Holistic Geospatial information Vision for Africa

Andre Nonguierma
Chief, GiSS
Nonguierma@un.org
United Nations Economic Commission for Africa
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Context

- A right decision making requires the gathering and reviewing of up-to-date, cold & hard facts.
- For the facts to be interpreted, understood, and linked to our goals and to our decisions, this needs to bring together data linked with the one thing they have in common: Location (Where)

**Why we need Geospatial Information**

- The Policy Drivers: Global Need for Spatially-Enabled Complex Information
- Everything that happens, happens somewhere over space and time
- 80% of all human decisions involve a “Where?” question
- You cannot count what you cannot locate
- Location affects nearly everything we do in life.

**Geospatial Info. Nexus Issues**

- **Availability**
  - Finding the appropriate information at the required time and at the relevant scale of aggregation.
- **Accessibility**
  - Even where information is available, it may not be easily accessible, either because of the lack of technology or because of associated costs
- **Transformability**
  - There is a general lack of infrastructure capacities for the collection and assessment of data, for their transformation into useful information and for their dissemination.
- **Governance**
  - There is a need for improved coordination among scattered data information, applications & services ecosystems in environment, demographic, social.

**Key Pillars**

- **SDI**: Frameworks with related policies & structures
- **FDS**: Fundamental Geospatial Datasets
- **AFREF**: African Geodetic Reference Frame
- **SALB**: Second Administrative Level Boundaries
- **GeoNyms**: Geographic Names
- **GeoStats**: Locate & Count

**African Holistic Geospatial Information Vision**

- Coordinated approach for cooperative management of geospatial information that adopts common regional standards, frameworks and tools
- Management of global geospatial information to address key global challenges
- A paradigm shift.... From... geospatial information as standalone data collection... to Knowledge generation, sharing and dissemination
- Organize data so that information (spatially enabled) can be produced as and when needed
- Just in time data on demand
- Produce Once, Use Many Times
- Data collected for one purpose or project can be used for other purposes and projects
- Empower users to do as much as possible by themselves

**Way Forward**

- Policy: Institutional mechanisms aligned with rational efforts, while taking into account international perspectives
- Data democracy: Ubiquitous availability of relevant spatial data/information as common goods. Adhering to agreed standards: metadata, data models, encoding, interoperability
- People: High Level Education to empower African youth in geospatial science and technology culture at all education levels (schools, universities)

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**Strengthening governance of geospatial information**

**Meeting urgent development needs**

**Providing a service (Spatial enablement)**

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Countries have expressed a need for better access and capacity for applying geospatial information to national priorities, in relation to national development objectives and the SDGs.

All the required information for regional priorities and agendas would not be complete without the location. They need to be localized.

They all need to answer “where” questions from a regional perspective.
1. Which type of data to produce | 2. What needs to respond to

<table>
<thead>
<tr>
<th>User</th>
<th>Negotiator</th>
<th>Decision Maker</th>
<th>Producer</th>
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</thead>
<tbody>
<tr>
<td>Information</td>
<td>Qualitative</td>
<td>Quantitative</td>
<td>Logistique</td>
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<td>Objective</td>
<td>Strategic</td>
<td>Economic</td>
<td>Action</td>
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<tr>
<td>Nature</td>
<td>Indicative (What)</td>
<td>Estimative (Where)</td>
<td>Mesurable (How)</td>
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<tr>
<td>Timeframe</td>
<td>(Multi) Yearly</td>
<td>Seasonal</td>
<td>Daily</td>
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<tr>
<td>Area</td>
<td>Regional</td>
<td>National</td>
<td>Local</td>
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<tr>
<td>Accuracy</td>
<td>Poor</td>
<td>Average</td>
<td>High</td>
</tr>
<tr>
<td>Usefulness</td>
<td>Negotiation</td>
<td>Discussion</td>
<td>Intervention</td>
</tr>
</tbody>
</table>

- **Availability**: Finding the appropriate information at the required time and at the relevant scale of aggregation.
- **Accessibility**: Even where information is available, it may not be easily accessible, either because of the lack of technology for effective access or because of associated costs.
- **Transformability**: There is a general lack of infrastructure capacities for the collection and assessment of water data, for their transformation into useful information and for their dissemination.
- **Dissimination**: Même lorsque l'information est disponible, elle peut ne pas être facilement accessibles, pour diverses raisons.
Geospatial Information for Sustainable Development (Gi4SD) in Africa
Collective approach in addressing information needs for key global challenges

