Capacity Building for Efficient Use of Geospatial Information

Ian Dowman
President ISPRS
University College London

Contents

- What is capacity building?
- Who is doing it….
- …..and why?
- Activities in capacity building for geospatial information in Africa
  - UN
  - Space agencies and other EO organisations
  - SDI organisations
- What more needs to be done?

What is Capacity Building?

- Efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce the level of risk. *In extended understanding, capacity building also includes development of institutional, financial, political and other resources, such as technology at different levels and sectors of the society.*
- *Development of facilities, programs or other resources which help develop a community's (organization or group) ability to perform specific tasks* (British Columbia Govt)

What is Capacity Building?

The UNCED (1992) definition for capacity building encompasses a country's human, scientific, technological, organizational, and institutional resources and capabilities. A fundamental goal of capacity building is to enhance the abilities of stakeholders to evaluate and address crucial questions related to policy choices and modes of implementation among different options for development. These choices would be based on an understanding of environmental potential and limits and of the needs perceived by the people of the country concerned.

Capacity Building for Geospatial information

Capacity building for geospatial information is the provision of facilities, programmes or other resources in the area of geospatial information, which will help develop a community's ability to perform specific tasks requiring such information.

- Building institutions
- Training
- Scientific networking
- Ensuring that suitable employment is available
- Developing infrastructure
- Providing equipment

Components of capacity building

(Georgiadou and Groot (2002)

	Purpose	Focus
CAPACITY BUILDING FOR GEOINFORMATICS	Human resources development	Supply the technical and professional personnel
	Organisational strengthening	Strengthen the management capacity of organisations, institutionalise GEO—ICT solutions (systems and processes) as well as strategic management principles
	Institutional Strengthening	Strengthen the capacity of organisations to develop and negotiate appropriate mandates and modus operandii as well as appropriate (new) legal and regulatory frameworks

World Summit on Sustainable Development

In the Implementation Plan from WSSD specific mention is made of Earth Observation and GIS to:

"Promote the development and wider use of earth observation technologies, including satellite remote sensing, global mapping and geographical information systems, to collect quality data on environmental impacts, land use and land-use changes, ….".

The plan also calls for support to countries, particularly developing countries, in their national efforts to collect data, use satellite and remote-sensing technologies for data collection and to access, explore and use geographic information.

Other initiatives

- NEPAD – new Partnership for Africa's Development
- Commission for Africa

NEPAD

NEPAD PRIMARY OBJECTIVES

- To eradicate poverty;
- To place African countries, both individually and collectively, on a path of sustainable growth and development;
- To halt the marginalisation of Africa in the globalisation process and enhance its full and beneficial integration into the global economy;
- To accelerate the empowerment of women

Commission for Africa — Action for a Strong and Prosperous Africa — Français

Objectives of the Commission

The following five formal objectives for the Commission were agreed at the first meeting in May 2004.

- To generate new ideas and action for a strong and prosperous Africa, using the 2005 British presidencies of the G8 and the European Union as a platform;
- To support the best of existing work on Africa, in particular the New Partnership for Africa's Development (NEPAD) and the African Union, and help ensure this work achieves its goals;
- To help deliver implementation of existing international commitments towards Africa;
- To offer a fresh and positive perspective for Africa and its diverse culture in the 21st century, which challenges unfair perceptions and helps deliver changes; and
- To understand and help fulfil African aspirations for the future by listening to Africans

USAID
FROM THE AMERICAN PEOPLE

- **USAID's Strategy in Africa**
- USAID will continue to support greater access to education and health services to build a more educated and healthier workforce.
- USAID will place greater emphasis on conflict mitigation and management, and will continue to support civil society organizations, encourage greater accountability in government, and promote respect for the rule of law.

International Council for Science

- In order to strengthen international science for the benefit of society, ICSU mobilizes the knowledge and resources of the international science community to:
  - Identify and address major issues of importance to science and society.
  - Facilitate interaction amongst scientists across all disciplines and from all countries.
  - Provide independent, authoritative advice to stimulate constructive dialogue between the scientific community and governments, civil society, and the private sector.
- Regional strategies

Current initiatives involving Geospatial data

- Strategy for Africa
- Health and Wellbeing
- GeoUnions: IGU, IUGG, IUGS, IUSS, ISPRS
  - Cities & Megacities
  - Desertification
  - Groundwater
  - Hazards
  - Health

The main objectives of ICSU in Africa?

