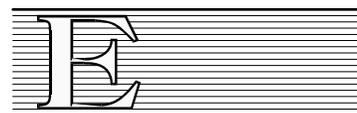**UNITED NATIONS**
**ECONOMIC AND SOCIAL COUNCIL**

**ECONOMIC COMMISON FOR AFRICA**

**Third Meeting of the Committee on**
  **Sustainable Development (CSD-3)**

**Addis Ababa, Ethiopia**
**7-9 October 2003**

**Parliamentary Documentation**

# MAKING SCIENCE AND TECNOLOGY WORK FOR THE POOR AND FOR SUSTAINABLE DEVELOPMENT IN AFRICA

# MAKING SCIENCE AND TECHNOLOGY WORK FOR THE POOR AND FOR SUSTAINABLE DEVELOPMENT IN AFRICA[1]

## Introduction

The importance of Science and Technology to modern societies, and the role of a technologically informed population in promoting social and economic development, have long been recognized. Further advances in technology are creating new methods of communication and information handling, which have profound effects on society at large as they bring unprecedented opportunities and challenges for scientific endeavors. African countries that have not sufficiently addressed the acquisition of scientific and technological knowledge must now redouble their efforts with a strategy that begins with the popularization of science and its application to development in concrete terms.

Although science has a universal character, it is supported or constrained by practices, which are influenced by local customs and values. In Africa, these behaviors and practices are deeply rooted in traditional beliefs and superstitions that are not easily displaced by science or by modern approaches based on new knowledge. Policies for science and technology for development, therefore, need to take into account the nature of the local environment, in order to effectively deliver the benefits of science to society. Herein lies the challenge for African nations and their governments.

There are several reasons why a focus on science and technology to benefit the poor in Africa is both appropriate and timely. Most important among them is that the number of people living below the poverty threshold in sub-Saharan Africa is still growing, from 242 million to 300 million during the 1990s. Secondly, science and technology is the most important, readily available means for empowering the poor. African countries need the capacity to explore the socio-economic implications of new technologies, especially to be able to predict their impact on society, to identify emerging opportunities, and to serve as early-warning system to forecast technological threats. For this, new approaches are needed which would shift the direction of scientific development from its current programs that are elitist and conservative, to new initiatives that are inclusive and populist, and which would be of more direct benefit to the poor.

The rapid growth and unprecedented influence of new technologies, especially the information and communication technologies including the Internet, is raising global awareness of the power of technology as a whole. It is now compelling for African countries to invest in these or risk widening the gap between them and the rest of the world. It is this realization that should bring science and technology, and the strategies for making them work for development, to the top of the African agenda. The key issue should be the empowerment of individuals and groups, to be able to use scientific knowledge and technological know-how to address such pressing problems as prevention and treatment of HIV/AIDS and other public health crises, food security and nutrition, high unemployment, drought, and water supply.

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[1] Paper prepared with the assistance of a senior international consultant, Mr. Akin Adubifa

Initiatives in public understanding and utilization of science would consist of finding the means to deliver scientific information to lay people in a manner that makes it attractive and enjoyable, as well as training scientists on how to communicate their messages effectively. Several instruments are available, particularly through formal and informal education: media presentations by experts and practitioners to interpret for the general public the scientific and technical aspects of such issues of concern as farming methods, community healthcare, etc.; broadcasts of relevant science and technology messages about daily living, highlighting the implications of science and technology to matters of daily routine; and exhibitions, fairs, and science competitions, all of which present opportunities for the public to see, ask questions about products and processes.

These initiatives must seek to answer questions about how technology should be used to facilitate development, what role the private sector and the non-governmental sector should play, what technologies should be promoted, and what type of educational structure and curricula would facilitate the achievement of national objectives. The strategies of delivery would include a restructuring of science education, a focus on the utility of scientific culture, the use of familiar materials and processes, and teaching through indigenous science and technology practices, including in indigenous languages.

