Activity 6.3 - Geoscience information infrastructure and management

EGS – OAGS Workshop
Cape Town 8-9.02.2015

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Relevance of the Topic

• A unique archive of Africa-related geoscientific data and information exists in African and European geoscientific organisations.

• Data realises its full potential and value when made accessible (free or at affordable cost), used and disseminated.

• Geological database (quality & scale of maps, ease to access to information, etc.) is an attractiveness criteria for the mining companies [Fraser Institute ranking index].

➢ Availability of reliable information represents an important part of the infrastructure a country has the duty to supply.

➢ Wealth generated by the mineral resources of Africa can financially benefit to prioritise information management at national levels.
Relevance of the topic

Data sets and information systems delivered by national mapping, mineral inventories “Mining Sector Support Programmes” (WB, EC, bilateral cooperation, etc.)

Governance documents for sustainable use of georesources

Relevance of the topic

- Economic aspects
  - Georesource maps
    - e.g. groundwater or mineral resources

- Social acceptance
  - Conflict maps
    - (between different interest groups)
      - e.g. existing / future mining sites vs. other types of land use (agriculture, housing)

- Respect of Environment
  - Vulnerability maps
  - Risk maps
    - e.g. mineral exploitation vs. pollution of aquifer or soil contamination

Maps for sustainable use of georesources

Bearable

Equitable

Viable

EuroGeoSurveys - The Geological Surveys of Europe
Relevance of the topic

Decision making documents: Mineralisation predictive maps

- Advanced methodologies for predictive modelling (neural networks)
  - High resolution mineral predictive map, e.g. gold in NW Ghana

Knowledge synthesis for prospecting and exploration activities for:
- mining companies
- small scale miners

Guidance for local land use planning:
- delineation of preferred prospecting areas
- construction of roads and settlements

[AEGOS Phase 1 case study]
East Senegal: Conflicts between existing **gold mining and other land use** (left), and a predictive map of conflicts between **licensed gold exploration** and other land use (right). [AEGOS Phase 1 case study]
Gap analysis: Geoscience information and management

• Assess human and equipment resources (software, hardware, network) of the OAGS members in view to strengthen and operate national focal points as part of the African network of geoscientific spatial data infrastructures

• Analyse the existing situation of the geoscientific IT equipment, personnel and skills in OAGS member organisations

• Recommend improvements in view to strengthen the facilities and capacities – focus on 8 components:

  - IT infrastructure
  - Existing IT hardware
  - Existing IT software
  - Data architecture
  - Skills adequacy
  - Investment priorities
  - Metadata
  - Publication of data & products
Gap analysis: existing IT infrastructure

- **Servers**
  - 1 to 4, up to 8: 14 surveys
  - 1: 4 surveys

- **Workstations**
  - 15-25 | 40-60 | 200-350
  - Average age: 4 years old

- **Software**
  - DBMS & GIS available

- **IT working environment**
  - High profile: 7 surveys
  - Medium profile: 3 surveys
  - Almost no infrastructure: 2

- **Software**
  - Very well equipped: 7
  - Fairly well equipped: 4
  - Limited range but sufficient: 3
  - Incomplete / no answer: 9

EuroGeoSurveys - The Geological Surveys of Europe
Gap analysis: Data architecture

- Data management is organised in 14 surveys (client-server to standalone)
- 3 surveys implemented publication/remote access to selected data and products through Internet
- Use of web services remains to be developed with interoperability standards

Data input format

- Unstructured data, i.e. document in text format
- Simple structured data
- Text formatted in a markup language
- Database file format DBF
- Database format with standardized connectors
- Raster data
- Georeferenced raster data with geodatabase
- Vector data with geodatabase

Data publication: technologies for data sharing

- Data is provided via internet & web application for free or by free download without secured application
- Data is provided on demand (soft copy)

Data management

- Server-based data storage systems, LAN, computers as front-end devices, some data is published on the internet using web standards
- Server-based data storage systems, LAN, computers as front-end devices, some data is published on the internet, no standards
- Server-based data storage systems, LAN, computers as front-end devices
- Standalone computers, no network (or network without server-based data storage)
Gap analysis: Skills adequacy

- 14 positions: IT professionals, IT-related staff and end users of infra. & data
- From full team of IT and IT-related professional s to IT manager with “6 hats”

<table>
<thead>
<tr>
<th>Position</th>
<th>Skill</th>
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<tr>
<td>IT system manager</td>
<td>Application programming</td>
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<tr>
<td>IT operator</td>
<td>Database administration manager</td>
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<td>IT technical support</td>
<td>Data modelling expert</td>
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<td>IT security expert</td>
<td>Database operator</td>
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<td>Network administration and technical support</td>
<td>GIS Specialist</td>
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<td>Web site manager</td>
<td>3D modelling specialist</td>
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<td>Web site developer</td>
<td>Technician</td>
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Adequacy of IT personnel

