of DE Africa with increased benefits to Africa. Furthermore, partnerships will ensure that DE Africa delivers a platform that will be sustained in Africa for decades to come."*

In 2020, DE Africa consolidated networking, awareness raising and profiling work to date, to strengthen existing relationships and establish new enabling collaborative and coordinating partnerships that will support ongoing delivery and impact, including:

- Growing our status as a Community Activity of the Group on Earth Observations (GEO) including participation on panels in the annual GEO Symposium.
- Working with the Committee on Earth Observation Satellites (CEOS) to guide and support the further development of analysis ready data streams, with DE Africa as an example of their impact.
- Forming formal relationships with six Africa-based Implementing Partners, through which DE Africa will ensure locally led and informed capacity development.
- Strengthening technical partnerships, including those with Amazon Web Services, Esri, Radiant Earth and the NASA 'SERVIR' program, through which DE Africa is benefiting from proven and cutting-edge technology and methodologies, and is contributing as part of the EO community.
- Exploring emerging partnerships with development agencies such as United Nations Development Program (UNDP) and the International Water Management Institute (IWMI), through which Digital Earth Africa products and services will be tailored to complement well established, long-term development initiatives.

The success and growth of DE Africa's partners through 2020 is testament to and a vote of confidence in the relevance, value and future sustainability of Digital Earth Africa. Table 1 below summarises key partnerships established in 2020. Partnerships will continue to grow in 2021 including with down-stream innovators who can leverage DE Africa to create value.

Table 1 *- DE Africa Partnerships – selected key partners.*

Partner	Description
Key African Partners ♦ South African National Space Agency (SANSA) ♦ Centre de Suivi Ecologique (CSE), Senegal ♦ African Regional (AFRIGIST), Nigeria ♦ Observatory Sahara Sahel (OSS), Tunisia ♦ AGRHYMET, Niger ♦ Regional Centre for the Mapping of Resources for Development (RCMRD), Kenya ♦ Rwanda Ministry for ICT and Innovation ♦ Ghana National Statistical Service ♦ Cooi Studios, South Africa ♦ Thunderbird School of Global Management, Kenya ♦ University of Antanonarivo, Madagascar ♦ dLab, Tanzania	These partners provide support across the program from governance and program delivery, through to the uptake and application of our products and services. Many of these partners are not only users of the DE Africa Platform themselves, but through their networks and support for national and sub-national partnerships, allow DE Africa to be accessed and used by a broad range of government and non-government organisations. DE Africa will continue to support these key partners in using and supporting others to use the platform.
International frameworks, Aligned Programs, Technical Enablers and Use Enablers ♦ Group on Earth Observations (GEO) ♦ GMES and Africa ♦ ESRI ♦ Amazon Web Services ♦ United States Geological Survey ♦ NASA-SERVIR ♦ Committee on Earth Observation Satellites ♦ Radiant Earth	Partnerships with technical enablers, use enablers and aligned programs are providing DE Africa with critical expertise, infrastructure and other institutional capabilities to support its establishment and delivery in Africa. GEO provides an international context of coordination to support the better use of Earth observations for sustainability.
Development Coordination Partners ♦ United Nations Economic Commission for Africa ♦ United Nations Development Program ♦ International Water Management Institute ♦ United Nations Convention to Combat Desertification ♦ World Economic Forum	DE Africa is exploring opportunities to work in collaboration with a range of development partners to apply DE Africa to priority development challenges, at scale.

Communications and engagement

In 2020, the Communication Strategy was deployed to support and enable Digital Earth Africa's Program objectives. DE Africa has strengthened engagement with the Earth observation and development community across Africa, enhancing awareness and profile, and creating opportunities for alignment and collaboration. DE Africa is not only raising awareness and actively engaging with the Earth observation and development community, but is positively influencing the growing Earth observation sector and emergence of the digital data driven economy, guided by the DE Africa Alignment Strategy.

During the year, participation in events and dialogues has been a key strategy in raising awareness and profile and identifying opportunities for alignment and collaboration. Media coverage, a new website and a consistent social media presence have been important to building an audience, encouraging engagement, and raising awareness of the Program amongst key stakeholder groups. Digital Earth Africa refreshed the communications partner network, conducting interviews with 10 of our key communications partners to understand the best way to promote the DE Africa program, and how to work together to amplify key communication messages. Based on the feedback received and the goals of the program, we have drafted updates to the Communication Strategy to better leverage the networks of our partners. A new creative concept was also developed including a refined logo and messaging to be more visually engaging and better reflect the DE Africa value proposition to create greater impact.

