Executive Summary of the GEO Workshop on Earth Observations

for IWRM for River Basins in Africa

Nairobi, Kenya 12-14 January 2012

In cooperation with UNESCO, a GEO-UNESCO Joint Workshop on Earth Observations and Capacity Development for IWRM for River Basins in Africa was held at UNESCO on 12-14 January 2012 in Nairobi, Kenya. The workshop was a follow-up to the 2nd Global Earth Observation System of Systems (GEOSS) African Water Cycle Symposium (Addis Ababa, 2011) at which the participants recognized the commonality and regionality of water-related issues and socio-economic impacts caused by water-related disasters in Africa. Symposium participants concluded that the African Water Cycle Coordination Initiative (AfWCCI) should focus initial efforts on working with river basin organizations (RBOs), with the specific aim of enhancing current capacity through improved data collection, analysis, integration, and sharing among the nations comprising the river basins. The GEO framework was designated to develop the political consensus needed to effectively coordinate the trans-boundary aspects of the chosen river basins. This summary reports on the portion of the meeting devoted to GEO Workshop on Earth Observations for Integrated Water Resources Management (IWRM). The Workshop participation comprised 73 people from 24 different countries and 8 River Basin Organizations.

In opening remarks, Toshihiro Sonoda (UNESCO, Division of Water Sciences) noted that Integrated Water Resource Management (IWRM) includes more than just water: management of land and related resources is also essential in order to maximize the resultant economic and social welfare equitably and sustainably. About Amani (UNESCO-IHP) also made the observation that we cannot manage what we do not know. Thus there is the need to understand both the physical processes and the resources available to gain more knowledge for IWRM. An objective of the workshop should be to determine how Earth observation data can best be used for decision making with respect to IWRM. Johnson Akinbola Oguntola (UNECA) observed that good capacity wirth respect to IWRM has been established across Africa in some cases. However, there is a need to establish ownership and foster trust building through jointly-owned regional infrastructure projects.

A series of keynote presentations as well as reports from river basin authorities illustrated the water-related needs and challenges facing Africa, and how GEOSS can serve as a framework for delivering observations, services, data integration and capacity building in support of informed decision-making to respond to these challenges. Key issues related to the needs and challenges facing Africa with respect to river basin management may be summarized as follows:

- lack of access to data and data sharing;
- lack of infrastructure for collecting and analyzing data;
- lack of funding for maintenance and upgrade of infrastructure;
- need for capacity building, enhancement of capabilities , and retention of expertise;
- political buy-in and role of national government (critical for success of any initiative);
- trust building and increased visibility (promotion of awareness of shared responsibility);
- water use and conservation:
    - changes and variability of hydrological regimes and fresh water availability
    - water pollution (particularly point-source)
    - increasing Evapo-transpiration
    - excessive siltation
    - groundwater depletion and salinization
    - invasive species (aquatic weeds)
- formalizing the generation and exchange of info using GEO Data Sharing Principles between member states;
- data and models to enforce charters and agreements;
- socio-economic changes (pressures from population displacement from famine, war);
- response to poverty: how to share benefits and coordinate approaches to infrastructure development (as opposed to individualistic/nationalistic objectives);

- inadequate sanitation and waste-water infrastructure;
- weak capacity of national water management institutions;
- need to synchronize basin-level agreements with national objectives;
- food security;
- promote broadbased stakeholder participation;
- aquifer depletion and artificial recharge;
- management for hydro-electric power production.

