



CURRENT STATUS OF CONTROL OF RADIATION SOURCES AND RADIOACTIVE MATERIALS IN THE UNITED REPUBLIC OF TANZANIA

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Abstract. A Protection from Radiation Act was enacted in Tanzania in 1983 to regulate the use of ionizing radiation and protect people against its danger. The Act established a regulatory authority known as National Radiation Commission (NRC), which is the corporate body to enforce the law and regulations.

From the beginning of 2000, the NRC has kept inventory of 200 and 324 radiation installations, and radiation sources and radioactive materials in the country, respectively; and has provided personnel monitoring services to 665 radiation workers.

However, due to the trade liberalization that is currently being experienced in the country, the increase in the number of radiation practices is observed yearly. To cope with the situation, the whole system of notification, authorization, registration and licensing needs to be improved. The improvement has now started by amending the existing Protection from Radiation Act.

INTRODUCTION

A Protection from Radiation Act was passed in Tanzania in 1983 (Act of Parliament No. 5 of 9 May 1983) to regulate the use of ionizing radiation and protect people against its danger. In the same year, this Act established a regulatory authority known as the National Radiation Commission. Thus, by Act, the Commission became, on the 22 July 1983, the body corporate responsible for atomic energy matters. Emphasis in the Act was mostly put on medical applications due to the fact that more than 90% of sources of ionizing radiation were X-ray generators, and in particular, diagnostic X-ray machines. However, to date applications of nuclear technology in industry, agriculture and research have steadily increased in the country. In recognition of this, the existing Act is now under amendment so that the promotion of the technology and protection against its associated dangers are also included.

RADIATION SOURCES AND RADIOACTIVE MATERIALS

At the beginning of this millennium the leading sources of radiation in the country were still diagnostic X-ray equipment (71%) followed by sources used in research and industry (24 %), and therapeutic and nuclear medicine (4%) (Fig. 1). The ratio of the number of diagnostic X-ray facilities to other radiation sources is becoming smaller compared to that of a decade ago. Hence these figures suggest that, with the trade liberalization policy that the country is currently experiencing, the number of radioactive materials in the country will continue to rise. In order to contain the foreseeable situation, the regulatory authority should have a sustainable radiation infrastructure.

THE NATIONAL REGULATORY AUTHORITY AND LEGISLATIVE INFRASTRUCTURE

Tanzania enacted the Protection from Radiation Act [1] in 1983, under which the regulatory authority known as "National Radiation Commission" (NRC) was established (Fig. 2). Its mission is to enforce the legislation and deliver radiation protection services in the country. Under the Act, a code of practice was prepared, approved and put into force by the Minister responsible for atomic energy matters in 1990. However, since more than 90% of the applications of radiation were mainly in the medical field, the code of practice focused on the applications of ionizing radiation in medicine.

FIG. 1: RADIATION SOURCES AND RADIOACTIVE MATERIALS IN THE COUNTRY IN THE BEGINNING OF Y2K

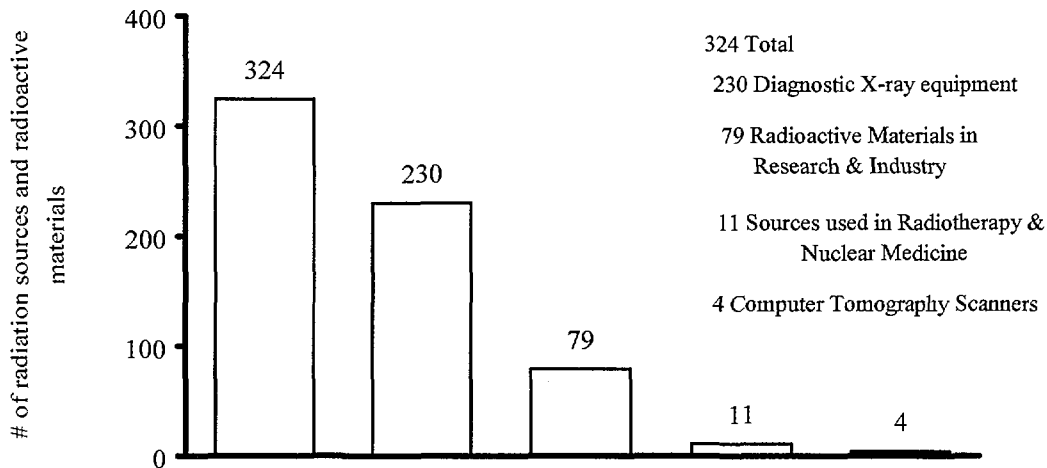
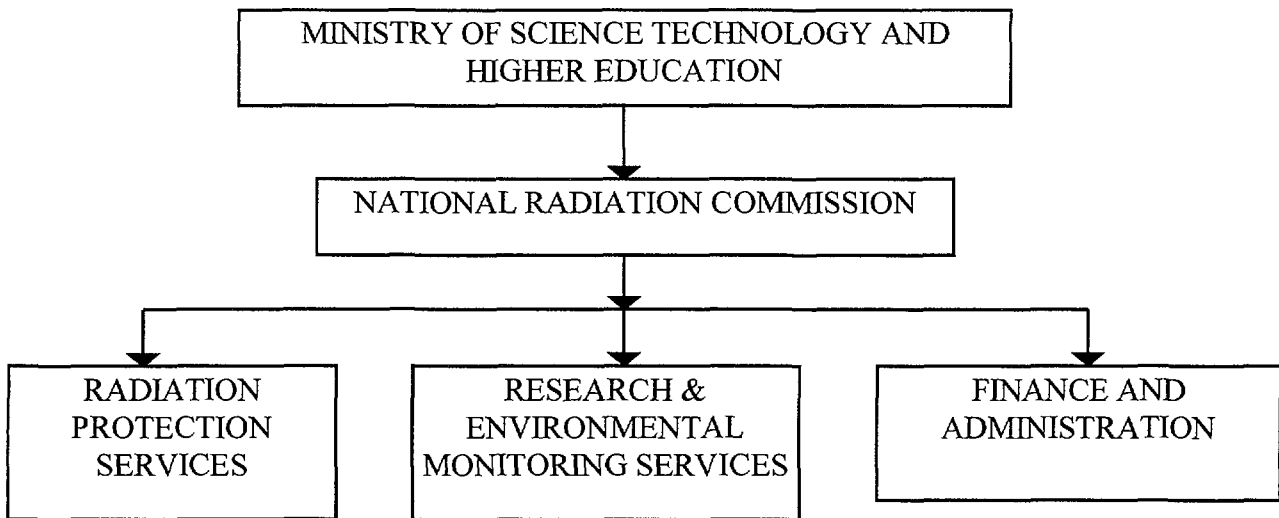


