Developing Spatial Data Infrastructure (SDI) in Africa: A cooperative Geospatial information Management process

United Nations Economic Commission for Africa
ICT and Sciences & Technology Division (ISTD)
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E-Applications Section

IAMOSA – Geneva – 16-18 March 2011
Outlines

- Why Geographies
- Why Spatial Data Infrastructures
- What SDI is about
- Africa’s Vision : ARSDI
- Priorities & Strategies
- Challenges & Conclusions
## Why we need Geographies

### Need for complex Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Food Security</strong></td>
<td>- Land cover, soil, topography, hydrography, rainfall,</td>
</tr>
<tr>
<td></td>
<td>moisture, demographics, infrastructure, yield,</td>
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<tr>
<td></td>
<td>production..</td>
</tr>
<tr>
<td><strong>Water Supply</strong></td>
<td>- Hydrography, topography, aquifers, waterbodies,</td>
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<tr>
<td></td>
<td>land cover, soil types, vegetation, rainfall…</td>
</tr>
<tr>
<td><strong>Resources Management</strong></td>
<td>- Ecosystems, biodiversity, vegetation, land cover,</td>
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<td></td>
<td>soils, water, wetlands, biomass…</td>
</tr>
<tr>
<td><strong>Drought</strong></td>
<td>- Rainfall, temperature, evapo-transpiration, wind,</td>
</tr>
<tr>
<td></td>
<td>aerosols…</td>
</tr>
<tr>
<td><strong>Security and Emergency</strong></td>
<td>- Land cover, soil chemistry, topography, geology, utilities,</td>
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<tr>
<td></td>
<td>settlements, transport infrastructure….</td>
</tr>
<tr>
<td><strong>Health Planning</strong></td>
<td>- Hospitals locations, settlements and demographics,</td>
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<tr>
<td></td>
<td>disease vectors, environmental factors distribution…</td>
</tr>
<tr>
<td><strong>Etc.</strong></td>
<td>- Etc.</td>
</tr>
</tbody>
</table>

- All the information products exemplified would not be complete without the location attribute.
- They need to be localized:
  - Where are the features located?
  - Where are the population involved in an activity, vis-à-vis location of the activity?
  - Who will benefit from an activity or event? Or at risk? Where are they?
  - Where are the markets for the products? The input factors?
  - Where are the infrastructure elements, utilities, etc?
  - What areas are suitable (or unsuitable) for specific activities or events?
  - How do we move (people, products, services) from source to destination?
Why Spatial Data Infrastructures?

- Unlock the hidden potential in the data
  - Arrange for widest possible dissemination of available information

- Produce Once use Many Times
  - Shift from mapping as standalone activity to mapping as component of information management
  - Move beyond single agency needs to community needs: No single agency can satisfy its geographic data needs on its own - Data collected for one purpose can be used for other purposes

- Make information available to decision makers and the community when they need it; where they need it; In a form they can use (almost) immediately
  - Empower users to do as much as possible by themselves
  - Put in place policies, resources and structures
## SDI Africa: National Governance

### 14 Countries with SDI Coordinating Bodies
- Botswana, Burkina, Congo, Liberia, Madagascar, Mali, Namibia, Nigeria, Senegal, South Africa, Sudan, Swaziland, Tanzania, Zambia

### 9 Countries with SDI Committee, Sub-Committees, Working Groups
- Botswana, Burkina, Liberia, Mali, Namibia, Nigeria, South Africa, Swaziland, Tanzania
**SDI Africa : National Implementation**

<table>
<thead>
<tr>
<th>At least 1 Meeting held in a year</th>
<th>Botswana, Burkina, Madagascar, Mali, Namibia, Nigeria, Senegal, South Africa, Sudan, Tanzania</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 Countries with Geographical Names Authority</td>
<td>Botswana, Burkina, Congo, Liberia, Madagascar, Mali, Namibia, Nigeria, Senegal, South Africa, Sudan, Tanzania, Zambia</td>
</tr>
</tbody>
</table>
# SDI Africa: Maps Revision