## Science and Technology for Sustainable Development

Understanding of science and technology is an essential pre-requisite for making wise choices in the acquisition and utilization of knowledge resources, which are to be fully deployed towards human development and welfare. Attempts to bring the benefits of science to society require a certain threshold of capacity to understand science and its implications, and to recognize the daily opportunities to make science work for people.

The challenge to develop strategies that promote a science-technology culture has taken on greater significance because the popularization of science and technology takes place in a wide variety of practices. It also generally seeks to:

- encourage society at large to share in the fruits of science;
- make careers in scientific fields more attractive, accessible and beneficial to a wider sector of society, especially women;
- demystify scientific phenomena  through the application of science and technology to everyday problems;
- sensitize the population at every level to the daily occurrences and applications of science;
- promote a view of science as "fun" and enjoyable, especially to encourage active participation by children; and
- use science and technology in addressing the present crises that are the daily concerns of the population.

**Key Issues for Sub-Saharan Africa**

Many countries are taking the traditional route of formal education to try to meet the challenge of popularization, but this has proved inadequate. Sometimes, local culture gets in the way. The most critical obstacle is the competing demand for limited resources. By comparison with developed countries, a number of additional factors can be identified that account for the widening of the gap between them and sub-Saharan Africa.

A.  Poor Quality of Curriculum in Formal Education:

There are weaknesses and deficiencies in the science education curricula and their delivery in the education system. First, the schools enrollments are low, particularly for girls and rural populations. A significant percentage of youths thus lack access to the feeble science and technology programs that exist in the curricula. Furthermore, there are very few incentives to draw the youth into careers in science and technology.

B.  Low Standard of Formal Education:

The teaching of science and technology requires a special form of instructional communication. Science teachers are not adequately trained in such skills. For example, they are seldom able to show the correlation between science and everyday living. In addition, teachers are often so poorly paid that they cannot devote the necessary amount of attention to the needs of their students. Hence the general public does not become enlightened consumers or "intelligent users" of their natural environment.

C.  Unsuitable Delivery of Non-Formal Education:

The major weakness here lies in the sources of knowledge and information. The nature of what is available, the form in which it is available, and the ability to use it productively are the main concerns that must be addressed. The non-formal approaches often miss the underlying principles of science, as they tend to concentrate on a shallow interpretation of scientific applications without the requisite knowledge base. There is need to consider new instruments such as media presentations by experts and practitioners, and regular broadcasts of science and technology messages that are relevant to daily living.

D.  Cultural Environment:

In many of Africa's rural and tribal communities the explanatory theories that shape their understanding of their environment stem from cultural beliefs and traditions, as well as age-old superstitions. These influences are not easily displaced by science or its popularization programs.

**A Framework for Action**

Stakeholders in African development need to appreciate the imperative of giving greater attention to pro-poor policies. They should also recognize that strategies that specifically target the poor are more beneficial to national development.  Although external influences and global economic climate have often defined the limits of African possibilities, the performance of African countries even within those limits has been poor. Stakeholders now have to come up with new policies that recognize that development should be participatory, start from the grassroots, and provide equitable benefits for the whole society.

Programs to Implement Popularization of Science

Initiatives in public understanding of science would consist largely of finding the means to deliver scientific information to lay people, and training scientists on how to get their messages across. Instruments that capture the interest and imagination of the general public are usually effective in popularizing science and simple application of technology. The  programs should seek to:

1. Encourage creativity and innovation in everyday scientific and technological activities, and provide incentives for participation.
2. Provide opportunities for the general public (especially the youth) to appreciate science and technology and participate in its development.
3. Demonstrate the linkages between basic and applied science and technology, and showcase their role in development.
4. Give visibility to successful projects and research results that impact on society's progress and development.
5. Honor and recognize scientists and technologists who make significant contributions in their fields.

A strong program for the popularization of science needs to be located in a similarly strong institution that carries a clear mandate for this purpose.  Such a focal point institution has to be both regulatory and advisory, under an oversight arrangement that is as close as possible to the highest levels of government. The institution needs to be invested with enough authority to be able to command the respect and cooperation of other institutions and organizations, both public and private that are relevant to the popularization of science. The government should demonstrate its political will towards such a program through appropriate funding and political patronage.

