Digital Earth Africa Coastlines: a continental-scale service for monitoring coastline changes around Africa

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Digital Earth Africa
Coastlines: A Continental Coastline Monitoring Service

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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.
Digital Earth Africa’s continental-scale satellite data archive

- 36 years (> 3 petabytes) of Landsat and Sentinel-2 satellite imagery from 1986
- Freely accessible in the cloud via Open Data Cube and AWS S3 + STAC
- Continental scale products and services
- Analysis tools and training materials
- Different interfaces for difference needs
The Context:

Coasts serve as major socio-economic hubs for 38 African countries:

- Africa’s coastal areas host half of the 15 African megacities which are fast expanding due to rural-urban migration and population growth
- The African blue economy is expected to be worth $405 billion and employ more than 57 million people by 2030
- Coastal communities and the blue economy are vulnerable to the impacts of climate change
The Issues:

Rising sea levels and rates of coastal erosion represent a pressing threat for African coastal communities, real estate, agriculture and aquaculture:

- Coastal erosion has a severe impact on African land and buildings with estimated losses of $8 billion per year
- Coastal erosion has consequences for fish populations, marine ecosystems and local communities

Effective management of coastal changes and mitigation of risk, as well as sustainable coastal zone management, rely on consistent and regularly updated data across the continent
Monitoring coastlines is challenging:

- Dynamic - constantly changing with hazardous conditions
- Intensive coastal monitoring expensive and impractical at scale
- Usually restricted to well studied local sites and populated areas

Freely available satellite image archives can offer a powerful and cost-effective tool for monitoring coastlines at regional and national scales
Digital Earth Australia Coastlines: A Coastline Monitoring Service

- Based on Australian innovation @ Geoscience Australia - Open Data Cube
- First Continent-wide Coastlines monitoring service
- Based on historical satellite imagery – Landsat
- Includes tidal modelling
- Accurate down to 10m
- Track continental changes since 1988, updated annually
- Monitors more than 33,000 km of coast
- Used by industry and local councils

Hotspots and rate of changes - Cervantes, Western Australia
State of Knowledge: EO Studies covering Africa

- **Sandy Beach Evolution Around Seaports** (Wiebe de Boer et al. 2019) ports only, Google Earth Engine
- **Maghreb, Tunisia and Morocco** - National Oceanography Center (Marines resource, ESA, World Bank, 2020), unvalidated, no tide modelling - Google Earth Engine
Digital Earth Africa Coastline Monitoring Service
Digital Earth Africa Coastlines

- Improved version of the Australian Coastlines
- Co-developed and validated with implementing partners in Africa
- First Africa-wide Coastlines monitoring service
- Tracks continental changes from 2000 to present
- Monitor more than 60,000 km of coast
- Provides free interactive access to
  - Hotspots
  - Rates of changes
  - Average yearly shorelines
Coastlines Validation:

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View it on the Maps  https://maps.digitalearth.africa/
Identify hot spots and rates of change

Mangrove dynamics in Mozambique

200 meters of shoreline retreat, Madagascar
Understand uncertainties, identify impacts

Impact of man-made infrastructure in Nigeria
Integrate and Redistribute the Data

• WMS and WFS links allows direct integration in QGIS, ArcGIS or any OGC Web Service compatible platform

• No commercial license, free for all users, including Industry to create own Services

• Training tools are available to understand better the methods used and also to tailor the outputs to your need
The Benefits – Economic Valuation

By mitigating coastal erosion risks in 3 key sectors, Digital Earth Africa could inject ~$460 million per year into Africa’s economy and change the lives of ~270 million people.

- **Real Estate & Agriculture**: $101 million
  - of asset value (land & buildings) saved per year

- **Fishery**: $185 million
  - the potential benefits per year by alleviating the loss of fish catches

- **Insurance**: $176 million
  - per year in additional profits & jobs for the insurance industry

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• Access the data: https://maps.digitalearth.africa/
• View the documentation: https://docs.digitalearthafrica.org
• Let us know what you are doing with the data info@digitalearthafrica.org
• Join our live sessions! 11am (GMT Zero time) https://us02web.zoom.us/j/5890793425
  • 2 Nov 2022 Joseph Tuyishimire French
  • 9 Nov 2022 Kenneth Mubea English
• Visit our booth at GEO WEEK (next week)
• Go to the helpdesk https://helpdesk.digitalearthafrica.org if you have any questions

Training modules will be available soon on the Digital Earth Africa learning platform
Authors & Acknowledgements

**Authors**: Dr Lisa-Maria Rebelo, Dr Robbi Bishop-Taylor, Dr Cedric Jorand, Joseph Tuyishimire, Edward Boamah, Mamadou Lamine Ndiaye, Dr Moussa Sall, Dr Amadou Sall, Victoria Neema, Ndye Fatou Sane, Lissong Diop, David Ongo, Rose Waswa, Dr Lisa Hall, Dr Fang Yuan, Dr Stephen Sagar, Dr Adam Lewis

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Thank You.
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