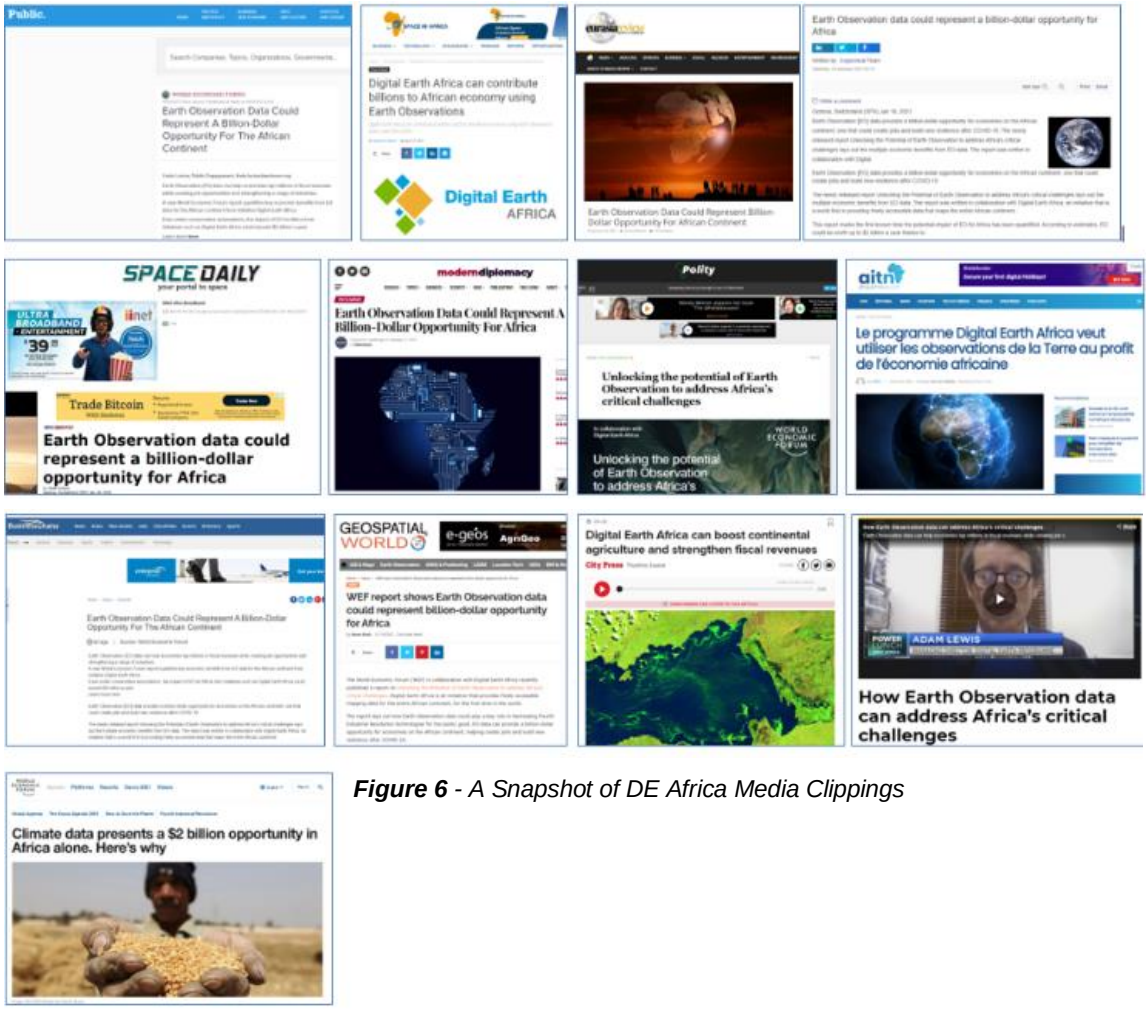


Figure 6 *- A Snapshot of DE Africa Media Clippings*

In Focus: DE Africa Communication Highlights

Webinar

DE Africa held the first of a series of webinars aimed to share latest advances of the Program. It was a great discussion and video is now available online on the DE Africa YouTube channel. The discussion highlighted the value of the DE Africa program, and the importance of connections to other partners, programs and initiatives. We had 193 registrations from over 40 countries, which will increase the DE Africa stakeholder database. We had 85 unique attendees from 30 countries, 18 of which were in Africa.