- To assist ICSU and its members in their strategic planning for activities in Africa and ensure that their plans and activities are well linked to the science community in the region, relevant networks and organizations and reflect Africa's priorities;
- To provide support and help with co-ordination, if needed, to scientific networks in the region and initiate new networks,
- To facilitate the free flow of scientists and scientific knowledge across the borders;
- To ensure efficient information transfer from ICSU and its family members to the scientific community in Africa; and the collection and dissemination of any valuable scientific information for Africa;
- ***To promote and facilitate capacity building in Africa, including support for post-graduate training programmes for young scientists; and the procurement of educational and research facilities;***
- To promote and facilitate the mobility of African scientists within the continent; including organization of regional and international interdisciplinary science programmes; conferences; and the exchange of professional visits;
- To promote and facilitate the formation of scientific societies and academies within the continent;
- To promote and facilitate the application of science for accelerated socio-economic development of the African continent.

Who is doing capacity building for GI?

- United Nations
  - UN Economic and Social Council (ECOSOC)
  - UN Economic Commission for Africa
    - Committee on Development Information (CODI)
  - UN Statistics Division
  - UN Environment Programme (UNEP)
  - UN office of Outer Space Affairs (OOSA)
  - FAO
- Universities
  - RECTAS
  - ITC
- CEOS
- ICSU
- GEO
- Societies

Committee for Earth Observation Satellites

- CEOS is an international coordinating mechanism charged with coordinating international civil spaceborne missions designed to observe and study planet Earth.
- Objective:
  - to optimize benefits of spaceborne Earth observations through cooperation of its participants in mission planning and in development of compatible data products, formats, services, applications, and policies;
- Structure
  - Working Groups:
    - Calibration and Validation,
    - Information Systems and Services,
    - ***Education, Training and Capacity Building***
- ***WSSD Follow on – Africa Action Group***

Group on Earth Observations (GEO)

Group on Earth Observations (GEO) established by the first Earth Observation Summit in July 2003 which declared the need for:

"….timely, quality, long-term, global information as a basis for sound decision making".

The second Earth Observation Summit in April 2004 agreed to a Framework which established the basic principles for preparing an Implementation Plan for a Global Earth Observation System of Systems (GEOSS).

The third Earth Observation Summit in February 2005 formally set up GEO and adopted the ten year implementation plan.

The two year plan calls on GEOSS to:

- Produce a comprehensive review and analysis of gaps and methodologies, based on existing capacity building efforts;
- Facilitate, with existing efforts, the maintenance and strengthening of education and training;
- Facilitate, with developing countries, the establishment and maintenance of baseline sites for global in situ networks that cannot always be justified nationally;
- Develop a network of experts involved in existing capacity building initiatives related to Earth observation.

GEO Capacity Building Committee

The goals of capacity building in GEO are to strengthen the capability of all countries, and particularly of developing countries participating in GEOSS to:

- Use Earth observation data and products in a sustainable, repeatable manner (both space-based and in situ sensors);
- Contribute in situ observations to global networks, and access and retrieve relevant data from global data systems useful for in situ applications.
- Analyze and interpret data (both in situ and space based) to derive nationally, regionally and globally relevant information and provide decision-support systems and tools useful to decision makers.
- Integrate Earth observation data and information with data and information from other non-Earth observation sources for a comprehensive and holistic view and understanding of problems, in order to identify sustainable solutions.

Joint Board of Spatial Information Societies

ISCGM ICA IMTA ISPRS FIG IHO AIG

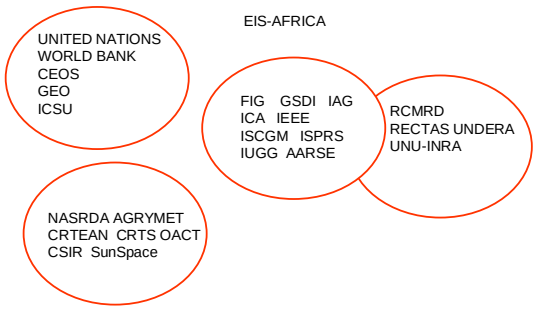
Committee on Capacity Building in Africa

Mission

- To co-ordinate the capacity building activities in Africa of the members of the Joint Board and to advise the Joint Board on policy issues relating to education in Africa.

