TIGER Capacity Building Facility - Phase 1, Lessons Learnt

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ABSTRACT

The TIGER Capacity Building Facility focused on closing the technological gap between the users and the earth observation community within the TIGER programme. Thirteen projects participated in different aspects of the capacity building facility:

1. - Basic education, provided via distance learning.
2. - Tailored short courses, selected according to the research interest and technical background of the participants.
3. - Research topic oriented supervision, provided by specialists of the research fields of the participants.
4. - Advanced short courses focusing on selected earth observation techniques.

Distance education turned to be efficient and cost effective in the programme - but only for those, who followed the courses completely. There was a relatively large percentage that could not complete the studies. The second and the third type of education were carried out in ITC, in the Netherlands. The participants evaluated the courses and the supervision very effective and adequate. Nevertheless, the follow-up was not always possible. Two advanced short courses were held in Africa (Cape Town and Nairobi). One of them addressed the 'scientific elite' of the EO community, whilst the second focused on the users of this technology.

1 INTRODUCTION

"Water, the blue gold of the 21st century, can be monitored from space at several different stages of the hydrological cycle, using Earth observing satellites." – states the home page of the TIGER Initiative (ESA 2008). The European Space Agency launched this initiative following the 2002 Johannesburg World Summit on Sustainable Development - focusing on the use of space technology for water resource management in Africa and providing concrete actions to match the Resolutions (Achache *et al.* 2004; Fernandez-Prieto and Palazzo 2007).

The TIGER Initiative aims at: "assisting African countries to overcome problems faced in the collection, analysis and dissemination of water related geo-information by exploiting the advantages of Earth Observation (EO) technology" (TIGER Steering Committee 2005). A long term strategy is defined for pursuing three main result categories:

1. Support improved governance and decision making;
2. Contributing to enhance institutional, human and technical capacity; and
3. Fostering sustainability.

In our context, the second point deserves special attention, which is carried out through dedicated capacity building and training activities. In this context and in order to improve and enhance water research results and capacity in Africa, 50 research projects and studies were selected in 2005 as the initial core of the TIGER research component. Within this research component, a dedicated capacity building facility was created with the following objectives:

- Support at least 15 TIGER research projects with tailored capacity building activities; developing their human, technical and institutional capacity to use EO technology within the water management process.
- Contribute to developing sustainable information services and systems to improve IWRM (at regional, national and local scales) by using space-based technology to overcome the water information gap in African countries.
- Support the consolidation of a critical mass of technical centres, water authorities and universities in Africa with the skills and capabilities to derive, disseminate and use space-based water-relevant information for IWRM.
- Contribute to improving water research results in Africa by exploiting the advantages of EO technology.

ESA contracted the International Institute for Geo-information Science and Earth Observation (ITC) in September 2006 to host the TIGER Capacity Building Facility (TCBF). The first phase ended in March 2008. A new phase is planned to be launched soon.

2 ACTIVITIES IN TCBF

Finally, thirteen TIGER projects participated actively in the programme, and several individuals (mostly from the water management sector) joined some of the organized training courses.

Four basic activities took place in the TIGER Capacity Building Facility:

- Core training
- Applied short courses
- Project-oriented supervision
- Advanced courses

The first three activities focused on the selected fifteen TIGER projects, but the fourth group was open to other stakeholders too.

An important step in the implementation was the review of the needs, in which the participating projects expressed their capacity building needs, and the programme was tailored accordingly.

2.1 Core Training

TIGER Capacity Building Facility provided basic training for the African partners via distance education courses in two themes: "*Principles of Remote Sensing*" and "*Principles of Geographic Information Systems*". These courses were meant to broaden the capacities of the participating institutions at a basic level.

