

55941



UNITED NATIONS  
ECONOMIC AND SOCIAL COUNCIL

Dist.:  
LIMITED

E/ECA/NRD/CART/183  
12 February 1993

Original: ENGLISH

Economic Commission for Africa

Eighth United Nations Regional  
Cartographic Conference for Africa

Addis Ababa, Ethiopia  
22-27 February 1993

REMOTE SENSING EDUCATION AND TRAINING REQUIREMENTS  
FOR AFRICA IN THE 1990'S

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BY ..

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Abstract

The advent of the experimental missions to space in the 1960s laid the foundation of a revolutionized remote sensing technology. Henceforth, the trends of advancement of the technology were to determine the depth of man's understanding of the earth's resources and the environment on which the world is dependent for survival. In the developed world, important policy decisions on national goals for the advancement and utilization of the technology have already been put in place.

In Africa however, despite the great strides that the technology has made, remote sensing is yet to be fully incorporated in national development programmes. This can be blamed largely on the type and quality of education and training that Africans have had access to.

This paper evaluates the effectiveness of the existing education and training programmes in Africa, discusses the constraints inherent therein, and proposes a plan of action that will make Africa a beneficiary of, and active participant in remote sensing rather than a passive partner in a situation that is rapidly changing.

Introduction:

Remote sensing has since the successful launch of the first satellites dedicated to land resources observation in the early 1970's, become the most powerful technology in earth resources research, inventory, assessment and management. Indeed information that had hitherto remained the domain of the "unknown" has been unearthed by probing space vehicles, completely changing man's understanding of the natural resources of the earth, and how the delicate balances between man and his environment can be changed by his use of these resources. Already, remote sensing from space has been applied to a variety of multi-disciplinary but thematic projects worldwide with successes unachieved before with conventional methods of natural resources development. The enthusiasm thus far generated has resulted in the development of a variety of earth observation satellites which orbit the earth daily, collecting unique and exciting types of data about its resources. The 1990s are going to see an intensification of space earth observation programmes of increased sophistication and utility, that will further enhance man's perception of the earth and its environment.

Unfortunately, Africa trails at the tail of the other continents in the ability to take advantage of this technology, yet it is the most affected region of the world by acute environmental degradation, famine, drought and other natural calamities. Further, it is Africa that has least developed its policies for resources exploitation because of lack of the right knowledge about these resources.

Even at this stage in time when many nations of the world have put in place national policies about the employment of space earth observation technologies in their resources development and management strategies, only a few African countries have drawn up elaborate plans to introduce these

technologies to a wider spectrum of users within their frontiers.

This happens against the background of a bleak future for Africa unless a deliberate plan of action is taken by the region's governments to dedicate themselves to making the continent a technological power. Indeed as the World Bank\* reports, "African governments must comit themselves to training a cadre of world-class scientists and technologists if they are to avoid economic and social catastrophe on an unprecedented scale in the next century."

Remote sensing training and education in Africa is simply not achieving the results to get the continent out of this World Bank prediction, and neither are other technologies developing fast enough, despite the fact that most African governments are reported to spend more of their national budgets on education and training than other sectors of their economies.

#### The Historical development of remote sensing training in Africa:

Following the successful launch of the first generation land resources satellites in the early 1970's by NASA ie, the Landsat Series, resources mapping agencies in the developed world were quick to carry out research in the thematic applications of the data collected by these satellites as an evaluation of the utility of such data. The enthusiasm so developed was quickly copied by UN agencies and the private enterprise who realized a new turn in the methodology of execution of their tasks. Many governments and UN agencies were eager to share these new found thrills with the less developed countries, and so started the remote sensing education and training programmes in Africa.

In Eastern and Southern Africa sub-region, the history of training dates back to 1977 when the US Government through its agency for development, USAID, signed an agreement with the Regional Centre for Surveying and Mapping to assist the latter to avail remote sensing technical services and training to the member States of the sub-region.

