Innovations in Geospatial Technologies for Achieving Sustainable Development Goals in Africa

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G&A: An Innovative EO initiative for the African Sustainable Development
CONTEXT & CHALLENGES
The second-largest continent

- 6% of world
- 20% of world emerged land
- 55 countries covering 30,415,873 km²

The second most populous continent (2016)

- An estimated population of 1.216 billion people
- 17.44% of World Population
- A population that doubled in size over the course of 27 years

The AFRICA WE WANT is in Africans’ hands

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THE AFRICAN DEVELOPMENT CHALLENGES

AGENDA 2063: THE AFRICA WE WANT

INTEGRATED – PROSPEROUS and PEACEFUL AFRICA

Africa Economic Pillars

- Agriculture, Natural Resources and Water
- Energy
- Blue Economy
- Digital Infrastructure

Agenda 2063: Multifaceted

Infrastructure

- Climate change and variability
- Disaster Risk Reduction
- Post-2015 on Sustainable Development

Global challenges

- Impressive Economic growth: the aggregate GDP of the continent has doubled in the last 10 years, to over USD 2.2 trillion.
- Increase of democracy level (number of countries and quality)
- Societal: Mass movements (migration), Population growth, and growing youth population (60% under 30 year-age)

Characteristics of the Challenges

- Interlinked
- Transcend national boundaries
- Cannot be addressed by government single handedly
2063: THE AFRICA WE WANT

Objectives

1. A High standard of Living, quality of life and well being for all citizens
2. Well Educated Citizens and Skills revolution underpinned by Science, Technology and Innovation
3. Healthy and well nourished citizens
4. Transformed economies
5. Modern Agriculture for increased productivity and production
6. Blue/ocean economy for accelerated economic growth
7. Environmentally sustainable and climate resilient economies and communities
8. Zero Hunger
9. Good Health and Well being
10. Decent Work and Economic Growth

Priority areas

- Incomes, jobs and decent work
- Poverty, inequality and hunger
- Modern and livable habitats, and basic quality services
- Education and STI skills driven revolution
- Health and nutrition
- Sustainable and inclusive economic growth
- STI driven manufacturing
- Industrialization and Value addition
- Economic diversification and Resilience
- Agriculture Productivity and Production
- Marine resources and Energy
- Ports operations and Marine Transports
- Bio-diversity, conservation and sustainable natural resource management
- Water security
- Climate resilience and natural disasters preparedness and prevention
- Communication and Infrastructure Connectivity

Populous version
TOWARDS AN INNOVATIVE OPERATIONAL AFRICAN OUTER SPACE PROGRAM
AFRICAN SPACE AND DIGITAL CHALLENGES

- WORLDWIDE WEAKEST CONNECTIVITY
- WEAKEST EXISTING DIGITAL INFRASTRUCTURES
- HUMAN CAPITAL DEVELOPMENT

LOW OR LACK OF INVESTMENT AND FUNDING
The Oslo Manual defines four types of innovation:

**Governance / Organisational innovation**
A new organisational method in business practices, workplace organisation or external relations.

**Process innovation**
A new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.

**Service and Product innovation**
A good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics.

**Marketing innovation**
A new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.

https://www.oecd.org/site/innovationstrategy/defininginnovation.htm
REAL EMERGING OPPORTUNITIES FOR INNOVATION IN EARTH OBSERVATION ARENA
GROWING INTERNET CULTURE

MOBILE TECHNOLOGIES
• The number of Sentinel-2 L1C (Standard products) tiles over Africa (including Madagascar) are almost 24000 tiles per month
• The average size of a S2 L1C tile is about 600MB
• The average size of the S2 L1C tiles covering Africa is **14.4 TB per month**
INCREASING AVAILABILITY OF DIGITAL EARTH DATA & SERVICES
HISTORICAL CHANGE IN SPACE BUSINESS

Old Space
- Expensive rockets (over 100m USD per launch)
- Expensive satellites (over 250m USD each) and heavy (2 Tones)
- Satellites that took 5 to 10 years to develop
- Driven by government spending, both civilian and military.

Result
- Handful and rich nations could afford to go into space

New Space
- Satellites that can be developed in less than 2 years
  - Cost less than a house and light (500 kg)
  - Can be deployed as constellations
  - Driven by commercial investments.

2005
GROWING DIGITAL EARTH AND RELATED S&T

The grow of Spatial data Infrastructure (SDI)

The grow and improvement of Geo browsers (Google Earth, NASA's world wind, etc.)

The expansion of sensor networks, measuring Earth surface, hydrological and atmospheric phenomena, etc

The rapidly growing volume of social and scientific georeferenced user-generated content, and also of articles

The facilitation and promotion of the use of georeferenced information from multiple sources over the Internet

In 1997, THE UNITED NATIONS INTERNATIONAL TELECOMMUNICATIONS UNION (ITU), opened nearly 7 ghz of spectrum globally to connect the world through non-geostationary satellite systems.

The ONEWEB SATELLITE CONSTELLATION is a proposed satellite internet constellation of approximately 882 SATELLITES EXPECTED TO PROVIDE GLOBAL INTERNET BROADBAND SERVICE TO INDIVIDUAL CONSUMERS AS EARLY AS 2019.

STARLINK (SPACE X) is a satellite constellation development project, to develop a LOW-COST, HIGH-PERFORMANCE SATELLITE BUS AND REQUISITE CUSTOMER GROUND TRANSCEIVERS TO IMPLEMENT A NEW SPACE-BASED INTERNET COMMUNICATION SYSTEM. It will launch 4425 mini-satellites in low orbit by 2024 to supply the planet with very high speed Internet (1Gb/s per user).