Terms of Reference

- Collect and maintain information of meetings on capacity building in the geospatial area in Africa held by any organisation.
- Review the information and advise members of the Joint Board of opportunities for collaboration and for organisation of events and of potential duplication of effort.
- Establish and maintain an email network of interested individuals and organisations who can contribute to information on activities and any problems.
- Advise the Joint Board on any problems or potential problems which could be reduced by members of the Board.
- www.fig.net/jbgis



Examples of Capacity Building

- Organisations in Africa
- Nigeria
- African Resource Management Satellite
- AFREF
- Mapping Africa for Africa
- Geoscience in Africa
- Village resource centres in India
- Societies
- Educational Institutions

EIS-AFRICA

- consolidates ten years of investment and capacity building efforts in Environmental Information Systems (EIS) in sub-Saharan Africa into an Africa-wide organisation promoting the greater use of harmonised geo-spatial information.
- EIS-AFRICA is a non-profit pan-African organisation of geo-information practitioners and institutions.
- It is based in Pretoria, South Africa, and is governed by an international executive committee.
- EIS Africa publishes a newsletter and supports many capacity building activities throughout Africa.
- The mission of EIS-AFRICA is to develop African capacity to generate, manage, disseminate and use geo-spatial and environmental information to enrich policy debate and support decision-making for the well-being of African people.

EIS-Africa Strategic Objectives

- Access to geo-spatial and environmental information in Africa is being facilitated by EIS-AFRICA through networking and appropriate technology.
- Major development and policy initiatives, processes and activities on the African continent are being influenced by environmental and geo-spatial information.
- African Institutions supported by EIS-AFRICA and its partners are using best practices and policies for information management.
- Capacity development for geo-information management and use is being facilitated and enhanced by EIS-AFRICA
- EIS-AFRICA is an organization that implements best practices in institutional governance and management

Newsletters

Space Technology for Disaster Management
September 2005 Updates

Spatial Data Infrastructure – Africa Newsletter

GSDI

MAINSTREAMING GEOSPATIAL INFORMATION FOR SUSTAINABLE NATIONAL DEVELOPMENT IN NIGERIA

O. Kufoniyi, J. O. Akinyedeb

Capacity Building: Dealing with human, institutional and technological capacity building. The policy makes it mandatory: to include training component in GI projects; to locally implement GI projects to a minimum level of 75%; that all GI producers shall provide evidence of the local contents of their production activities in compliance with Government policy on local content; etc.

NigeriaSat-1

- The first Nigerian satellite, a microsatellite called NigeriaSat-1, was successfully launched into low earth orbit on 27th September 2003.
- The choice of NigeriaSat-1 was influenced by
  - its low cost, affordability and the
  - Advantage of comparable performance to the expensive large satellites
  - the possibility to support capacity building.
- Fifteen Nigerian engineers/scientists were trained in all aspects of satellite technology including ground station management.

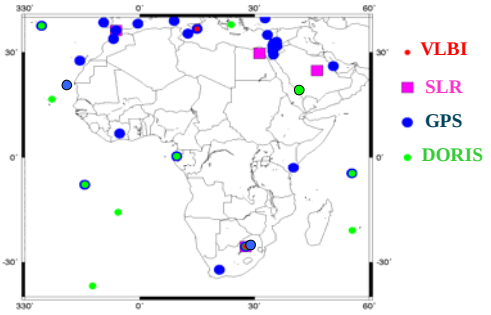
AFRICAN RESOURCE MANAGEMENT SATELLITE PROJECT (ARMS)

- A joint satellite programme of South Africa, Nigeria and Algeria and any other interested country in Africa
- Laying the foundation of sustainable technology development in Africa.
- The project is one of the key flagship projects in the NEPAD Science and Technology Ministerial Programme areas.
- The countries involved would collaborate in building capacity to support space programmes in Africa.