- Coordinated process that adopts common regional standards, frameworks, and tools
- Addressing key global challenges including sustainable development, climate change, disaster management, peace and security, and environmental stresses
SPACE IN AFRICA | OPPORTUNITIES

Taking advantages of
- Space policies in Africa
- Institutional coordination and arrangements
- Synergistic approaches
- Guiding principles on data, applications and services

### Indigenous Capabilities
New Business Model
African Initiatives and Centres of Excellence (Stellenbosch, Regional Centres, National EOS…)

### Political Support
20%
Political Buy-in
More and more political awareness and engagement

### Constructive Partnership
10%
Enhanced and expanded International Cooperation with emphasis on South-South Cooperation involving Africans, diasporas and partners

### National Efforts
50%
National Programmes
More and more African Initiatives and Centres of Excellence

### Enabling Operational Environments
- Multi-level long term Infrastructures and Networking
- Indigenous Space Capabilities

### Continent Space Governance
Synergism
Constructive partnership

### People Needs
Accessibility of evidence-based information.
Connectivity and data exchange between producers and users
Information, Products & Services Linking global to local

### High-Level Education and Holistic Capacity
Education is essential: Leads to technology adoption, ingestion and use
Basic training: To maintain operational capacity in space applications for technicians, managers, scientists and basic users
High Level Training: Empower African youth in space science and technology culture.
Core African space scientists (pure and applied research)
**SPACE IN AFRICA | ENABLING INFRASTRUCTURES**

### Existence of Operational Centres of Excellence

- **AGRHYMET** – **RECTAS** – **RCMRD** - **RSAU** - **CRASTE**
- African countries developing and acquiring EOS | Algeria, Egypt, Ethiopia, Ghana, Kenya, Morocco, Nigeria, South Africa...

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Data collection, accessibility and integration</th>
<th>Monitoring and Assessment</th>
<th>Inform. Diffusion &amp; Capacity</th>
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</thead>
<tbody>
<tr>
<td>AGRHYMET</td>
<td>Yes</td>
<td>Yes/No</td>
<td>Yes</td>
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<tr>
<td>RCMRD</td>
<td>Yes</td>
<td>Yes/No</td>
<td>Yes</td>
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<tr>
<td>CRTEAN</td>
<td>Yes</td>
<td>Yes/No</td>
<td>Yes</td>
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<tr>
<td>RSAU</td>
<td>No</td>
<td>Yes/No</td>
<td>No</td>
</tr>
</tbody>
</table>
### SPACE IN AFRICA | DATA & PRODUCTS

#### Considerable Purpose-oriented datasets exist
- MSG
- LANDSAT
- QuickBird
- RADAR
- Nations EO

#### Numerous Observing Systems exist
- IKONOS
- QuickBird
- SPIN-2
- SPOT 4, 5
- EROS A1
- Envisat
- Aura/Aqua/Terra
- Grace
- QuikScat
- Sage
- SeaWinds
- TRMM
- Toms-Ei

<table>
<thead>
<tr>
<th>Categories</th>
<th>Types</th>
<th>Operational Examples</th>
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</thead>
<tbody>
<tr>
<td>Raw Data</td>
<td>Satellite image, Aerial Photos, Radar</td>
<td>MSG, LANDSAT, QuickBird, RADAR, Nations EO</td>
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<tr>
<td>Processed Data</td>
<td>Indexes, Time Series</td>
<td>GeonetCast, RFE, Lands</td>
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<tr>
<td>Analysed Data</td>
<td>Quantity, Trends, Forecasts</td>
<td>GMFS, SAF, Global Changes</td>
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</table>
# Space in Africa | Operational Services

