# IAEA Technical Co-operation Activities: Africa

This third article in the series is written by Abdel Abu Bakr, Area Officer for the Technical Assistance Programme in this region.

**In 1975 Tanzania became the newest African Member State of the International Atomic Energy Agency, bringing the total African membership of the Agency up to 25 countries. The other African Member States are: Algeria; United Republic of Cameroon; Egypt; Ethiopia; Gabon; Ghana; Ivory Coast; Kenya; Liberia; Libyan Arab Republic; Madagascar; Mali; Mauritius; Morocco; Niger; Nigeria; Senegal; Sierra Leone; South Africa; Sudan; Tunisia; Uganda; Zaire; Zambia. Membership of the Agency entitles these countries to receive assistance both from the Regular Programme of the Agency and from UNDP resources, while non-Member States in the region only receive Agency assistance financed from the latter source.**

Any attempt to look at the technical co-operation programme in Africa must start by stressing the wide differences between African countries in their level of scientific and technical development ranging from countries with advanced atomic energy programmes to countries just crossing the threshold towards the peaceful use of nuclear energy. Perhaps the most striking and marked difference is in the quality and number of nuclear energy scientists and technologists available.

In view of this, the technical assistance programme in the African context has been a selective one, guided by considerations of pragmatism and responsiveness to particular requirements of the different individual countries and not by any doctrinaire or ready-made strategy for assistance.

### To promote skill and knowledge

The three components of technical assistance provided to Africa (for the period 1958 to 1974) were expert services (44%), equipment (29%) and fellowships (27%). This assistance had the objective of promoting the transfer of skill and knowledge required for the use of atomic energy in the economic and social development of the countries concerned.

Chart 1 shows the countries that received Agency assistance from 1958 to 1974. Chart 2 shows the value of assistance provided between 1970 and 1974, which amounted to about 14 per cent of the total assistance provided by the Agency to all countries.

In practical terms applied to Africa, the IAEA's assistance is related to the implementation of national, economic and social development plans and designed in part to ensure that the potential of the peaceful uses of atomic energy is taken into account as a tool to promote economic and social development wherever appropriate.

CHART 1
DEVELOPING COUNTRIES IN THE AFRICAN REGION
IN RECEIPT OF TECHNICAL ASSISTANCE
UNDER THE AGENCY'S REGULAR PROGRAMME
AND FROM UNDP: 1958–1974

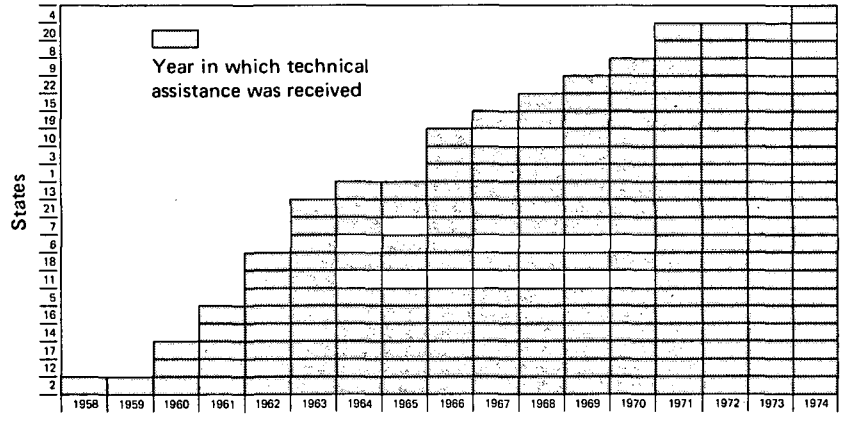
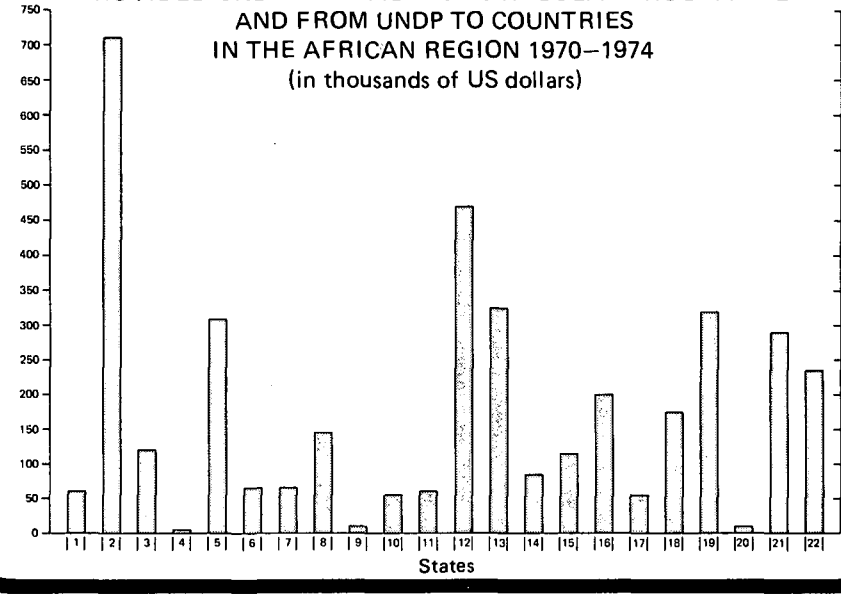