Presentations from representatives of space agencies highlighted recent satellite launches and products available – in many instances fully accessible at no cost – for IWRM. Examples include:

National Space Research and Development Agency (NASRDA)

- African resource Monitoring Constellations

Japan Aerospace Exploration Agency (JAXA)

- Tropical Rainfall Measuring Mission (TRMM)
- Global Change Observation Mission (GCOM)
- Global Precipitation Mission (GPM)

National Aeronautics and Space Administration (NASA)

- SMAP (soil moisture active/passive mission, still in research phase)
- GRACE for groundwater change assessment
- LDAS – Land Data Assimilation System
- Water Information System Platform (WISP)
- SERVIR – located in Nairobi making use of Kenyan Meteorological Service for flood forecasting (supported by USAID)

National Oceanic and Atmospheric Administration (NOAA)

- SMOPS – Soil Moisture Operational Product System
- Atmosphere Land Exchange Inverse Model (ALEXI) for surface temperature and Evapo-transpiration
- Vegetation Health Index
- Hydro-Estimator for Rainfall (4km spatial resolution, produced hourly)
- Tropical Rainfall Potential (TRaP) 6-24 hr rainfall accumulations

European Space Agency (ESA)

- TIGER-NET – improving IWRM by exploiting advances in EO technology in African river basins

Committee on Earth Observation Satellites (CEOS)

- CEOS Water Portal – data from several sites, distributed data access, how to utilize.

For complete descriptions and full data/product lists and availability, please refer to workshop presentations, located at: http://www.editoria.u-tokyo.ac.jp/projects/AfWCCI/Nairobi/presentations.htm

Other agencies that are providing assistance and products for IWRM include:

United Nations Environment Programme (UNEP)

- African Water Atlas – available online
- Lake Turkana Basin Project
- Eye on Earth Summit – Zambezi and Lake Victoria proposed as foci

Global Energy and Water Cycle Experiment (GEWEX)

- Research on monsoons and extremes
- Understanding human influences on environment (dams, diversions, urbanization, etc), currently very poorly accounted for in current climate models
- Regional Hydro-climate Projects – AMMA, HYMEX

EARS (private industry, in partnership with EUMETSAT)

- Energy and Water Balance Monitoring System (EWBMS)
- river flows forecasting, drought monitoring
- daily data – precipitation and evapo transpiration
- drought indices – meteorological, hydrological, agricultural, climatological
- Africa Inter-Basin Implementation Project

Faculty of Geo-Information Science and Earth Observation (ITC)

- extensive capacity-building and knowledge transfer programs
- development of GEONetcast Toolbox

Regional Center for Mapping of Resources for Development (RCMRD)

- Sustainable development through application of EO
- SERVIR: Hydrologic early warning system for east Africa

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Overseas Development Agencies provided overviews of their interests and activities across Africa, in relation to IWRM:

United Nations Economic Commission for Africa (UNECA)

- Mission: ECA promotes and addresses Africa's development agenda in collaboration with the AU and other key stakeholders by formulating policies, fostering regional integration. Supports:
- ACMAD – established in collaboration with WMO, Niamey
- ADF – Africa Development Forum
- CODA – Coalition for Dialogue on Africa
- ECA Partnership Forum
- ECA Partners Portal

African Development Bank (AfDB)

- AFW – African Water Facility – instrument for implementation of Africa Water Vision 2025
- AfDB charged by AMCOW to administer funds for projects designed to address:
    - Insufficient investment
    - Lack of capacity of institutions
    - Poor knowledge uptake

World Bank (WB)

Cycle of WB project planning and execution:

- Focus on preparing investment projects
- Capacity building, technical assistance, master plan assistance
- Can work with GEO to accelerate planning with technical feasibility study
- Technical guidance for application of GEO-related concerns, issues
- NBI and other donors for project identification and planning; GEO can provide inputs and guidance.

Development of water resources is critical for economic development; WB wants to work closely with AfWCCI group in application of new technologies and EO. There is no specific instrument to receive proposals from GEO, so the recommendation is to work through NGOs and Universities. Focal points should be set up for advocation of GEO-related technologies for applications emanating from respective countries.

Japan International Cooperation Agency (JICA)

Challenge is to support development of better IWRM system including on-time and on-site activities, and to incorporate latest EO and technologies. Expects GEO Community to provide more accurate spatial and temporal data.