<table>
<thead>
<tr>
<th>16 Countries with New Mapping Initiatives</th>
<th>Botswana, Burkina, Congo, Lesotho, Liberia, Madagascar, Mali, Namibia, Niger, Nigeria, Senegal, South Africa, Sudan, Swaziland, Tanzania, Zambia</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 Countries with Maps Revision</td>
<td>Botswana, Burkina, Congo, Lesotho, Liberia, Madagascar, Mali, Namibia, Nigeria, Senegal, South Africa, Sudan, Swaziland, Tanzania, Zambia</td>
</tr>
</tbody>
</table>
Let’s Assume we do not have yet…

- … functional “SDIs” in Africa.
  - The technology, policies, standards, human resources, and related activities necessary to acquire, process, distribute, use, maintain, and preserve spatial data

- What should we do?
ARDSI Paradigm

- Adopt cooperative, multi-stakeholder approach to production, management, and dissemination of spatially enabled data: Regional and National level

- Improve regional scale development decision-making

- Ensure that reliable information is easily available for policy, investment, planning, management and monitoring and evaluation purposes at the regional and sub regional scales:
  - Infrastructures, Agriculture, Environment, Health, Biodiversity, etc…
  - They all need to answer “where” questions from a regional perspective
Definition of Fundamental Geospatial Datasets for Africa

<table>
<thead>
<tr>
<th>Data Theme</th>
<th>Data Set</th>
<th>Data Theme</th>
<th>Data Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geodetic Control Network</td>
<td>Geodetic control points</td>
<td>Land management units/areas</td>
<td>Land Parcels/Cadastre</td>
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<tr>
<td></td>
<td>Height datum</td>
<td></td>
<td>Land Tenure</td>
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<tr>
<td></td>
<td>Geoid model</td>
<td></td>
<td>Street Address</td>
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<tr>
<td>Rectified Imagery</td>
<td>Aerial photography</td>
<td></td>
<td>Postal or zip code zones</td>
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<tr>
<td></td>
<td>Satellite imagery</td>
<td></td>
<td>Land use planning zones</td>
</tr>
<tr>
<td>Hypsography</td>
<td>Digital elevation model</td>
<td>Transportation</td>
<td>Roads</td>
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<tr>
<td></td>
<td>Spot heights</td>
<td></td>
<td>Road centrelines</td>
</tr>
<tr>
<td></td>
<td>Bathymetry</td>
<td></td>
<td>Railways</td>
</tr>
<tr>
<td>Hydrography</td>
<td>Coastline</td>
<td>Structures</td>
<td>Airports and ports</td>
</tr>
<tr>
<td></td>
<td>Natural water bodies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boundaries</td>
<td>Governmental units</td>
<td>Utilities and services</td>
<td>Power</td>
</tr>
<tr>
<td></td>
<td>Populated places</td>
<td></td>
<td>Telecommunications</td>
</tr>
<tr>
<td></td>
<td>Enumeration areas</td>
<td>Natural environment</td>
<td></td>
</tr>
<tr>
<td>Geographic names</td>
<td>Place Names</td>
<td></td>
<td>Land cover</td>
</tr>
<tr>
<td></td>
<td>Feature Names</td>
<td></td>
<td>Soils</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Geology</td>
</tr>
</tbody>
</table>
Creation of Regional Databases

- Geospatial databases for regional use
- Infrastructures Development Database (Energy, Transport, Telecommunication…)
- African Climate Policy Development Database
- Agriculture Commodity Value Chain Database
- Disasters and Security Preparedness Database

Trans African Highways
Network of permanent GNSS base stations (CORS) covering the whole continent

At least one in every country

Eventually, everywhere in Africa less than 1000 km from a base station.

Salient Features
- 5 GPS CORS Stations installed in African Sub regions
- 30 GPS Reference Stations to be installed
- On-going inventory of existing and planned GNSS base stations in African countries

http://geoinfo.uneca.org/afref/
Development of Interoperability & Standards: The Harmonized Administrative Boundary

- **Second Administrative Level Boundary (SALB)**
- Produce a comprehensive digital database of Second Administrative Level Boundaries
- Provide a flexible and intuitive coding scheme that can be applied to any country, independently from administrative structure.
  - an international borders template developed by the UN Cartographic Section in order to be able to create a global data set that is cross-boundary
  - an editing protocol in order to insure the comparability between the countries
  - a coding scheme for the identification of each administrative unit through time and space
  - a metadata profile that is associated with the information
  - a validation process of all the information by an official entity (generally the National Mapping Agency).