<table>
<thead>
<tr>
<th>Domains</th>
<th>Products / Services</th>
<th>Tools / Instruments</th>
<th>Operational Programmes</th>
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<tbody>
<tr>
<td>Water</td>
<td>- Wetlands</td>
<td>MSG, LANDSAT, SPOT-XS</td>
<td>TIGER, AMESD, AQUIDEV</td>
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<tr>
<td></td>
<td>- Surface Water</td>
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<tr>
<td></td>
<td>- Ground Water</td>
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<tr>
<td></td>
<td>- Flooding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate</td>
<td>- Rainfall</td>
<td>MSG, NOAA</td>
<td>AGRHYMET, ACMAD, AMESD, ZAR</td>
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<tr>
<td></td>
<td>- Temperature</td>
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<td></td>
<td>- ETP</td>
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<tr>
<td>Vegetation</td>
<td>- Forest cover</td>
<td>MSG, NOAA, SPOT-VGT, MODIS, LANDSAT, ENVISAT, RADAR, CBERS, IRS</td>
<td>PSRN, GEOLAND, AMESD, ACP/Obs</td>
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<tr>
<td></td>
<td>- Density</td>
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<tr>
<td></td>
<td>- Biomass</td>
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<tr>
<td>Lands</td>
<td>- Land Cover</td>
<td>SPOT-XS, LANDSAT, ENVISAT, RADAR</td>
<td>Africover, LADA, AMESD, GlobCover</td>
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<td>- Soils Types</td>
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<td>Topography</td>
<td>- MNT</td>
<td>ENVISAT, RADAR, SPOT, TOPEX,</td>
<td>AREF, EGNOS</td>
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<tr>
<td></td>
<td>- Slopes</td>
<td></td>
<td></td>
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<td></td>
<td>- Exposition</td>
<td></td>
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<tr>
<td>Security</td>
<td>- Disasters</td>
<td>MSG, ARM, ARMC</td>
<td>UNSPIDER, WFS</td>
</tr>
</tbody>
</table>

**Key Points:**
- Maturity in Developing Core Operational Services
- GMES & Africa Programme
SPACE IN AFRICA | GMES & AFRICA

Courtesy | Meshack {2020)

Raw Data
- Satellite Imagery
- Biophysics
- Socio-Economic

Processed Data
- Land Cover
- DEM

Analyzed Data
- Dynamics & Seasonalities
- Trends

Water & Natural Resources
- Water Resources Monitoring
- Surface Water (Monitoring and Assessment)
- Groundwater (Knowledge Consolidation)
- Geographical Regional Reference Vector Database
- Land Degradation
- Natural Habitat
- Tropical Forest
- Agriculture
- Pastures
- Wildfires

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A streaming service delivering access to Airbus satellite imagery over the whole Africa.

- Fully refreshed within a 12-month period.
- Data enriched by a Digital Elevation Model layer.
- GIS-ready, Ortho-rectified imagery.
A revolutionary cloud-based imagery solutions for Stats and SDG in Africa
- With highest accuracy and quality images available online.
- Hosts most timely satellite imagery of world events.
- Provide image access within hours of acquisition.
- View and downloading privileges to any area of Interest (AOI).
- Designed in such a way you pay on what you use.
- The model enables users to get best value by only paying for what he needs.
- The licensing models vary depending on the demand.

100Pb of Archived Data + daily collect

100PB + 1 billion km² of fresh imagery per year
Space Technology can advance Africa efforts to build:

- Purpose-oriented datasets
- Structured and comprehensive data foundation that would be consistent, comparable and compatible at the local, national, regional, and global levels.
Common Geographies
- Updating and sharing common administrative boundaries

Responding to the SDG
- Building, Holistic, Active, All-inclusive Information
- Enriching statistical data

2020 Round of Censuses
- Fostering geospatially-enabled censuses.
- Building geo-referenced dwelling frames
1. Structural [Frameworks]

- Law | Regulations
- Appropriate data policies

The law is reason. Ensure that data access arrangements observe the highest policy and ethical frameworks.

2. Management [Governance]

- Appropriate technical infrastructure
- Appropriate common tools and standards

Ensure data are fit-for purpose
Develop once, Use many times

3. Collaboration [Partnership]

- Cooperative management of data
- Collective approach in addressing information needs

Explore collaborative solutions in preference to developing national space programmes.
1. Africa is increasingly acquiring capacity to produce, process and use Earth Observation data for sustainable development agenda

2. The World is increasingly developing satellites that are relevant to the African context and mechanisms for timely access (availability, affordability, infrastructure) to the data (historical, current and future).

3. Africa is slowly developing / updating capacity in the engineering and application of space science and technology and the requisite infrastructural capabilities.
The African Action Plan:

**English:**
www.uneca.org/sites/default/files/PublicationFiles/un-ggim_-__geospatial_information_for_sustainabledevelopment_in_africa-20171115.pdf

**French:**
www.uneca.org/sites/default/files/PublicationFiles/geospatial_information_for_sustainabledevelopment_in_africa_fre-20171115.pdf