EDUCATION AND CAPACITY BUILDING IN EARTH OBSERVATION FOR WATER-RELATED APPLICATIONS IN EMERGING ECONOMIES

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SPECIAL CHALLENGE

- Teaching the use of **front-end and expensive technology** (geo-information science and earth observation) to students coming from **economically weaker countries**
- **Information gap** for management of resources in weaker countries – EO could contribute

We shall introduce the experiences of

**ITC:**
Faculty of Geo-Information Science and Earth Observation of the University of Twente
ITC COURSE PARTICIPANTS 1950-2011
ORIGIN OF ITC STUDENTS, EXCLUDING EXTRAMURAL AND PHD

Total students 1950-2011: 21,286
Total countries 1950-2011: 175

Asia 9,112
Africa 6,546
Europe 3,203
America 2,153
Australia & Oceania 182

America 10%
Europe 15%
Asia 43%
Africa 31%
Australia & Oceania 1%
Modular set-up of education based on European Credit Transfer System
Degree (and its components) are accredited

Three-week modules
- Transferred to Distance Education
- Transferred to partner Universities in the context of Double degree programmes
- Modified to short course elements at partner Universities (WaterNet)
- Elements taken for intensive ToT programmes (Cap-Net, TIGER CBF)
# Water Resources and Environmental Management Course Structure (MSc)

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>MODULES (3 weeks)</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-3</td>
<td>Geo-information science and earth observation</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Water related processing tools</td>
</tr>
<tr>
<td></td>
<td>5-8</td>
<td>EO and Quantification of Water Cycle Components</td>
</tr>
<tr>
<td></td>
<td>9-10</td>
<td>Data integration and modelling</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>Research Skills</td>
</tr>
<tr>
<td></td>
<td>12-13</td>
<td>Advanced Modules and orientation</td>
</tr>
<tr>
<td></td>
<td>14-15</td>
<td>MSc proposal writing</td>
</tr>
<tr>
<td>4</td>
<td>16-23</td>
<td>Individual research</td>
</tr>
</tbody>
</table>

A programme based on research
- Entry level: BSc

UNIVERSITY OF TWENTE.
Very large Alumni community

Links with Universities and Regional Centres

PhD programme

International research cooperation

Capacity building experiences with:
  - CB projects, e.g. TIGER
  - Joint courses with African / Asian Universities (educational partnerships)
  - Supporting member of WaterNet – (University network for IWRM in Southern Africa)
  - Supports CapNet – International Network for Capacity Building for IWRM
EDUCATION PARTNERSHIPS

Joint Education Partnerships: Status
- Implementation
- Development
- Pre-feasibility
- Identification

December 2006

UNIVERSITY OF TWENTE.
Taking advantage of the modular setup of the regular education
Tailor-made content, where needed

Types:
- Technology transfer
- Networking for capacity building
- Capacity building for research
- Research-driven capacity building
TECHNOLOGY TRANSFER
GEONETCAST, DEVCOCAST

- Capacity building for GEONETCast
- GEONETCast Toolbox: software tools based on ILWIS 3.7+
- Training kit
# Networking for Capacity Building

**WATERNET**

## Core Modules at the University of Dar-es-Salaam and the University of Zimbabwe (8 Modules)

- Principles of MWRM
- GIS, database management and analytical tools
- Principles of Hydrology
- Water Resources Analysis & Planning
- Principles of Aquatic Ecology
- Principles of Water Quality & Environmental Management
- Socio-Economics of Water & Environmental Resources
- Policies, Laws & Institutions

