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**NUCLEAR SCIENCE AND TECHNOLOGY FOR DEVELOPMENT
IN AFRICA**

NUCLEAR SCIENCE AND TECHNOLOGY FOR DEVELOPMENT IN AFRICA

INTRODUCTION

1. In their efforts to create and utilise capacities in science and technology for national development, many African countries have also devoted attention to nuclear science and technology with a view to exploit its special features and applications in many fields of human endeavour. In spite of its relative newness in use, nuclear science and technology is already making its contribution in water resources management, environmental protection, food and agriculture, radiation protection and safety, animal production and health, human health care, and quality control in industry. These developments have benefited from deliberate national policies in nuclear science and technology and have led to the setting up of infrastructure and promoting human resources for the various components of the peaceful uses of nuclear energy. The United Nations, its specialised agencies particularly the International Atomic Energy Agency (IAEA), Food and Agriculture Organisation of the United Nations (FAO) and other national institutions in developing countries have lent their support to this endeavour.

2. On a global basis cooperation and exchange in nuclear science and technology could be traced to the 1954 General Assembly resolution which foresaw the establishment of the IAEA to facilitate the use, by the entire world, of atomic energy for peaceful purposes and foster international cooperation in its exploitation for the common good of mankind. The convening, in 1955, of the first International Conference on the the Peaceful Uses of Atomic Energy added impetus for worldwide cooperation in nuclear science and technology.

ACQUISITION AND TRANSFER OF NUCLEAR SCIENCE AND TECHNOLOGY

3. The basic notions of nuclear science are acquired through the normal university physics courses. The number and quality of training have improved over time as more universities were equipped to offer this type of courses and deeper specialisation in nuclear science and technology. A UNESCO survey of education and research in basic sciences and technology carried out among two hundred and seventy five teaching and research institutions in 25 African countries confirmed the existence of various M.Sc and Ph.D nuclear physics and nuclear instrumentation programmes. In view of the limited facilities available in many African countries, most of the advanced training and research is accomplished in overseas institutions.

4. Most if not all of the non proprietary technology transfer in the field of nuclear science and technology has taken place under the patronage of the International Atomic Energy Agency (IAEA) which was established in 1957. Since its inception the IAEA has been instrumental in channelling multilateral technical assistance to many countries in nuclear research and applications. In terms of building the technological capacities of developing countries in Africa, the process of technology acquisition and transfer has been multifaceted, including: assistance in determining the countries requirements and setting up appropriate framework of policies and plans to meet them; provision of technical experts for training, research, and execution of field projects in conjunction with local experts; fellowships at leading institutions, scientific visits and management seminars; upgrading of infrastructure for research, testing, training. These and

many variants of the same have served as major channels for transferring skills, expertise, tools and experience for safe handling and application of nuclear science and technology in Africa.

5. The growth of interest in nuclear science and technology and extent of involvement of African countries in applications can be illustrated by the growth of African membership in the IAEA, membership of the African Co-operative Agreement for Research, Development, and training Related to Nuclear Science and Technology (AFRA), and the participation of African countries in nuclear technology applications in the agricultural field. This is given in Annex 1 & 2.

6. A considerable number of nuclear applications in addressing issues of development bring into convergence interests of several countries, and increasingly regional activities have assumed considerable importance. The eradication of plant pests e.g tse-tse fly in large areas of the continent, various applications of nuclear technique in agriculture (plant breeding and genetics, food irradiation to control food losses, and diminish incidence of food borne diseases), nuclear medicine, etc. are among areas of common interest. Increasingly regional cooperation in nuclear science and technology is being pursued under the umbrella of AFRA which came into force in April 1990. The agreement, initially for a five year period, has now been extended by five years till 2000.

NUCLEAR SCIENCE AND TECHNOLOGY WITHIN THE UNECA PROGRAMMES

7. Interest and activities in nuclear science and technology within the United Nations Economic Commission for Africa have focused on creation of awareness on the useful applications of nuclear techniques and institution building. Initially these efforts were oriented mainly at nuclear energy. Currently a more broad approach is emerging, which looks at a wider range of issues ranging from expansion of knowledge in the subject matter of nuclear science and technology and extending to nuclear applications in support of sustainable development.

8. The ECA's mandate in nuclear science and technology derives from the Commission's Terms of Reference adopted by ECOSOC resolution 671 A(XXV) of 29 April 1958, and subsequent decisions of intergovernmental bodies which called upon member States to develop their human and institutional resources in nuclear science and technology, the Lagos Plan of Action, Section XI para 294(c), and Commission resolutions 572(XXI), 688(XXV) and 575(XXVIII). Consequently the activities in this area have been developed under two broad categories i.e. creation of awareness among the member States on the peaceful uses of nuclear science and technology, and the establishment of the institutional machinery to foster collaboration and common action in the development and utilization of nuclear science and technology in the African region.