Website Refresh

The DE Africa website is an important resource for the Program, and in 2020 a site refresh was undertaken to ensure it was practical and easy to use for the Program's audiences. Our goal has been to enhance our public communication about the benefits of the DE Africa program and promote further uptake and engagement with our services. The website features thematic landing pages outlining how DE Africa is supporting Sustainable Development Goals and the African Union's Agenda 2063 framework across the following areas: water resources and flood risks, agriculture and food security, land degradation and coastal erosion, and urbanisation.

AWS Data Announcement

The movement of DE Africa data to the African continent via the newly established AWS presence in Cape Town was a media highlight for the Program, with the announcement in November generating trade interest both in Africa and globally.

World Economic Forum Report

The DE Africa Program was proud to work with the World Economic Forum on the release of its report '*Unlocking the Potential of Earth Observation to address Africa's critical challenges*.' Media engagement around the report resulted in strong interest from African and global trade publications, a broadcast opportunity with CNBC Africa and a blog with the World Economic Forum. The report was also one of the inputs to a session at the WEF 2021 Davos Agenda.

Social Media Highlights

As the message about DE Africa reached new audiences, the Program built an engaged and relevant social media community. From January to December 2020 @DEAFrica Twitter followers increased by over 150%, with regular engagement from government, industry and not-for-profit stakeholders, as well as other members of the geoscience community. The Program also established a LinkedIn page in May 2020, which had gathered over 430 followers by December of the same year.

Institutional Foundations

DE Africa is transitioning to be an Africa-based, owned and managed platform, ensuring effective and sustainable governance, institutional hosting and delivery arrangements. We have adapted to changing circumstances to progress a fit-for purpose 'distributed model' that will enable greater and more inclusive engagement with our key African partners.

In 2020 DE Africa:

- Convened three Technical Advisory Committee meetings to continue to build awareness, buy-in, and Africa-based ownership of the program.
- Developed and endorsed the nine institutional strategies and policies
- Successfully recruited the program's first Africa-based staff, Dr Kenneth Mubea (User Engagement Manager, Kenya) and Edward Boamah (Technical Manager, Ghana), who are facilitating greater contextualised and locally relevant engagement.
- Signed a formal agreement with the Group on Earth Observations (GEO) as an interim trust fund mechanism. The fund will provide ongoing Africa-based human resource and project support for Year III.
- Engaged an independent Africa-based selection panel to undertake a comprehensive review of proposals to host the DE Africa Program Management Office (PMO).

Operationalising the Governance Framework

The Technical Advisory Committee has played a key role in advising on and endorsing key strategies through 2020. The TAC includes 19 Members from across 12 African countries. The DE Africa Governance Framework is currently being updated prior to the inaugural DE Africa Governing Board meeting to reflect the move to a more distributed operational model. The Framework will include board composition, governing principles and accountability.

Building DE Africa strategies and policies

Through 2020 the DE Africa Establishment Team continued the development of institutional strategies and policies that will guide ongoing delivery of the program through Phase II and beyond. Key strategies and policies developed or revised in 2020 include the following:

- Capacity Development Strategy
- Communication Strategy
- Technical Roadmap
- Partnership Strategy
- Alignment Strategy
- Data Validation Strategy
- Gender Equality, Diversity and Social Inclusion Strategy
- Monitoring, Evaluation and Learning Framework

Growing the Africa-based program team

A key objective of Phase II of DE Africa is to establish the institutional and management arrangements that will underpin ongoing delivery of the program through Phase III and beyond. In 2020 key milestones were progressed including the recruitment of the program's first Africa-based staff (Dr Kenneth Mubea-User Engagement Manager, and Edward Boamah-Technical Manager).

Pivoting to a 'distributed operational model'

In 2020 the program progressed establishment of a distributed delivery model whereby overall management will be coordinated through the PMO, and implementation will be channelled through partnerships with key organisations across Africa. The major benefit of such a structure is to distribute ownership of the program throughout Africa, allowing DE Africa to grow while staying close to the issues, needs and priorities within sub-regions and countries. The distributed operation model regionalises the DE Africa Program to better meet the demands of our users.