The study load was 130 study hours, which had to be completed in six weeks. Participants got the study material via mail, which included the software and all the information to be used. The self study did not require continuous internet access, so it could be used successfully even in countries with connection difficulties. Several ways of keeping contact was used for the supervision: e.g., via the Blackboard software, via e-mail, or telephone. The combination of the different means enabled the participants to contact the tutors whenever needed. At the end of the course, an examination took place to assess the achieved level and participants, who successfully set for it, got a course certificate.

Thirty three individuals got training in this setup. Some of them followed only one course; the others followed both of them.

2.2 Applied short courses

Each project was invited to send two persons to ITC to follow selected short courses (modules, in ITC terminology). A more advanced entry level was required for this then for the core training. These courses were basically meant for the practitioners, who have basic EO knowledge, and wanted to learn more advanced techniques applicable in their TIGER research projects.

Twenty five participants arrived to ITC, the Netherlands to follow 33 three-week courses. The topics varied from EO technological topics (like radar remote sensing), to water-related issues, depending on the needs of the partner projects. This setup was very much appreciated by the participants, because it provided not only direct exposure to the most advanced techniques, but also possibilities to meet other TIGER colleagues to learn to know each other personally and exchange ideas.

Additionally to the face-to-face short courses, two of the project members were entitled to enrol on selected advanced distance education courses. Each of these courses had similar setup to the ones in the Core Training, but the discussed scientific and technical issues were of a much higher level. Fourteen participants followed seven different topics using distance education.

2.3 Project oriented supervision

Participants of the applied short courses were also invited for a project-oriented consultation/research period at ITC. Individual supervisors were selected for each course participant according to the scientific topics of their TIGER research project.

Twenty one researchers got personal supervision. This was the most flexible part of the programme. The individual supervision focused on the gaps between the resources and the goals of the projects, so the supervision methods varied according to the needs. The participants were located in the TIGER cluster in ITC, which provided a forum for cooperation and developing the 'TIGER atmosphere' (Figure 1).

Figure 1 Discussion over a radar image in the TIGER cluster.

2.4 Advanced courses

Two advanced training sessions were held in Africa, which were also open to other stakeholders then the selected TIGER projects. The first course took place in November 2006, in the University of Western Cape, Cape Town, South Africa, whilst the second course was organized in 26-30 November, 2007, in RCMRD, Nairobi, Kenya.

In Cape Town, 25 participants attended the course from 14 countries, most of them leading scientists of TIGER projects, whilst in Nairobi 26 participants from 13 countries, mostly mid-level water managers.

Both courses were meant as eye openers, which were built up from classical blocks: lectures and practical exercises, although these latter ones got high emphasis to help the participants in understanding the theory. The presentation philosophy was to show that even complex tools (like radiative transfer models) "can work" in practical applications.

It is important to note that these courses were held in African institutions, which are advanced in the application of EO in water management. They did not only contribute with providing facilities, but also with contributing to the programme of the courses with lectures and case studies. This local involvement brought closer the lecturers and the audience to each other.

On the last day of the second course, a feed-back session took place: the course participants and the lecturers summarized the experiences related to EO applications in Africa in a round table discussion.

3 IMPACT ON AFRICAN EO PRACTICES IN WATER MANAGEMENT

The Tiger Capacity Building Facility focused on thirteen projects with activities 1-3. Nevertheless, this did not mean the exclusion of the others from the programme: they were invited to send participants for the advanced courses in Africa. Since the TIGER Initiative focuses on the existing institutional structure of the African countries, the first phase of TCBF supported the capacity building in these – mostly academic – institutions. The offered opportunities were ranging from introductory level EO and GIS courses to front end scientific short courses, according to the needs of the partners. Twenty two African countries were represented finally in the programme by 94 individuals (Figure 2). Although most of the included TIGER projects focus on a single country, the number of included countries is much higher then the number of projects, since African organizations used the opportunity to send participants to the advanced courses from a broader circle of institutions.

The first phase of TCBF primarily provided support to the ongoing TIGER research projects, to help achieving results at a high scientific standard. On the other hand, it can be considered as a training of trainers programme, which improved the academic level of the earth observation experts at the top institutions of Africa.