Necessary Data for WRM –

- Water consumption for potable water, agriculture and industrial water use
- Simulation of population growth and economic growth
- Rainfall (daily), river flow, operational data of reservoir, groundwater level at basin level for at least 10 years

Flood management –

- Topographical data in rivers (dike bank alignment cross sections, weirs, et)
- Topographical data in basins
- Inundation data (area depth, duration, recorded in past floods)
- Rainfall (hourly) water level in rivers (hourly) river flow quantity (hourly, operation data of reservoir (hourly) at respective river bains during last 10 years

About Amani (UNESCO-IHP) commented that data needs are critically in short supply across Africa. In his view there needs to be a paradigm shift among ODAs: the issue of data needs to be highlighted as crucial. and ODAs should consider building networks to receive, store, process data. This will be a good investment.

Breakout groups met to identify current gaps with respect to individual/institutional/infrastructure capacities across Africa to respond to these challenges, and to consider specific steps to address them. The groups concluded with the following recommendations:

Targets and Actions

1) Observation Capacity:

Data products should be derived from in-situ, satellite, and data assimilation systems and the integrative functions that bring these data sets together. Tools and contributing systems include data requirement spread sheets, distributed- (CEOS Water Portal, GEOWOW) and centralized- (DIAS) data archiving,

2) Data Archiving and dissemination Capacities:

The functions of quality control, meta-data registration and common formatting are necessary to realize the benefits from observation. The experiences of University of Tokyo's DIAS will serve as a basis for these archival approaches. Other systems are available, such as SERVIR, and will also contribute to these goals.

3) Modeling Capacity:

A range of modeling capabilities are needed for determining land-atmosphere interaction, water flow, water quality, vegetation, and data assimilation. These models will be developed in conjunction with the GEWEX community and academia more generally.

4) Prediction Capacity:

Prediction models and enhanced observational networks are needed to enhanced flood and drought prediction and warning systems.

5) Assessment capabilities for Climate Change and Land Use Impacts

In order to implement a climate change and land use impacts assessment function, it will be necessary to provide ways to select the appropriate choice of climate model, apply bias correction and downscaling techniques, and to interpret the results in terms of water security and water-energy-food nexus interactions.

6) Management Capacity:

Methodologies will be developed to interpret the results of the assessments and predictions in terms of recommended management options through a range of management tools including optimization schemes, reservoir operation decision support models, and evacuation recommendations and instructions.

7) Capacity Building Coordination:

Capacity Building is a major activity throughout the world. Africa would benefit greatly from capacity building developed along the lines of either special centers to support capacity building or university consortia.

Model 1: Center approach

- Based on global partnerships, but work done in and by the center;
- Capacity building could be via personnel exchange and training programs with partner universities and research labs globally;
- Center would require computing and data handling resources.

Model 2: University consortium

- Could consist of partnerships of regional universities with global (e.g. Japan, Europe, U.S.) institutions and international programs;
- Might include some aspects of Model 1 (e.g. computing capability).

8) Data Policy

The planning for these activities would be done in a way that would adhere to GEO principles including the GEOSS Data Sharing Policy.

Schedule

Just after the workshop:

- Task Team 2 will be formed to develop a draft implementation framework including: data spread sheets, membership requirements, demonstration periods, schedule coordination, implementation plans, funding possibilities, and the development of a draft agenda of the 3rd Symposium.
- Members of this team would include GEO Secretariat, River Basin Organization representatives, and representatives from UNESCO, UNECA, UNEP, WMO, CEOS, the Science/university community and from the private sector.

27-29 Feb. 2012: the 3rd Symposium in Gabon

At this session there will be extensive discussion of the following critical issues:

- the draft implementation framework
- Contribution to the Rio+20: exhibition and a possible video.

Just after the 3rd Symposium:

- Task Team 3 would be formed to develop a draft implementation plan for demonstration basins. Membership of this task team would include the GEO Secretariat, candidates from the demonstration basins as well as appropriate members from Task Team 2.

Other events:

- Rio+20 20-22 June 2012
- Implementation Planning Workshop: Sep.-Oct. 2012
- Early 2013: the 4th GEOSS African Water Cycle Symposium