## Options (4 Modules)

<table>
<thead>
<tr>
<th>UNIVERSITY OF DAR ES SALAAM</th>
<th>UNIVERSITY OF ZIMBABWE</th>
<th>UNIVERSITY OF BOTSWANA</th>
<th>UNIVERSITY OF KWAZULU-NATAL</th>
<th>UNIVERSITY OF MALAWI</th>
<th>POLYTECHNIC OF NAMIBIA</th>
<th>UNIVERSITY OF THE WESTERN CAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Resources Modelling</td>
<td>Wetlands and Agriculture</td>
<td>Catchment Water Management</td>
<td>Environmental Management Tools</td>
<td>Water Demand Management</td>
<td>Water Utilities Management</td>
<td>Water and Development</td>
</tr>
<tr>
<td>Hydrological Processes</td>
<td>Agri-Industrial Water Use</td>
<td>Catchment Management</td>
<td>Earth Observation and Hydrological Analyses</td>
<td>Environmental Water Management</td>
<td>Water Demand Management</td>
<td>Water and Development</td>
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<tr>
<td>Hydrological Modelling</td>
<td>Catchment Water Management</td>
<td>Environmental Water Management</td>
<td>Earth Observation Project</td>
<td>Management of Aquatic Ecosystems</td>
<td>Environmental Water Quality Process</td>
<td>Water and Development</td>
</tr>
</tbody>
</table>

## Groupwork Project

**Dissertation Research Project (6 Months)**
NETWORKING FOR CAPACITY BUILDING

CAPNET

Initiates, hosts and disseminate knowledge and skills training related to IWRM:

ITC contributes to

- Drought Monitoring
- EO and GIS for IWRM
- Use of GIS and RS for Integrated Rural Flood Management
- Use of GeoNetcast products for IWRM
CAPACITY BUILDING FOR RESEARCH

TIGER Capacity Building Facility

ITC
TCBF management
CB activities &
Regional Offices

TUD
CB activities

ISEGI-UNL
CB activities

8 Projects

4 Projects

8 Projects

Regional Offices:
RCMRD
AGRHYMET
WRC

VITO
Technical support

DDS support
TIGER Research projects

20 Research projects, all cooperating with ministries/water authorities at regional or international scales

- Carry out research
- Receive data from the TIGER programme
- Receive support and supervision from TCBF:
  - Supervisor
  - Tailored capacity building plan
  - Promotion of results
TIGER PARTICIPANTS FROM AFRICA IN DIFFERENT CB ACTIONS

- Training courses in Africa
- Supervision in EU
- Short courses in EU
- DE courses (advanced)
- DE courses (basic)

Phase I (2006-08)
Phase II (2009-12)
RESEARCH-DRIVEN CAPACITY BUILDING

CEOP-AEGIS

- Research project on the hydrology of the Tibetan Plateau
- WP for result dissemination and stakeholders’ panel
- Advanced courses for water practitioners in:
  - China
  - India
  - Nepal
LESSONS LEARNT: GENERIC SETUP

- There is still a strong need for quasi-basic EO and GIS education among the water practitioners in emerging economies.
- Information about EO(-based) data availability was appreciated in all courses.
- The follow-up support is very important.
- Time is never enough.
LESSONS LEARNT: SHORT COURSES

- The highest drop-out rate in the distance education courses: office duties and other obligations divert participants.

- Giving such courses on the premises of leading local institutions:
  - Contributes to the courses with local examples and expertise
  - Contributes to the institutions with the most advanced material and knowledge.

- Such short courses are mostly eye-openers.

- The academic community of emerging countries needs short courses to get information about the advanced scientific developments.

- The EO product user community takes advantage of such courses for the better identification of the user needs.
LESSONS LEARNT: LEVELS OF CB

- The most advanced EO techniques can help in the less developed countries with the highest efficiency, but these are the countries where the need is the highest for capacity building.

- More formal education is also needed (e.g. degree courses at MSc and PhD level).

- On-the-job training is the most welcome by many of the participants.

- Further involvement of water practitioners in the EO-related programmes is needed.

- Proper embedding of EO technology in local institutions (e.g. water authorities) is needed.
LESSONS LEARNT: RESEARCH

- There is a capacity in the less developed world that we can build on. Centers of EO excellence are developing.

- There is a need for support in publishing.

- The success of research highly depends on finding the best individual at the partner institution.
CONCLUDING REMARK

- International capacity building for the use of EO in water-related applications is part of globalization – at its best:
  - No political boundaries can be seen on satellite images
  - International students studying together learn to understand each other better – contributing to a technically/scientifically sound global community of practitioners.