African Reference Frame (AFREF)

- a project to set up a geodetic framework for GNSS in Africa,
- built on the existing sparse network of continuously operating GPS stations.
- The project calls for hardware, software and training to install, support and use the GPS network.
- AFREF is supported by UN and NMOs have signed up to it.

Space Geodesy in Africa (Neilan 2004)



AFREF – Rationale (Neilan 2004)

- *Communication and internet* are critical to success and sustainability of GNSS infrastructure
  - access to information, global data, products, and technology advances
  - Increase knowledge base, capacity building
- Training, education, access to resources, retention of quality personnel and stability are issues
- Collective approach within African nations
  - Each adopting similar methodologies and technology
  - Permits progress where practical, implementing a network of GPS stations
  - Support and training envisioned by IGS/ITRF - seeking resources

AFREF – Rationale (Neilan 2004)

- Need for a geodetic structure gaining recognition throughout Africa and international partners
  - The 50+ nations within Africa can realize a homogeneous reference system consistent with ITRF
  - UN GNSS Workshop Zambia July 2002 - AFREF recommendations
  - Approach *"plan regional, implement national"* - Windhoek Declaration Dec '02, SAREF model for regional implementation
- Support of international organizations
  - United Nations Office of Outer Space Affairs (UN-OOSA)
  - International Association of Geodesy
  - International GPS Service
  - International Terrestrial Reference Frame

Mapping Africa for Africa

- Mapping Africa for Africa (MAFA) is a new initiative basically intended to accelerate the pace of geo-information activities in Africa, set up by the Geo-information sub-committee (CODI-Geo) and supported by the African Countries represented by their National Mapping Organisations or organizations responsible for spatial data infrastructure, and by the International Cartographic Association.
- A plan of action to provide the fundamental geo-spatial information for sustainable development in support of various projects under NEPAD has been agreed.

Mapping Africa for Africa

- The terms of reference of the Working Group set up by ICA are as follows:
  - Promote international technical and scientific support, and advisory services from ICA and its affiliate members for mapping Africa for Africa projects.
  - Aid in capacity building and knowledge sharing.
  - Support mapping projects for Mapping Africa for Africa.
  - Encourage African countries to participate in ICA activities.
  - Facilitate cartographic outreach programmes in Africa.
  - Promote awareness of cartographic issues and resources.

Geo-Sciences in Africa (GIA) - An Initiative and Action Plan of IUGG and the ICSU Geo-Unions

The underlying objective of GIA is to assist in improving the quality of life in Africa through better preparedness for meeting the challenges posed by geo-hazards

To accomplish this, the GIA program will:

- Aid geo-scientists in Africa to develop and express their full potential and enhance their professional and public position in their countries and the region, and through international links.
- Promote and support geo-science study programs and students in Africa.
- Support and execute projects and programs that contribute to understanding of geo-processes at the local, regional and global levels, with emphasis on the needs of Africa.
- Generate knowledge and information useful for decision making that can improve the quality of life in Africa.
- Use the activities of GIA and the results it generates in outreach to the political and public arena in African countries -- to explain the importance and value of geo-sciences to society and to solicit support of the national authorities for geo-sciences in their countries.

The African Association of Remote Sensing of the Environment (AARSE)

Objectives

- To *provide* a forum to address issues of common interest through the conduct of conferences, seminars and workshops;
- To *promote* a greater cooperation and coordination of efforts among African countries, institutions and industries in the development of space technology and its application to natural resources and environmental issues;
- To *promote greater* appreciation of the benefit of the technology, especially, remote sensing and Geographic Information System (GIS) in the pursuance of an African priority program for Economic Recovery and sustainable development.
- To *exchange* views and ideas on technology, systems, policy and services of remotely sensed data and GIS which are applicable to the betterment of Africa;
- To *improve* teaching and training in remote sensing and GIS and to collect, evaluate and disseminate results and failures in remote sensing activities from all over the world;

Village Resource Centres in India

EO for planning water supply in India

- an excellent example of synergistic use:
  - data from EO systems and other space systems
  - local information collection
  - processes modelling
  - global data processing
- leading to decision-making and concrete actions at several scales.
- Setting up such systems is a key tool towards the sustainable development defined by WSSD.