- Expertly adequate
- Adequate
- Less adequate
- Not adequate

Availability of internal funds for IT equipment maintenance and/or upgrade + training in the budget

- Available
- Not sufficiently available
- Not available

Availability of external funds for IT equipment maintenance and/or upgrade + training (projects)

- Available
- Not sufficiently available
- Not available
Gap analysis: Investment priorities

• First priorities: **Server and workstation** hardware and software + security
• Significant concern about the **training of new staff** to overcome the turnover after the projects end
• Feedback on the ability to run the statutory activities with the available level of IT equipment and staff: **12/23 surveys are satisfied**
Gap analysis: Access and publication of data & products

- **Primary data, added-value data, maps, reports for decision making**

- **Product: results from statistical/spatial analysis and combination of primary data sets/layers from multiple sources and disciplines**
  - **Standard**: based on best practices; can be reproduced with flexibility
  - **Specific**: end-user request; output of case-specific processing of primary data, using advanced methods and algorithms, with expertise

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<thead>
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<th>Category</th>
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<tr>
<td>Production of data products</td>
<td>50%</td>
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<td>Selling selected data sets/or products</td>
<td>40%</td>
<td>60%</td>
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<td>This commercial activity is a source of income</td>
<td>30%</td>
<td>70%</td>
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<td>The money collected cover the cost of the sales activity</td>
<td>20%</td>
<td>80%</td>
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<td>Sales activity is statutory</td>
<td>10%</td>
<td>90%</td>
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<td>Sales activity for budgetary reasons</td>
<td>0%</td>
<td>100%</td>
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<td>Reference to internal data policy</td>
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<td>Reference to national data policy</td>
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<td>Reference to international data policy</td>
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*EuroGeoSurveys - The Geological Surveys of Europe*
Synthesis: Geoscience information and management

- **2 global indicators: IT equipment and facilities | staff & skills**
  - 1/3 have an adapted level of equipment and staff
  - 1/3 has probably the necessary equipment and/or staff or existing ones are sufficiently to less adequate
  - 1/3 are not properly equipped/staffed or did not report the necessary information

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<thead>
<tr>
<th></th>
<th>+ Available &amp; operational</th>
<th>+- Sufficiently to less adequate</th>
<th>- Not adequate or not available</th>
<th>? Incomplete or no information</th>
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Availability of IT equipment and facilities (infrastructure, hardware, software, network)


Availability of geoscientific database management and data processing capacities (staff)

Recommendations: Geoscience information and management

• Avoid the “One size fits all” approach

• Consider each local context with respect to the available logistics and resources (government, self-generated income, projects):
  ▪ Equipment to serve the geological survey missions as data producer
  ▪ Build on operational equipment and staff with improvements of standards and procedures
  ▪ Open source software to limit the investment and maintenance costs
  ▪ Put together the conditions for sustainability after the PanAfGeo delivers

• Keep the balance between:
  ▪ Necessary facilities and capacities to run the PanAfGeo case studies
  ▪ Ability to keep them operational afterwards with local resources

• 3 target groups identified for the capacity building scheme:
  ▪ IT personnel (infrastructure)  
  ▪ Geoscientists (manage + process)  
  ▪ GIS professionals (products + services)  
  □ Face-to-face
  □ On-the-job
  □ Open distance e-learning
Outline of future PanAfGeo Project

• **IT personnel and skills**
  - Training of IT and geodata professionals + Training for trainers to overcome the staff turnover subsequent to PanAfGeo implementation

  5 proposed curricula – in OAGS countries – groups of 10-15 trainees
  - Spatial data infrastructure (SDI) – Interoperability
  - IT infrastructure and networks – User access management
  - Database management
  - Geographic information systems and user-oriented products
  - Data quality – Data right management – Data licensing

• **IT for a pan-African distributed spatial data infrastructure**
  - OAGS Geological Survey Organisations as national nodes: data & metadata
  - One regional node as the one-stop information platform: metadata & services

• **Implementation methodology**
  - Two 3-year phases (1) inception > start > pilot – (2) integration > extension
  - On-site visit to validate the initial status: operational equipment and skills
  - Involve local African IT capacities (training & maintenance)
  - Synergise with: AMDC, AMGI, GEOSS/CGI, AfriGEOSS, OneGeology, ANESI

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Merci de votre attention
Thank you for your attention
Obrigado pela vossa atenção