As stakeholders collaborate to bring synergy to the implementation of programs to popularize science, the following table summarizes the activities with policy instruments that can be implemented to make science and technology work for the poor in Africa.

## ACTIVITIES FOR POPULARIZATION OF SCIENCE AND TECHNOLOGY

| PROGRAM | KEY ROLE PLAYERS | IMMEDIATE OBJECTIVES | IMPLEMENTATION SRATEGIES | IMPLEMENTING ORGANISATIONS |
|---|---|---|---|---|
| Policy Reform | Government | Increased capacity for policy formulation and implementation | Seminars on S&T relevance; policy analysis workshops | Inter-ministerial committees, media, universities, professional associations. |
| Adult Education | Parents | Enhance capacity to motivate children; create awareness | Adult education; training in S&T components in daily experiences | Adult education institutions, media, NGOs, Women's groups. |
| Training of Teachers | Teachers | Enhance public understanding of S&T culture; improve schools curriculum | Reform teacher education through in-service training | Ministry of Education; Professional associations |
| Students Education | Students | Motivate interest in mathematics; encourage careers in science | Classroom instruction, extra-curriculum activities, science clubs | Accredited schools, qualified teachers, private sector, professional associations, clubs |
| Communication | Scientists | Acquire skills for communicating science with government and public; increase interaction with society | Strengthen internal networking; increase role of scientific organizations and academies; establish collaboration with media | Professional associations, media, academies, communication specialists. |
| Science Journalism | The media | Increase interest in S&T issues; improve coverage and analysis of science reporting | Train media staff, establish links with institutions, widen coverage of science, and allocate more air time. | Media executives and practitioners, scientists, professional associations. |
| Public activities (Fairs, Lectures, Exhibitions, etc.) | Government, NGOs, Universities | Interpret science for public understanding | Include science events in national festivals and public celebrations. | Schools, Libraries, Professional associations, Clubs |
| Science Competitions | Teachers, students, parents, NGOs | To sharpen interest of students and the youth in S&T | Organize inter-school events with prizes and incentives for participation | Government, schools, private sector. |
| Research | Science policy institutions, Ministry of Education | To improve the effectiveness of programs and provide technical support. | Collection and analysis of data to monitor performance and introduce new methods | Educational institutions, Donors, Consultants |
| Monitoring and Evaluation | Government | To provide feedback for improving efficiency and for policy reform | Establish independent commission of experts from public and private sectors. | The Commission, schools, professional associations, consultants. |

**Recommendations**

1.      National governments should establish a committee of experts to make a comprehensive study of the country's infrastructure that would support the activities for popularizing science and technology. The committee should recommend appropriate institutional arrangements, articulate achievable national objectives, and propose a program of work for establishing national activities for this purpose.

2.      The government should mobilize resources to be dedicated to science and technology development, and apply some of this to support the science popularization program. It is recommended that the Debt Swap option be explored as a means of reducing the nation's foreign currency debt obligations while boosting the resources available for science and technology development.

3.      It is recommended that national strategies should place some priority on:

- Restructuring science education
- Science and technology literacy and utilization of scientific culture
- Use of familiar materials and processes
- Teaching of science through indigenous science and technology, and
- Transfer of skills to national experts through study visits and South-South cooperation.

4.      It is recommended that national professional associations become pro-active and utilize their professional standing to improve career development in the sciences.

5.      Noting that donor support for science and technology development in Africa has been dwindling in recent years, it is recommended that donors should recognize the new opportunities that are arising from the unprecedented commitment of African nations through programs like NEPAD. They should commit themselves to collaboration on broad-based science popularization programs in which the entire society is the beneficiary. They should also use their comparative advantage to target women and the poor in rural and isolated locations.

6.      The Economic Commission for Africa (ECA) has comparative advantage through its convening power that can link focal point institutions. It can also provide countries with a knowledge base of international experiences and best practices that is not usually available at the country level. It is recommended that the ECA assist African countries to introduce a dynamic science and technology approach into the NEPAD program in order to facilitate the application of technological tools in their development.