Innovations in Geospatial Technologies for Achieving **Sustainable Development Goals in Africa**

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Context and Challenges

- **Opportunities**
- Innovations
- **G&A: An Innovative EO** initiative for the African **Sustainable Development**

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CONTEXT & CHALLENGES



AFRICA OUR.... AFRICA

The second-largest continent

6% of world

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

The second most populous continent (2016)

- 17.44% of World Population
- A population that course of 27 years

The AFRICA WE WANT is in Africans' hands

An estimated population of 1.216 billion people doubled in size over the

THE AFRICAN DEVELOPMENT CHALLENGES 5



CHARACTERISTICS OF THE CHALLENGES

Multifaceted

Interlinked

Transcend national *boundaries*

Cannot be addressed by government single handedly

2063: THE AFRICA WE WANT





GOOD HEALTH AND WELL OUALITY EDUCATION 0 DECENT WORK AND ECONOMIC GROWTH CLIMATE ACTIONS LIFE BELOW WATER

SUSTAINABLE GOALS





TOWARDS AN INNOVATIVE **OPERATIONAL AFRICAN OUTER SPACE** PROGRAM

AFRICAN SPACE AND DIGITAL CHALLENGES



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WORLDWIDE WEAKEST CONNECTIVITY

WEAKEST EXISTING DIGITAL INFRASTRUCTURES



LOW OR LACK OF INVESTIMENT AND FUNDING

HUMAN CAPITAL DEVELOPMENT

The Oslo Manual defines four types of innovation 9

Gøvernance / **Ørganisational** 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

pricing

A new marketing method involving significant changes in product design or packaging, product placement, product promotion or

REAL EMERGING OPPORTUNITIES FOR INNOVATION IN EARTH OBSERVATION ARENA

GROWING INTERNET CULTURE

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Source: McKinsey Report of November 2013 entitled "Lions go digital: The Internet's Transformative Potential in Africa"

MOBILE TECHNOLOGIES



EARTH OBSERVATION TRENDS

 The number of Sentinel-2 L1C (Standard products) tiles over Africa (including Madagascar) are almost 24000 tiles per month

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- 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



Sentinel-2 L1C







HISTORICAL CHANGE IN SPACE BUSINESS



 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.

GROWING DIGITAL EARTH AND RELATED S&T 16



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

Ref: Mahdavi-Amiri, A.; Alderson, T.; Samavati, S. (2015). "A Survey of Digital Earth". Computers & Graphics. 53: 95–117

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

NEW SPACE TECHNOLOGIES

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.

In 1997, THE UNITED NATIONS **INTERNATIONAL TELECOMMUNIC ATIONS UNION** (ITU), opened nearly 7 ghz of spectrum globally to connect the world through nongeostationary satellite systems.

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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.

(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 minisatellites in low orbit by 2024 to supply the planet with very high speed Internet (1Gb/s per user)

STARLINK

Geospatial Data Management and **Analysis Software** project that helps you harness the power of Satellite data.

DATACUBE, an Open Source

African internet connectivity and data access and sharing issues will be fixed with new space technologies

CUBESAT a type of miniaturized satellite for space research

CHINA SATELLITES CONSTELLATIONS IN EO AND **NAVIGATION &** POSITIONNING

GMES & AFRICA

AN INNOVATIVE EARTH **OBSERVATION INITIAVE FOR THE AFRICAN SUBSTAINABLE** DEVELOPMENT







GOVERNANCE **Modus Operandi of GMES & Africa**

- Policy Coordination and Advisory Committee:
 - \checkmark 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 ٠ from 5 different countries:
 - 20% of the grant should be reserved to contract out services with private sector Ο
 - 10% of the grant goes to Academia for training, development of curricula and support to graduate students Ο
 - Co-funding up to 20% is required by Consortia



STAKEHOLDERS, MECHANISMS OF IMPLEMENTATION





Co-funded by the European Union

Union





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NORTHERN AFRICA

OSS-Tunisia

Union



Co-funded by the European Union



INFRASTRUCTURE: THE G&A E-STATION

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THREE POSSIBLE CONFIGURATIONS



LEADING FACTORS FOR INNOVATIONS IN GMES & AFRICA SERVICES DEVELOPMENT



G&A SERVICES DEVELOPMENT: User pull approach, not a technology push approach











Fishing Zones Monitoring

Coastal Ecosystems Mapping. Monitoring and Assessment

Oil Spills Monitoring

3 days Marine Weather Forecast









MONITORING AND FORECASTING **OF PHYSICAL AND** BIOLOGICAL OCEANOGRAPHY VARIABLES

















FISHING
ZONES
AND
AND
PROTECTION







SITES MONITORING AND PROTECTION







COASTAL







COASTALECOASTALECOASTALECOASTALMAPPINGMAPPINGMONITORINGANDASSESSMENT













OIL SPILLS MONITORING AND WARNING







3-DAY FORECAST







WATER BALANCE MONITORING





Co-funded by the European Union







WATER LEVEL FOR FLUVIAL NAVIGABILITY AND HYDROLOGY CYCLE MONITORING AND ASSESSMENT





Co-funded by



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RIVERINE FLOODS MONITORING AND ASSESSMENT







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WETLANDS MONITORING AND ASSESSMENT







Co-funded by







WATER ABSTRACTION SURVEILLANCE MONITORING AND ASSESSMENT IN IRRIGATED AREAS













OPEN GEOGRAPHICAL REGIONAL REFERENCE VECTOR DATABASE AND AGRO-ECOLOGICAL ZONINGS







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LAND DEGRADATIC MONITORING AND ASSESSME















NATURAL HABITAT AND ASSESSMENT















TROPICAL FORESTS SURVEILLANCE AND ASSESSMENT









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SEASONAL MONITORING EARLY WARNING AND ASSESSMENT







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SEASONAL MONITORING EARLY WARNING AND ASSESSMENT















CONCLUSION

SUCCESS OF GEOSPATIAL AND ALLIED **TECHNOLOGIES FOR THE AFRICAN SUBSTAINABLE** DEVELOPMENT

ONLY ONE CHOICE: THE SHIFT OF PARADIGM

INNOVATING IN POLICY GOVERNANCE PROCESS.... SERVICES....











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