Towards Integrated Water Management in Africa: Space Technologies for Bridging the Water Information Gap

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The TIGER Programme

- In 2002, ESA has initiated TIGER as a concrete step to implement the recommendations of the WSSD.
- The paucity and poor quality of information on water resources is considered a key limitation at national, sub-regional and continental levels to achieve the WSSD goals;
- The TIGER goal is to support African Water Authorities to improve Integrated Water Management in Africa by exploiting the benefits of space technology to bring the water information gap at regional, national and local scales.
Innovators: Set of small-size projects aimed at supporting African technical centres (i.e., potential service providers) to advance in the use of EO technology for water resource management.

- in 2004, African institutions were invited to submit concrete proposals for Pilot Projects (through an ESA Announcement of Opportunity).

- The 95 project proposals submitted by more than 360 African experts dealing with water management issues.

- At present, 20 proposals have been accepted and 40 proposals are under evaluation (second review).
Two examples of proposed Innovators

Proposals addressing CHIRS Proba Data:

• Assessing Groundwater access by trees growing above contaminated groundwater plumes originating from gold tailings storage facilities.  
  Principal Investigator: M Govender (CSIR)

• Application of Remote Sensing Technology for Successful implementation of Water Resource Development and Management Policies in the Western Cape Region of South Africa  
  Principal Investigator: Thomas Abraham (University of the Western Cape in South Africa)

Example 1: Tailings Storage Facilities

• Deep-level gold mining produces extensive TSFs that contain large quantities of contaminated water.

• Salts and heavy metals seep from the TSFs into adjacent lands.

• To prevent the spread of contaminated water stands of deep-rooted trees could be established in strategic belts that lie across major seepage routes.

• Trees can potentially reach deep water tables, take up large quantities of water and remove some of the pollutants in this water.
Examples 1: Relevance to CHRIS Proba

- Application of remote-sensing technologies that will allow the rapid detection of the plant water status of existing trees over large areas of groundwater plumes from spatial imagery: Identify stressed vs. non-stressed trees through vegetation indexes.

- Use these technologies to examine which site characteristics are necessary to permit effective growth and water use by trees.

- Purpose of Chris-Proba Data
  - However trees are scarce and are generally located as clumps, rows, or small stands of trees.
  - Therefore both high spatial and spectral resolution data is required to identify differences in water status of the existing trees.

North-South Technology Transfer Projects

- During 2003/2004, ESA launched a number of TT Projects funded with more than 3 MEuro.

- All this projects are carried out in close collaboration with almost 20 African Institutions (North-South partnerships) by using a User Driven Approach;

- Service under development:
  - Rivers and lakes water levels;
  - Wetlands management;
  - Ground water and aquifer management;
  - Sanitation and epidemiology.
The GlobWetland project

- **Main Objectives:**
  - Short-term: Develop user-oriented information system (based on EO-technology) to support the National and Local authorities in managing Ramsar sites;
  - Long-term: contribute to establish a solid basis for the operational use of EO technology in wetland management worldwide;

- **Budget:** 1MEuro;
- **Duration:** 24 months;
- **Kick-off:** November 2003;
- **Geographical coverage:** Around 50 Ramsar sites worldwide mainly in Europe and Africa;
- **Implementation:**
  - International Team: Atlantis (CND), Synoptics (NL), WI (Int.) and RRS (D);

The GlobWetland African Sites

- **User Group:**
  - 10 countries: Algeria, Egypt, Senegal, South Africa, Kenya and the Lake Chad Commission Members.

- **Wetlands:**
  - 15 wetlands sites;
What EO can do for wetland managers?

- Base mapping;
- Water cycle monitoring (seasonal and long-term):
- Land cover/use and change:
- Wetland identification (e.g., mires);
- Wetlands typology mapping;
- Peatlands fires mapping;
- Topography:
  - DEMs
  - Terrain dynamics (subsidence);
- Coastal dynamics monitoring;
- Biophysical parameters:
  - water quality (e.g., turbidity, colour, ...);
  - evapotranspiration;
  - soil/water temperature;

The Prototyping: Aliakmon Delta (GR)

- Test Cases:
  - Aliakmon Delta (GR)
- Prototype Products:
  - Land Cover & Land use;
  - Wetlands typology;
  - Change Analysis;
The Prototyping Phase: Aliakmon Delta (GR)

Data Used:
- SPOT 5 10 m XS
- Field Data
- Topographic Maps

Accuracy:
- Less than 1 pixel (10m) positional acc.;
- Thematic acc. Good preliminary results;
- Under validation by the Users.
Relevance for CHRIS Proba in GlobWetlands

Relevance for CHRIS Proba:
- CHRIS Proba data have been requested for mapping the smallest sites (e.g., Algeria, where wetland size allows the use of a single image frame);

Planned processing:
- Processing will start in Phase 2: from April 2005 to April 2006;

HRC Proba:
- Also HRC imagery was ordered and acquired;

The TIGER Partnership

- UNESCO has joined the TIGER partnership and provides access to the hydrology community through its IHP networks.
- TIGER also benefits from the association of other space agencies, including those of Canada, Japan and the United States.
- CHRIS Proba may support the TIGER initiative allowing easy access to high-resolution super-spectral information for research purposes in Africa.
- The possibility to fully exploit this mission within the context of TIGER will be explored within 2005.
The TIGER Innovators ITT

- An Intended ITT have been announced in EMITS: Innovators-TIGER:
  - 0.5 Million Euros
  - Support African team to develop novel services and information system on integrated water management;
  - Strong component on training and capacity building;
  - Up to 5 projects (<100K each)
  - To be open in May 2005