CHART 2
VALUE OF THE TECHNICAL ASSISTANCE
PROVIDED UNDER THE AGENCY'S REGULAR PROGRAMME
AND FROM UNDP TO COUNTRIES
IN THE AFRICAN REGION 1970–1974
(in thousands of US dollars)




1 Algeria
2 Egypt
3 Ethiopia
4 Gabon
5 Ghana
6 Ivory Coast
7 Kenya
8 Liberia
9 Libyan Arab Republic
10 Madagascar
11 Mali
12 Morocco
13 Nigeria
14 Senegal
15 Sierra Leone
16 Sudan
17 Tunisia
18 Uganda
19 United Republic of Cameroon
20 United Republic of Tanzania
21 Zaire
22 Zambia

In order to ascertain the status of development of Atomic Energy Programmes in Africa the IAEA started preliminary assistance missions to African countries[1], followed up by similar missions under the Technical Assistance Programme in the form of an atomic energy planner who would visit a country on request for a period of up to 3 months to assist in preparing atomic energy programmes, to make recommendations on the applications of nuclear energy in specific sectors and to advise on the infrastructure needed to carry out the programmes. These atomic energy planner projects were implemented in the following countries: Morocco – 1961; Kenya – 1969; Sierra Leone – 1970; Tanzania – 1971; Libyan Arab Republic – 1973; Sudan – 1974; Algeria – 1975.

Later, requests for assistance to specific projects started to come in, mainly for the application of isotopes and radiation in agriculture, medicine, hydrology, etc. There were and still are only two research reactors operating in African developing countries, one in Egypt and one in Zaire and some assistance to these two countries was for projects centred around the reactor. Ghana started the construction of a research reactor in 1962 under a bilateral agreement, but construction work was stopped in 1966. The Government has now decided that the project should be reactivated.

Table 1 shows the fields in which assistance was provided. Assistance to agriculture predominated, receiving 31% of the total, followed by nuclear engineering and technology (14%), prospecting and mining (9%). It is interesting to note that while assistance to agriculture formed 40% in 1970, the percentage fell to 25% in 1974. The statistic, however, does not suggest down-grading of the priority given to agriculture, but rather the emergence of new needs making a claim on the meagre resources.

IAEA assistance was mainly in the priority areas as part of the major efforts of the African countries to develop their major agricultural, water and mineral resources. In the field of agriculture, the major effort of African countries has been to increase agricultural productivity and Agency assistance was concerned with the introduction of nuclear techniques as part of the effort. Agency assistance was also requested for strengthening agricultural research, which meant in many cases the addition of appropriate facilities such as small radioisotope units to existing agricultural research institutes, or where non-existent, at African universities.

In the development of water resources, IAEA assistance was either in the form of individual projects or as a part of a large-scale water survey project executed by other agencies such as FAO. The IAEA's contribution to these projects was to investigate water resources and the availability of ground water in arid zones by isotope techniques. In mineral resources development many Agency projects dealt with prospection and development of uranium deposits and the training of national geologists.

Agency assistance was also requested for the introduction of nuclear science in the curriculum of universities in order to build up the scientific infrastructure of the countries concerned.