There is a follow-up support from the TCBF to the selected TIGER projects: the supervisors, who supported the research during the project-oriented supervision phase, help the African partners in publishing the results on selected EO and water management forums. This is an important step in informing wider communities about the implementation of EO technology for the benefits of African societies.

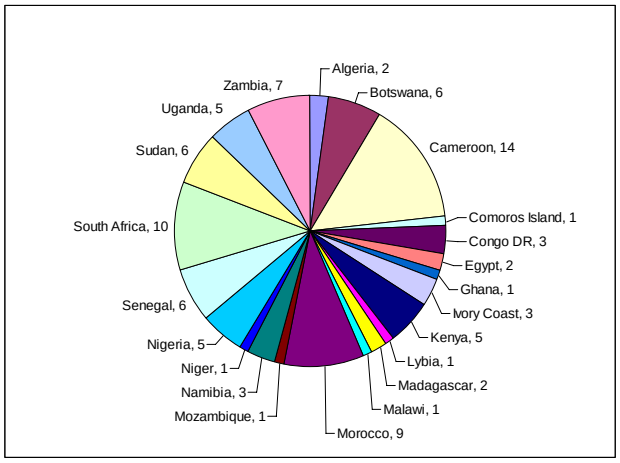

Figure 2 Distribution of participants of TCBF by countries

The first phase of the TIGER Capacity Building Facility was successful, that is clearly reflected in the feed-back from the programme participants that they gave anonymously after each unit of the programme. Here are some highlights from the comments (without the intention of assuming that this is a comprehensive overview of the broad palette of opinions):

About the tackled topics: "*I particularly appreciate the application of remote sensing techniques for water quality, flood and drought monitoring. I hope to bring these fundamental techniques to the knowledge of my colleagues for adaptation into various programmes and projects of my organisation.*" (Participant of the Second Advanced Course)

About the role of EO experts and water managers: "*Technocrats need it* [i.e. the course] *more than the managers but the former must know how to communicate information and data to the latter effectively and efficiently. Managers too must have some understanding to enable them appreciate outcomes/output from EO information & data*" (Participant of the Second Advanced Course)

About recommendations for the future: "*I think that the formula followed in this moment is good. It would be necessary* […] *to set up, or to sub-contract* […] *more specific trainings to the problems treated within the framework of the Tiger projects.*" (Participant of the Tailored Programme)

At the end of the second advanced course, a round-table discussion provided forum for exchanging ideas about the use of EO technology in African water management practices. It is difficult to include here all the interesting comments, but maybe one deserves quoting: "*The importance of communication was emphasized and the need of managers to be aware and appreciate the important role that RS can play in supporting improved water governance and decision-making. Therefore, the participants who are essentially senior technical people in their countries and are involved in decision making or at least influence decision making should spread this gospel when they return to their home countries.*"

Further comments about the second advanced course are published in the 8th Tiger Newsletter (TIGER 2005-).

Nevertheless, a selection, especially made by a biased party (in this case by the organizers of TCBF) can never show the full picture. Thus, in the next section, we try to make one step back and look at the outcomes from a distance, trying to find the most important positive and negative aspects, the lessons learnt.

4 LESSONS LEARNT

Without going into details, the practical and methodological lessons can be summarized as follows:

About the generic setup of TCBF

- The tailored programme was positively evaluated by the participants. Very active cooperation was formed between the supervisors and the African colleagues.
- Providing a flexible, tailored programme to the diverse needs of the partners is a complex task, but it pays off at the end in the satisfaction of the participants.
- There is a strong need for quasi-basic EO and GIS education in the research community in Africa. Many of the course participants were not at an advanced level, so the advanced courses were less efficient for them.
- Practical exercises are very much appreciated at every level of teaching.
- Information about ESA data availability was appreciated in all courses. It seems that many of the participants had originally very little knowledge about this.
- The follow-up support is very important in getting the research completed at a high level.
- Time is never enough.