ISPRS Mission

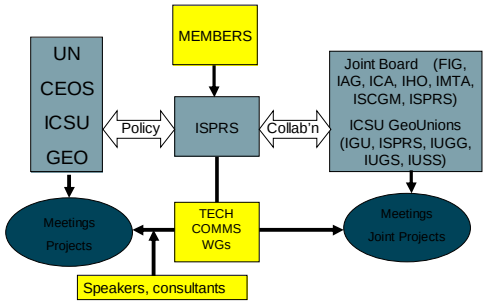
"ISPRS is an international NGO devoted to the development of international cooperation for the advancement of knowledge, research, development and education in the Photogrammetry, Remote Sensing and Spatial Information Science, their integration and applications, to contribute to the well being of humanity and the sustainability of the environment."

Priorities for 2004-2008

- Sustain and develop the scientific programme based on international excellence in research and in collaboration with other international scientific unions;
- Expand the international role of ISPRS by building on our existing links and developing a presence in developing countries, especially Africa;
- Continue the role of ISPRS in education and technology transfer in collaboration with international partners.

"Be the Voice for The P & RS & SIS community"

ISPRS – External relations



Worjshop Series "The User and the GEOSS Architecture"

- Objectives
  - **Focus on broad range of users and regional issues**
  - **Educate about GEOSS – user approach and architecture (structure)**
  - **Through interaction with users, get feedback on their needs – for data, information and infrastructure**
  - **Create continuing interactions/follow-ons including training and case studies**
- Status
  - **Two workshops have been completed (Korea, Pretoria)**
  - **Follow-on ideas are being developed and tested**
  - **Additional workshop are in planning**

GEOSS Workshop – AfricaGIS 2005: Some Conclusions

- More money is needed.
- Better understanding of the problems is required, this involves first the identification and then the participation of user groups, and then better communication.
- There are particular technical problems for Africa which include:
  - poor infrastructure;
  - low bandwidth;
  - lack of interoperability and metadata (not just an African problem);
  - basic technology equipment is needed – training is no use without equipment;
  - Lack of spatial literacy and education on use of GI in schools.
  - Lack of political will.
  - Poor communications amongst African governments.

GEOSS Workshop – AfricaGIS 2005: Possible solutions

- Long term, sustainable, national environmental programmes run by national governments.
- More networking.
- Training needs to be recurrent with a long term commitment.
- Poor communications amongst African governments GEOSS (SDI) can act as a rallying point, therefore outreach to ministers is needed.
- Need for good communication: between scientists, between disciplines and to policy makers; GEOSS can act as a catalyst and listen to end users, particularly non specialists.
- Activities must be more regionally relevant
- Activities must make more use of existing systems and capacity building efforts, provide easy to use tools.
- Outreach to African politicians, GEO should be able to provide political clout.

The challenges

- Maintain political awareness leading to funding.
- Maintain activity with greater co-ordination
- Stop the Africa Brain Drain
- Build sustainable institutions
- Demonstrate real benefits from efficient use of spatial data
- Make a difference

Africa's brain drain

- 30% of Africa's university trained professionals live beyond the continent's borders
- Up to 50 000 Africans with PhDs are working outside the continent
- University departments of geomatics are closing or losoing staff

www.aut.org.uk/media/pdf/3/4/thebraindrain.pdf

Education

Requirements

- Institutions which recognise the power of geospatial information and can make this known to decision makers
- Sustainable partnerships
- Quality assurance of programmes
- Example: ITC "from capacity building to building on capacity"

Conclusions

Capacity Building is essential – based on an understanding of the issues of Geoinformation and on the development of sustainable institutions

- The first requirement is international co-operation and a willingness to work together.
- Secondly provision of the technology. - recognition of gaps in the provision of data and international co-operation in filling these would be a big step forward;
- Thirdly funding. Funds are being made available to GEO and other agencies such as UN OOSA are funding capacity building exercises.