In the agreement that the Centre signed with USAID, although the training component was given a prominent emphasis, the intention was to develop middle level technicians and users as is vividly seen from the objectives of the agreement below:

- i) to organize training courses, seminars and demonstrations at periodic intervals to stimulate the utilization of remote sensing technology;
- ii) to provide on-the-job training to earth resources scientists;
- iii) to conduct research in the possible areas of application of remote sensing;

Through the USAID assistance to the Centre within the confines of this agreement, the Centre organized several short courses and seminars for scientists from the sub-region. The courses so conducted were discipline specific in earth resource areas such as agriculture, geology and mineral exploration, forestry, cartography, rangelands, water resources and environmental monitoring. These courses took any one of the following formats:

- i) 3 weeks intensive courses
- ii) 1-2 weeks information seminars
- iii) 4-12 weeks extended courses
- iv) 1-2 years training courses leading to Master of

Courses held on formats i, ii, and iii above were held either at the Centre or in one of the member States of the sub-region.

By the end of 1990 when USAID assistance to the Centre expired, close to 1,500 multi-disciplinary scientists had gone through the above courses. Of this number, only 2 benefited from Masters courses in the USA through the Centre.

In 1982 the French Government joined hands with USAID in funding training courses to the sub-region through the Regional Centre. These courses took and continue to take the same format as those organized through USAID assistance. The French funding for training has so far benefited 250 scientists amongst whom some have attended 1 year courses, in France.

Alongside the above two, other funding sources for short courses at the Centre have been UN agencies, (in particular UNITAR, UNEP, UNESCO, UNOSAD and FAO), the European Space Agency (ESA) and ITC. Courses funded by this group of agencies have been less frequent and only a few scientists from the region have benefited from them.

There have been other training programmes in the sub-region which are organized on a bilateral basis between a donor and a particular country. Most of these bilateral programmes have been short-term in nature, and because the participants train in the donor countries, only very few scientists from the sub-region have been trained so far.

These programmes have jointly produced a team of remote sensing users throughout the region. The community of users of remote sensing that has made use of the facilities at the Regional Centre is indeed, principally the former course participants to courses discussed above.

Elsewhere in Africa, other donors have supported remote sensing training through regional centres such as the Regional Centre for Training in Aerospace Surveys (RECTAS), Ile Ife, Nigeria, Centre Regional de Teledetection de Ouagadougou (CRTO), Burkina Faso, and on bilateral arrangements. National centres such as those in Egypt, Morocco and Zimbabwe have benefited from these bilateral arrangements.

Evaluation of the Remote Sensing Education and Training Programme in Africa:

The format of most of the training courses provided in the efforts discussed above was evidently drawn up to introduce some scientists and technicians to remote sensing. For this reason, training priority has usually been given to short courses and information seminars lasting about 3 weeks for professionals. Clearly, this amount of training is insufficient to produce high-level scientists that can participate effectively in development and utilization of remote sensing.

On bilateral arrangements however, a few scientists have pursued higher degrees to PhD levels. The numbers who have benefited from this opportunity however are indeed infinitesimally small, considering the African demand for this type of personnel. Very few university departments as a result, have any elaborate remote sensing programmes at all. There are no research programmes on the development of the technology being carried out in Africa (eg. development of sensors, processing techniques, new or improved applications, etc.) by Africans at all.

Inherent Constraints:

The slow development of the remote sensing education and training in Africa can be attributed to the reasons listed hereunder:-

1. Africa's over-dependence on donor-assistance:

i) Clearly, the objectives of the donors are usually never the same as those of the recipients in development. Whereas the donors preferred to offer short-term training courses to a few African professionals who would in turn train more users of remote sensing, Africa's real needs require long term training objectives that will initiate programmes of education and training that will see Africa participate actively in the space era as a partner rather than an observer. It is not surprising that even after USAID spent 12 years and close to USD7 million on developing remote sensing in Eastern and Southern Africa, only 2 scientists received Masters degrees on USAID scholarships. There was in the period, virtually no relationships established between institutions of research and higher learning in Eastern and Southern Africa, and similar institutions in USA for purposes of advancing remote sensing.

ii) Usually donor funds that are provided for the development of an activity such as this one are administered by personnel in their respective embassies whose personal interests override the intentions of their governments and who least understand the subject matter of the project at hand. Some remote sensing projects (with a training component) have been terminated in the Eastern and Southern Africa region because the administrators clearly did not understand the technology and its value.

iii) Lastly, because of Africa's over-dependence on external assistance for the development of remote sensing, those trained at higher levels outside Africa are usually very few because of the non-availability of sufficient scholarships.