The SWISS ASTROCAST wants to deploy 64 MICROSATELLITES IN LOW ORBIT TO COVER INHABITED AREAS where the objects (could be weather stations) of the "Internet of Things" will be not connected to dedicated networks.

DATACUBE, an Open Source Geospatial Data Management and Analysis Software project that helps you harness the power of Satellite data.

CUBESAT a type of miniaturized satellite for space research.

CHINA SATELLITES CONSTELLATIONS IN EO AND NAVIGATION & POSITIONNING

African internet connectivity and data access and sharing issues will be fixed with new space technologies.
GMES & AFRICA

AN INNOVATIVE EARTH OBSERVATION INITIATIVE FOR THE AFRICAN SUSTAINABLE DEVELOPMENT
GOVERNANCE

Modus Operandi of GMES & Africa

• Policy Coordination and Advisory Committee:
  ✓ AUC – RECs (Members)
  ✓ UN – EUROPEAN PARTNERS (Observers)

• African Union Commission is the Delegated Authority

• Technical Assistance Team

• Grants allocated to Consortia made up of at least five (5) African institutions including 1 academia sector from 5 different countries:
  o 20% of the grant should be reserved to contract out services with private sector
  o 10% of the grant goes to Academia for training, development of curricula and support to graduate students
  o Co-funding up to 20% is required by Consortia
STAKEHOLDERS, MECHANISMS OF IMPLEMENTATION

AFRICAN UNION COMMISSION
HUMAN RESOURCES SCIENCES & TECHNOLOGIES
GMES & AFRICA SUPPORT PROGRAMME

13 CONSORTIA
- 122 INSTITUTIONS
- 45 AFRICAN COUNTRIES
- 6 EUROPEAN COUNTRIES

DATA & INFRASTRUCTURES
PRODUCTS & SERVICES
GEOPORTALS
COMMUNICATION & AWARENESS RAISING
TRAINING & CAPACITY BUILDING

REGIONAL - NATIONAL - LOCAL IMPLEMENTATION

OVERALL MANAGEMENT

GMES AND AFRICA
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African Union Co-funded by the European Union
13 CONSORTIA

NORTHERN AFRICA
- OSS-Tunisia
- NARSS-Egypt

WESTERN AFRICA
- CSE-Senegal
- UoG-Ghana
- CSSTE-Nigeria

CENTRAL AFRICA
- AGEOS-Gabon
- CICOS-Democratic Rep. Of Congo

SOUTHERN AFRICA
- CSIR-South Africa
- SADC-Botswana
- SASSCAL Namibia

EASTERN AFRICA & SOUTH WEST OF INDIAN OCEAN
- ICPAC-Kenya
- MOI-Mauritius
- RCMRD-Kenya
INFRASTRUCTURE: THE G&A E-STATION

THREE POSSIBLE CONFIGURATIONS

- As part of MESA/G&A Station
  - 3 PCs + antenna for EUMETCast Africa
  - Data coming from EUMETCast (+ INTERNET – when available)
  - OS is Linux (CENTOS 6.6)

- ‘Windows version’ or ‘Stand-alone’
  - 1 PC/Laptop (no antenna)
  - Data synchronized from a Server
  - OS is MS Windows 8 or 10

- Other options
  - Linux VM in Windows environment
  - Installation on a single PC (rather than 2 PCs)
LEADING FACTORS FOR INNOVATIONS IN GMES & AFRICA SERVICES DEVELOPMENT
G&A SERVICES DEVELOPMENT: User pull approach, not a technology push approach

Users’ Survey and engagement

Tailored services

Needs

Key indicators

Modelling

Data

Acquisition of Space data and In-situ measurements

Source GFCS: http://www.wmo.int/gfcs/what-are-climate-services
Marine and Coastal Applications

- Monitoring and Forecasting of physical and biological oceanography variables
- Fishing Zones Monitoring and Protection
- Aquaculture Site Monitoring and Protection
- Coastal Vulnerability
- Coastal Ecosystems Mapping, Monitoring, and Assessment
- Ship Traffic Monitoring
- Oil Spills Monitoring and Warning
- 3 days Marine Weather Forecast
- Regional Marine Weather Forecast

Marine & Coastal Resources

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FISHING ZONES MONITORING AND PROTECTION
AQUACULTURE SITES MONITORING AND PROTECTION
COASTAL ECOSYSTEMS MAPPING MONITORING AND ASSESSMENT
OIL SPILLS MONITORING AND WARNING
3-DAY MARINE WEATHER FORECAST
12 LAND AND WATER APPLICATIONS
WATER LEVEL FOR FLUVIAL NAVIGABILITY AND HYDROLOGY CYCLE MONITORING AND ASSESSMENT
WETLANDS MONITORING AND ASSESSMENT
WATER ABSTRACTION SURVEILLANCE MONITORING AND ASSESSMENT IN IRRIGATED AREAS
OPEN GEOGRAPHICAL REGIONAL REFERENCE VECTOR DATABASE AND AGRO-ECOLOGICAL ZONINGS
TROPICAL FORESTS
SURVEILLANCE
MONITORING
AND ASSESSMENT
SUCCESS OF GEOSPATIAL AND ALLIED TECHNOLOGIES FOR THE AFRICAN SUSTAINABLE DEVELOPMENT

ONLY ONE CHOICE: THE SHIFT OF PARADIGM

INNOVATING IN POLICY
..... GOVERNANCE ..... PROCESS.... SERVICES....
THANK YOU

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