**Increasing number of experts**

The technical assistance programme in Africa has increased substantially over the years. Thus, while, for example, only one expert was assigned to Africa in 1959, in 1964 the number of experts rose to over 30. Over the period 1959 to 1974, 341 experts assisted

[1] 1960 to Sudan, Morocco, Tunisia, Senegal, Mali; 1961 to Liberia, Ghana, Nigeria, Ivory Coast; and 1962 to Togo, United Republic of Cameroon, Zaire, Madagascar, Tanzania, Uganda, Kenya.

**Table 1: Distribution of technical assistance field of activity: 1970–1974**

| Field | 1970 | | 1971 | | 1972 | | 1973 | | 1974 | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $1000 | % | $1000 | % | $1000 | % | $1000 | % | $1000 | % | $1000 | % |
| General atomic energy development | 45.1 | 7 | 60.2 | 7 | 77.9 | 9 | 79.0 | 10 | 54.9 | 6 | 317.1 | 8 |
| Nuclear physics | 60.0 | 9 | 41.9 | 5 | 64.6 | 7 | 77.5 | 9 | 48.4 | 6 | 292.4 | 7 |
| Nuclear chemistry | 8.8 | 1 | 19.1 | 2 | 49.7 | 6 | 32.2 | 4 | 57.2 | 7 | 167.0 | 4 |
| Prospecting, mining and processing of nuclear materials | 50.6 | 7 | 53.4 | 7 | 84.9 | 10 | 96.4 | 12 | 85.4 | 10 | 370.7 | 9 |
| Nuclear engineering and technology | 131.9 | 19 | 114.7 | 14 | 112.4 | 13 | 114.6 | 14 | 103.4 | 12 | 577.0 | 14 |
| Application of isotopes and radiation in **agriculture** | 280.0 | 40 | 306.9 | 37 | 262.4 | 30 | 199.7 | 24 | 217.9 | 25 | 1266.9 | 31 |
| Application of isotopes and radiation in **medicine** | 17.2 | 2 | 45.0 | 6 | 70.3 | 8 | 106.3 | 13 | 100.5 | 12 | 339.3 | 9 |
| Application of isotopes and radiation in **biology** | 24.3 | 4 | 52.7 | 6 | 67.8 | 8 | 39.1 | 5 | 13.7 | 2 | 197.6 | 5 |
| Application of isotopes and radiation in **industry** and **hydrology** | 30.7 | 4 | 79.8 | 10 | 45.6 | 5 | 54.7 | 6 | 119.7 | 14 | 330.5 | 8 |
| Safety in nuclear energy | 47.1 | 7 | 46.0 | 6 | 32.3 | 4 | 22.6 | 3 | 53.9 | 6 | 201.9 | 5 |
| TOTAL for Africa (a) | 695.7 | 100 | 819.7 | 100 | 867.9 | 100 | 822.1 | 100 | 855.0 | 100 | 4060.4 | 100 |
| TOTAL for all regions (b) | 3983.1 | | 4945.1 | | 5492.7 | | 5766.7 | | 6737.3 | | 26924.9 | |
| (a) as % of (b) | | 17% | | 17% | | 16% | | 14% | | 13% | | 15% |

**Table 2:**

**Total technical and large-scale assistance provided by the Agency to countries in the African region**

(1970–1974 in thousands of US dollars)

| | UNDP | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Regular Programme | | | Small-scale assistance | | | Large-scale assistance | | | Sub-total | TOTAL |
| | Agency monetary | In kind | Sub-total | UNDP monetary | In kind | Sub-total | UNDP monetary | In kind | Sub-total | (3c) + (4c) | (2c) + (5) |
| (1) | (2a) | (2b) | (2c) | (3a) | (3b) | (3c) | (4a) | (4b) | (4c) | (5) | (6) |
| 1970 | 415.2 | 75.1 | 490.3 | 199.0 | – | 199.0 | 6.4 | – | 6.4 | 205.4 | 695.7 |
| 1971 | 453.5 | 101.2 | 554.7 | 240.8 | – | 240.8 | 24.2 | – | 24.2 | 265.0 | 819.7 |
| 1972 | 511.4 | 69.8 | 581.2 | 247.8 | – | 247.8 | 38.9 | – | 38.9 | 286.7 | 867.9 |
| 1973 | 449.5 | 135.1 | 584.6 | 179.8 | – | 179.8 | 57.7 | – | 57.7 | 237.5 | 822.1 |
| 1974 | 355.8 | 194.7 | 550.5 | 179.8 | – | 179.8 | 124.7 | – | 124.7 | 304.5 | 855.0 |
| 1970–1974 | 2185.4 | 575.9 | 2761.3 | 1047.2 | – | 1047.2 | 251.9 | – | 251.9 | 1299.1 | 4060.4 |