In 2020 we established MoUs with six Implementing Partners (IPs) who will help build the technical and institutional capabilities of users and provide user support for the DE Africa Platform. These MoUs are being formalised into funding agreements that will see IPs become integral enablers of DE Africa delivery. IPs themselves will be key users of DE Africa, and through their networks across 43 African countries, DE Africa will be made accessible to a broad range of users across the continent.

In 2020 the Establishment Team initiated the PMO selection process, which is being overseen by an independent Africa-based selection panel. The process is due to be finalised in early 2021. DE Africa also established a formal agreement with the Group on Earth Observations (GEO) as an interim trust fund mechanism. The fund will provide ongoing Africa-based human resource and project support.

Figure 7 *- DE Africa TAC Meeting, Pretoria, South Africa, March 2020*

Challenges and Lessons

2020 has been a challenging year for everyone in many ways. Despite the limitations, restrictions and setbacks that have come with the COVID-19 pandemic, DE Africa has shown remarkable flexibility and resilience to continue roll out of the 'establishment' Phase II program. Where we have experienced challenges, the program has adapted and found new ways of working or applied new strategies to deliver outcomes.

For example, progress towards establishing the institutional host has been slower than expected and faced some setbacks. In response we have pivoted our approach and adopted a more flexible dispersed model which facilitates the networks, reach and capacity of regional partners across Africa. In doing so we have opened a broader range of options in securing a Project Management Office, which will be established in 2021.

Travel restrictions have impeded the ongoing process of face-to-face engagement, relationship building and awareness raising, but in 2020 we still successfully:

- held three Technical Advisory Committee Meetings;
- established multi-stakeholder task teams which worked virtually to support validation processes; developed and delivered the 6-week user training, and;
- made use of online platforms (Slack, WhatsApp) to enable collaboration and responsive communication across our users.

Reflecting on 2020, we have gained significant experience and learned lessons along the way:

- Building awareness and professional relationships with and across the African user community is key to growth in uptake and application. Through this establishment phase we need to continue to provide consistent, timely, responsive and clear advice, information and support. Notwithstanding continuing COVID-19 travel restrictions, DE Africa needs to continue to build local networks. Accelerated growth in the Africa-based team will assist with this.
- We need to continue to sharpen our communications about what DE Africa is and how it can benefit the governments, industry and people of Africa. African decision makers want to know how DE Africa is of benefit to the communities they work for – it is incumbent upon the program to define and communicate the potential value and benefits.
- We have proven the technical feasibility of DE Africa and made significant progress in establishing the technical platform, but we must turn focus to growing and better understanding the various applications, impacts and benefits.

Drawing on these lessons, and as we head into 2021, the program is planning, identifying strategic priorities and opportunities, and setting out a roadmap for delivery, which we will capture in the 2021 Annual Plan.

Outlook for 2021

Year three of the Phase II Establishment period will have a strategic focus on “growing the ecosystem of users”, which means continuing to deliver Earth observation products that meet development needs and supporting application to real world development challenges. It also means supporting local networks of users to collaborate and work together to apply DE Africa. Through 2021 there will be a strategic emphasis on the *transition* of capabilities and functions to Africa and *sustainment*, in terms of governance, management and resources.

- A ***transitioned*** DE Africa sees the operational and technical capability and capacity moved to Africa, bringing the distributed model to life. Implementing Partners own and lead the work, governed by the Board, the TAC and the PMO, according to well laid out processes. By 2022, the Geoscience Australia role should be discussed in terms of ‘support’ rather than ‘supply’.
- A ***sustained*** DE Africa has the implicit mandate, the governance systems, high level support from stakeholders, the operational capabilities such as technical pipelines and the funding support to be on-going (beyond the Phase-II funding).

Progressing both transition and sustainment objectives are dependent on ongoing demonstration of impacts and benefits.

The 2021 Annual Plan will be developed with these priorities in mind, and success will be defined by the extent to which we can achieve them. While ambitious, and likely to require ongoing efforts beyond the next 12 months, DE Africa Phase II is committed to delivering this foundation for Phase III and beyond.

Annexes

The following is annexed separately to this report

DE Africa 2020 Score Card