9. In this regard the ECA Secretariat convened a meeting of Plenipotentiaries on the Establishment of African Nuclear Energy Commission from 2 to 25 May 1989 which considered the Secretariat's proposals on the establishment of the African Nuclear Energy Commission for

the development of nuclear science and technology in Africa. The meeting recommended that a Technical Advisory Committee for the development of nuclear science and technology in Africa (TACNUSTA) be set up, and this was adopted by the Commission in resolution 688(XXV). As already stated in document ARCST/1/4 the subject of nuclear science and technology will be covered by the African Regional Conference on Science and Technology.

10. In the area of nuclear applications, the ECA has for a long time promoted the development nuclear energy as a viable alternative source of energy in Africa. Recently the Secretariat directed its attention to other aspects mainly food and agriculture and water resources development. In 1992 the secretariat carried out a study on experiences in nuclear technology transfer for agricultural production and food preservation in Africa. The study was examined by an Ad-hoc Expert Group meeting on nuclear science and technology which was organised by the secretariat in October 1992. The meeting outlined priority areas for action in assisting member States in nuclear science and technology. It called upon ECA to establish a data base on the nuclear science and technology potential in African member States, and to foster a regional approach in its utilization. It also endorsed guidelines for a draft regional project on the application of nuclear science and technology for food security, economic integration and sustainable development in Africa. ECA was called upon to elaborate phase one of the project.

11. The second Ad-Hoc Experts Group meeting met in May 1994. It examined the state of the development of nuclear science and technology in various African countries, and noted the progress made in mobilising resources for the implementation of phase one of the regional project developed by the first experts group meeting. This project phase covered a survey of existing nuclear science and technology potential, sensitization of member States to the use of nuclear techniques in the food and agriculture sector in Africa paying special attention to mobile and multipurpose nuclear technology equipment. Inputs were also sought for the remaining three phases of the project which would concentrate on building capability in nuclear micro analytical techniques, experimental irradiation treatments, and industrial irradiation respectively.

12. Based on the co-operation extended to the Secretariat by the Arab Organization for Agricultural Development (AOAD) in Khartoum, some funds have been made available for the partial implementation of phase one of the projet. This will will include: economic pre-feasibility studies on the application of nuclear science and technology for food security in Egypt, Tunisia, Algeria, Morocco, Cote d'Ivoire, Kenya, Zambia and Ethiopia; design guidelines on appropriate multi-purpose nuclear facilities for agricultural development and food security; and updated information on the potential in nuclear science and technology in member States.

13. ECA secretariat believes that all African member States should avail themselves of the opportunity to exploit the peaceful uses of nuclear technology to fulfil their socio-economic aspirations. The exploits of nuclear energy have already demonstrated its efficacy in the use of isotope techniques in hydrological explorations, improvement of animal health and nutrition, quality control in industry; the fight against animal and plant pests- the eradication of pests like the New World Screwworm in Libya, the Mediterranean fruit fly in northern Africa, and the use

of Sterile Insect Technique to fight against tse-tse fly (currently in Zanzibar, United Republic of Tanzania). It is worth noting that in a number of instances, nuclear techniques offer the most viable route to the solution of a given problem.

14. ECA considers cooperation with AFRA and IAEA on African programme activities very crucial for a more synergistic impact of the two organizations' programmes. It desires to work out more detailed modalities of cooperation for the benefit of the African countries. The secretariat's participation in the Sixth Technical Working Group of AFRA in April 1995, left no doubt that a lot is happening already in useful nuclear applications in the social and economic field of a few African member States. It was also clear that OAU and ECA were seen as essential partners of AFRA in its ongoing initiatives to gain more political support among the African governments and secure resources from the donor community. Very close collaboration exists between ECA and OAU in their effort to popularise the use of nuclear energy for peaceful purposes in the African region. Closer consultation and collaboration is developing between ECA and IAEA and it is envisaged that ECA will cosponsor with the IAEA a Regional Seminar on Food Irradiation to Control Food Losses and Food-borne Disease in Africa early in 1996. At the initiative of AFRA and IAEA, ECA attended the Sixth Technical Working Group Meeting of AFRA in Johannesburg in April 1995, and established useful contacts with the AFRA membership. These developments should be expanded so that future collaboration amongst the various organisations makes better impact in uplifting the capacities of member States in the field of nuclear science and technology.