projects in Africa. (Africa provided 53 experts who assisted projects in other countries). Much more interesting is the fact that the small-scale assistance under the Regular Programme served as an instrument for mobilizing additional reasons from UNDP to finance large-scale projects. The Agency is now assisting five large-scale projects and several small-scale projects financed by UNDP and the number of IAEA/UNDP projects is steadily increasing. This reflects the desire of Governments to embark on nuclear energy activities in the UNDP Country Programmes. It also reflects the success of the small-scale Regular Programme assistance, since quite a number of projects now receiving UNDP financial support are in fact extensions of projects initiated under the Regular Programme.

An example of the large-scale projects assisted by the Agency is the Centre for Radiation Technology in Egypt which has a UNDP budget of 700 000 US dollars and a duration of 4 years. The Centre will house a radiation facility to be used for determining the economic feasibility of radiation processing on an industrial scale. The activities of the Centre will be first the radiation sterilization of medical supplies such as sutures, syringes, cotton-wool etc., and second the improvement or modification of the characteristics of cotton and cotton/synthetic fibre fabrics, which could expand and lower the costs of the country's textile industry. Another example of such a large-scale project is the Training and Research Project in the Faculty of Science in Morocco which has a UNDP budget of 400 000 US dollars and a duration of 5 years. The aim of the project is to strengthen the teaching of nuclear physics and its applications and to introduce a post-graduate training programme for advanced training which Moroccan students used to do abroad in foreign universities.

### Training courses and seminars

The fellowship programme provided opportunities for candidates nominated by their Governments to study abroad either as part of a comprehensive project or on an individual basis, as a direct contribution to projects in the country's atomic energy programme. Between 1958 and 1974 the total number of Agency fellowship awards was 5005, and 614 awards, or 12.3% of the total, were to Africans. Africans also participated in many training courses organized by the IAEA to deal with specific aspects or topics. Mention should be made of two regional projects assisted by IAEA. One project was a regional training course for African technicians in the maintenance and repair of equipment. In the past the training of technicians lagged behind the training of scientists with the resulting imbalance, and since the problem was common, a regional approach was thought appropriate. The second regional project was the assignment of a regional adviser who visited most African countries to assist the authorities in the formulation, application and maintenance of internationally accepted radiation protection standards, in performing radiological safety assessments of nuclear programmes, including all uses of ionizing radiation for workers, for the population and the environment. The project also included a training seminar held for radiation protection officers from each country.

### Conclusion

This survey of technical co-operation activities in Africa has shown that much has been achieved in a relatively short time. In some cases the entire nuclear energy programmes of countries were created with Agency assistance, and in other cases Agency assistance improved government programmes or filled in gaps which countries could not meet from

their own resources. In conclusion one should stress the following general reflections: (1) There is often a limited relevance of the development of science and technology in the developed world to the problems facing African countries. The corollary to this in practical terms is to be wary of technically exciting and prestigeous projects that may not be within the technical and financial capacity of the country, or even of schemes of some scientific interest to individuals but of little or no relevance to the pressing development problems. (2) Atomic energy in isolation is not a priority need in the African context, but it does have an ancillary place in economic and social development. It should not therefore be intended that nuclear energy facilities be used in isolation from the existing conventional means or even be continuously used, but they should be available to provide an efficient service function when required. (3) Nuclear energy projects will have a greater impact if related to major efforts embodied in the national development plans of the country concerned. A nuclear facility such as a research reactor, for example, should be integrated into the educational and scientific programme of the country. (4) The strengthening of the scientific research capacity of a country is not necessarily and in all cases best achieved by creating new institutions. Very often a better way is to strengthen the existing resources in universities and already existing research organizations.