- [www.salb.org](http://www.salb.org)
## African Status: Infrastructures – Enabling Environment

- **Existence of many Operational Centres of Excellence**
  - AGRHYMET
  - RECTAS
  - RCMRD
  - RSAU
  - CRASTE
  - National Agencies

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Data collection, accessibility and integration</th>
<th>Monitoring and Assessment</th>
<th>Information Diffusion &amp; Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRHYMET</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>RSAU</td>
<td>Yes/No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>CRTEAN</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>RCMRD</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
**Institutional Capacity**

- Partnering Numerous Regional and Continental Bodies
  - AMU
    - ALGERIA, LIBYE, MORROCO, TUNISIA, MAURITANIA
  - ECOWAS
    - BENIN, COTE D’IVOIRE, TOGO
  - UEMOA
    - BURKINA FASO, GUINEA BISSAU, SENEGAL, MALI, NIGER, GUINEA, LIBERIA, NIGERIA, SIERRA LEONE
  - CILSS
    - CHAD
  - ECCAS
    - CAMEROON, CENTR. AFR. REP, GABON, EQUAT. GUINEA, REP. CONGO
  - CEMAC
    - BURUNDI, RWANDA
  - EAC
    - DR CONGO, ANGOLA
  - COMES
    - EGYPT
  - IOC
    - DJIBOUTI, ERITREA, ETHIOPIA, SOUDAN, SOMALIE, KENYA, UGANDA
  - IGAD
    - MAURITIUS, SEYCHELLES, COMOROS, MADAGASCAR
  - SADC
    - BOTSWANA, LESOTHO, SOUTH AFRICA
  - SACU
    - MALAWI, ZAMBIA, ZIMBABWE, NAMIBIA, SWAZILAND

- All maintain geoinformation activities
- Same multiple bodies at national level

www.uneca.org
Geoinformation Governance in Africa

- Institutional Frameworks
  - Objective
    - To put in place a cooperative, multi-stakeholder approach to production, management, and dissemination of spatially enabled data: Regional and National level
  - Committee on Development Information, Science and Technology (2-5 May 2011 in Addis Ababa, Ethiopia)
    - ECA’s parliamentary body to provide technical advice on, and oversight over the information science and technology including Geospatial Science (GSS) and Geospatial Information Technology (GIT).
    - Open to delegates from government and various observers
  - CODIST-Geo Executive Working Groups:
    - Fundamental Datasets, AFREF, Capacity Building, Standards
Networking with Others SDIs….

- United Nations Spatial Data Infrastructure (UNSDI) coordinated by the UN Geographic Information Working Group (UNGIWG)
  - Vision for comprehensive, decentralized geospatial information framework that facilitates decision-making at various levels by enabling access, retrieval and dissemination of geospatial data and services in a rapid and secure way
  - UNSDI initiative recognizes common interests with national, nongovernmental and multilateral development efforts
    - Coordination of activities and services
    - ECA role in coordinating African countries
    - ARSDI therefore overlaps with UNSDI in content and methodology
Strategies and Priorities

- **Strategy**... Indigenous African capabilities
  - Coordinate with other regional bodies a continental vision to foster the development of an indigenous African capability in Geospatial Science and Technology where all the technical capacities are maintained and shared by Africans.

- **Priorities**... African Holistic Geoinformation Vision
  - Build an African Geospatial policy and champion sound research and technology programmes development, where activities will be significantly expanded to cover the fostering of innovation, product and service development, and applications (linking global to local, based on prevailing social, economic and technological realities in the continent)
Contacting Us

- UN Economic Commission for Africa (UNECA)
  - ICT, Science & Technology Division

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  - http://geoinfo.uneca.org/sdiafrica/
  - http://www.uneca.org