15. In reviewing the information above, and in the deliberations which will ensue, the meeting should direct its attention to policies and strategies which need to be developed in order to strengthen Africa's hand in mastering and utilising nuclear techniques in its socio-economic endeavour. In this regard it is hoped that the deliberations will help the meeting in addressing the following issues:

(1) What measures could enable all African countries avail themselves of the benefits of nuclear science and technology

(2) In what way can regional cooperation in the development and utilisation of nuclear science and technology be intensified and widened to include more African member States?

(3) What should be done to increase synergy in the regional programmes and activities of the ECA, OAU, AFRA, IAEA, etc. for promoting the peaceful uses of nuclear energy in Africa?

(4) What concrete action should be taken to realise the formation of an association of nuclear scientists and technologists in Africa as a means to foster closer collaboration amongst them?

A: YEAR OF MEMBERSHIP OF THE IAEA

- 1957 - Egypt, Ethiopia, Morocco, South Africa, Tunisia
- 1958 - Sudan
- 1960 - Ghana, senegal
- 1961 - Mali, Zaire
- 1962 - Liberia
- 1963 - Algeria, Cote d'Ivoire, Libyan Arab Jamahiriya
- 1964 - Cameroon, Gabon, Nigeria
- 1965 - Kenya, Madagascar
- 1967 - Sierra Leone, Uganda
- 1969 - Niger, Zambia
- 1974 - Mauritius
- 1976 - United Republic of Tanzania
- 1983 - Namibia
- 1986 - Zimbabwe

Source: IAEA Bulletin: Quarterly Journal of the International Atomic Energy Agency, Vol.37, NO.1, 1995

B. MEMBERSHIP OF A.F.R.R.A

- 1990 - Tunisia, Egypt, Algeria, Nigeria, Madagascar, Morocco, Kenya, Sudan
- 1991 - Ghana, Tanzania, Mauritius, Cameroon
- 1992 - South Africa, Zaire
- 1993 - Ethiopia, Zambia
- 1994 - Niger, Cote d'Ivoire

Source: IAEA Report to the Sixth Technical Working Group Meeting of AFRA - (IAEA Doc. AFRA 9506, April 1995)

ILLUSTRATION OF AFRICA'S PARTICIPATION IN
NUCLEAR PROJECTS AND PROGRAMMES

Countries	D1	D2	D3	D4	D5	D6	
Algeria	1T	-	1T	-	1T, 2CR	1T, 1CR	7
Cameroon	1T	1CI	1T, 1CR	-	-	-	4
Cote d'Ivoire	1T, 1CI	2CR 1CI	2T, 2CR	-	-	1T, 1CR	10
Egypt	1CR, 1CI	1CR	1T, 1CR, 1CI	1CI	1T, 2CR, 3C	1CR	14
Ethiopia	-	-	2T, 2CR	1CI	1	-	6
Gabon	-	-	-	-	-	-	0
Ghana	1CR, 2CI	1T, 3CR, 1	2T, 3CR	2T, 1CI	-	1CR	21
Kenya	1CR	1CR	2T, 2CR	1T, 3CI	2CR, 2CI	-	13
Liberia	-	-	-	-	1T, 2CI	-	0
Libyan A.J.	-	1T	-	2T, 1CI	-	1CR	5
Madagascar	1T	-	-	-	-	-	1
Mali	-	2CR	1T, 2CR	-	-	-	5
Mauritius	1T	-	-	-	-	-	1
Morocco	1T, 1CR, 2CI	1T	2CR, 1CI	1CI	-	1T	9
Namibia	-	-	-	-	-	-	0
Niger	1T	-	2T, 2CR	-	-	-	5
Nigeria	2T, 2CR, 2CI	1T, 1CR	1T, 4CR	1T, 1CI	2CR, 1CI	2CR	20
Senegal	1T, 1CR, 2CI	-	3CR	-	-	-	7
Sierra Leone	1T, 1CR	-	1T	-	-	-	3
South Africa	-	-	-	-	-	1CI	1
Sudan	1CR	1T	2CR	-	-	-	4
Tunisia	2T, 1CR	-	1T, 1CR	-	-	-	5
Uganda	1T, 1CI	1T, 1CR	2CR	1T, 1CI	1T, 1CI	-	9
U.R. Tanzania	1CR	-	2T, 2CR	1T	1T	-	10
Zaire	1CI	1T	-	-	-	1CR	3
Zambia	1T	1T	1T, 2CR	2T	2T	1C	11
Zimbabwe	-	-	1T, 2CR	1CI	1CI	-	7
No. contracts	37	22	58	21	30	13	181

Source: UNECA STS/NRD/TACNUSTA/1/92