About the distance education courses

- Properly constructed distance education material is a useful and affordable alternative for EO education even in countries, where technical limitations affect internet connections.
- The highest drop-out rate was experienced in the distance education courses. Investigations of the reasons showed, that office duties and other obligations divert course participants from the studies easier in this education form.
- The higher the scientific level, the more disciplined participants enrol on the courses. More drop-out occurred in the basic courses than in the advanced ones.

About the applied short courses and project-oriented supervision

- Supervision time is rarely enough.
- Data acquisition took a long time for the participants. This is partly due to the fact that around the start of the programme they did not exactly know what data were needed, and partly due to the time consuming data acquisition practices.
- In the peak of the programme, when many TIGER participants were at ITC at the same time, a group mentality developed, which facilitates further contacts and cooperation between the TIGER member/participant organizations and individuals. Unfortunately, some of the participants could not enjoy this advantage since they came to ITC in a period where not many other tiger-participants were enrolled.

About the advanced courses

- Giving such courses on the premises of leading African institutions on the one hand contributes to the courses with local examples and expertise; on the other hand it contributes to the institutions with the most advanced material and knowledge.
- Such short courses are mostly eye-openers, and it is up to the participants how much they can follow-up the discussed topics.
- Although Internet provides a wealth of information, due to technical limitations in most places of Africa, solutions have to be found to reduce the dependence from it (e.g. ‘internet in a box’). It is needed even if the Internet access is good at the location of the course, because many of the participants face such technical difficulties in their home countries.
- The academic community of Africa (represented by the participants of the 1st advanced course) needs such courses to get information about the advanced scientific developments. They can use such courses as the starting point for intensive learning. Unfortunately, this community is very small, and not evenly distributed among the countries.
- The EO product user community of Africa (represented by the participants of the 2nd advanced course) take advantage of such courses for the better identification of the user needs. This is a potentially much broader community, but only the tip of the iceberg can be reached by such courses. Therefore, these short courses serve their purpose the best if they are organized with different local partners at different locations for the influential key players.

About the future of TCBF

- The water information gap is the largest in the economically less developed countries. As such, the most advanced EO techniques can help in these countries with the highest efficiency, but these are the countries where the need is the highest for capacity building. Maybe this is the largest challenge of TCBF.
- Besides awareness rising training sessions, more formal education is also needed for the academic community of Africa (e.g. degree courses at MSc and PhD level) to gain the critical mass at the universities for building the knowledge base of the user community on their own.
- On-the-job training would be most welcome by many of the participants.
- Further involvement of water practitioners in the programme is needed.
- Proper embedding of TCBF in local institutions in terms of facilities and mandate should be guaranteed.

5 CONCLUSIONS

The first phase of the TIGER Capacity Building Facility is closed, and we can conclude that it successfully achieved its goals. Due to practical reasons, this level had to be limited; it could focus on the support of selected TIGER research projects. The personnel of these projects are located basically in the key academic and research institutions of Africa, and will play an important role in spreading the 'gospel', teaching and training of the upcoming generations of EO specialists and water managers.

The second advanced course, which was opening up to the user community, i.e. the water managers proved that there is an enormous need to fill the information gap which exists due to deteriorating measurement and observation networks. Water managers understand the potentials and the limitations of EO techniques, and are open to use EO-based information in their practice.

There is a new phase planned for the TIGER Capacity Building Facility. The programme has not been worked out completely yet, but looking back to the results of phase one, we can conclude, that it will have to focus on two major aspects: broadening the EO literacy among the information users, i.e. the water practitioners, and providing higher academic qualifications to the key players in EO research and education, to enable them to teach new generations of EO specialists and users in Africa.

6 ACKNOWLEDGEMENTS

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For further information, the reader is advised to turn to the TIGER Capacity Building Facility home site (ITC and ESA 2006).

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