2. Wrong target groups:

The education and training, so far, given in Africa has mainly targeted the professionals. Very little attempt has been made to educate other groups such as decision makers, opinion leaders, managers, the private sector, high school students and the public at large. All these must be involved in any successful education and training programme. Experience has shown that many mid-level professionals in the African civil service do not influence decisions. They are in fact not able to organize in-house training programmes to teach their colleagues after they have undergone a training programme. They finally find themselves out of the civil service (because of the lower motivation levels in the civil service) in places where they do not apply remote sensing.

Experience in the developed countries shows that remote sensing is more and more being developed by the private enterprise. Unfortunately, these scientists in Africa do not get access to the technology because their managers do not know it.

3. Wrong venue of training:

The few Africans who receive training in remote sensing institutions in Europe or America most usually find themselves dormant because they do not have the same equipment on which they trained. This is another case of the disadvantage of over-dependence on aid assistance.

4. Improper political guidance:

The brand of politicians in many African countries disregard the value of high quality education and training in favour of monetary gains from positions of decision making. It is not uncommon to find an illiterate minister

of Natural Resources or Environment or Mines and Geology, etc. This is a hard group to educate, however, elaborate an education programme might be.

Education and Training Needs for Africa:

It is no exaggeration that Africa is the least developed continent on the globe. It is also true that the rate of technological development is slowest in Africa worldwide. Further, Africa suffers more from environmental, political and economic problems than any other part of the world.

The times ahead are promising only to those who can benefit from the rewards of technological development. In this regard, Africa must take advantage of the developments that it can participate in developing, such as remote sensing.

In the 1990's, Africa's remote sensing education and training requirements to answer the above will be:-

1. The development of public awareness in matters relating to remote sensing and its applications to natural resources inventory, planning and management as well as environmental protection.
2. Incorporation of remote sensing education in the formal education curricula from secondary school to university.
3. The development of a high calibre scientific and research cadre that will make Africa a space power.
4. The development of a large applications/user community to take advantage of the space developments in 3 above.

A suggested Plan of Action:

As the World Bank has pointed out, Africa is simply not competitive enough in an increasingly competitive world, and if it wishes to benefit from the advances in the advancement of science and technology, the continent must improve its education and training, and aim toward the highest standards. Africa must develop its own indigenous scientists from amongst the pool of talented Africans to run the scientific and technological institutions on the continent, which can participate in the advances taking place around the developed world to-day. In order to achieve this in remote sensing, the following outline of activity is proposed:-

1. Each country in Africa should form a panel of remote sensing experts to guide its respective government in the development of remote sensing. The panel should draw up an education and training program for all groups of persons and institutions involved in remote sensing such as: the politicians, managers, university professors and researchers, professionals, teachers, the public, etc. For each group, a detailed curriculum should be developed in accordance with the national goals, as well as methods of ensuring that the education or training is achieved. The panel should also review such programmes from time to time, and take advantage of new developments being developed internally in the country's institutions of research, as well as externally by other researchers around the world. The panel should draw up the country's remote sensing policy that the government will adopt.

2. Since the development of the remote sensing technology is an expensive undertaking, there will be need for regional cooperation through regional Centres such as the RCSSMRS, RECTAS, CRTO, etc. Member states of such Centres should make a committed effort to benefit from and share with

and processing stations, and other expensive installations and expertise.

3. The regional Centres should on their part, jointly establish one African Institution of advanced research and education where such activities as research on space platforms; sensor design, image processing, etc. can be carried out. This institution will be responsible of propelling Africa into space in the next 10 years.

To do this, this institution will collaborate with and draw from the experience developed by space agencies around the world such as CNES, NASA, Swedish Space Agency, ESA, etc. Africa certainly has the human resources that can be trained to develop space systems.

4. At all levels, national, regional or continental conferences and/or seminars or workshops should be organized by those concerned to review planned projects, projects in progress and those accomplished. Such forums will also benefit from the ideas of invited eminent space scientists and remote sensing experts from around the world.

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