FIG. 2: NATIONAL RADIATION COMMISSION ORGANIZATIONAL CHART



The use of radioactive sources and radioactive materials in research, agricultural and industry has tremendously increased in the country. This has been a result not only of nuclear applications established through IAEA technical assistance projects but also of a current trade liberalization policy. Radiation protection services, which until 1986 were provided by the USA and the UK to two institutions in the country, are provided by the Commission with the assistance of the IAEA and include personnel monitoring services to all persons working with sources or generators of ionizing radiations (Fig. 3); radiation surveillance and safety inspections to all the respective centres (Fig. 4); radiation analysis of imported/exported foodstuffs and other environmental samples; and the calibration of dosimetry systems and survey meters for the regulatory authority and radiation users. The RAIS program provided by the IAEA has been very helpful to keep the data updated especially of personnel monitored and radiation surveillance and safety inspections in the country.

FIG. 3: THE NUMBER OF RADIATION WORKERS MONITORED IN THE BEGINNING OF Y2K

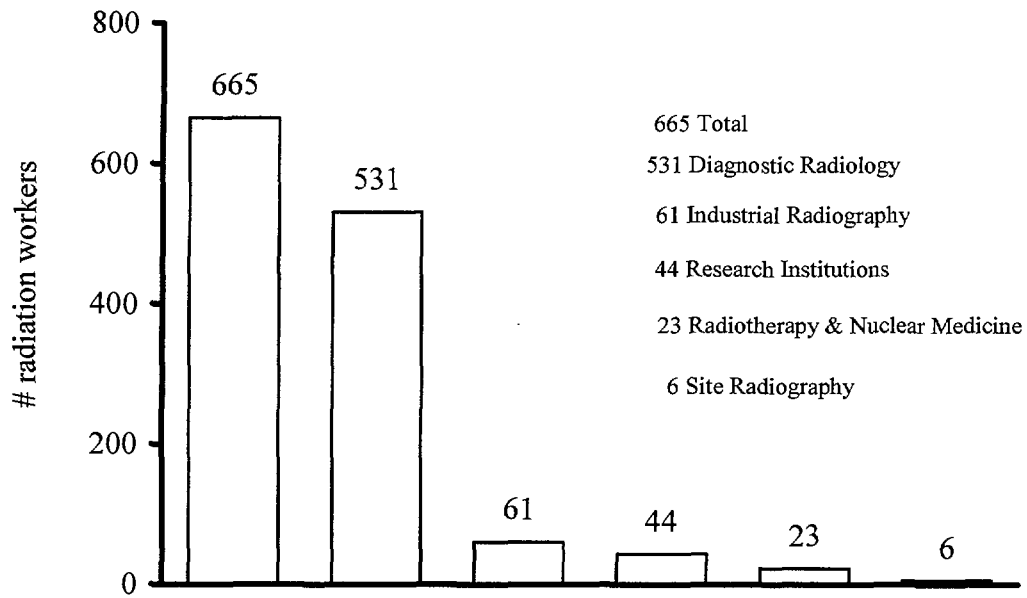
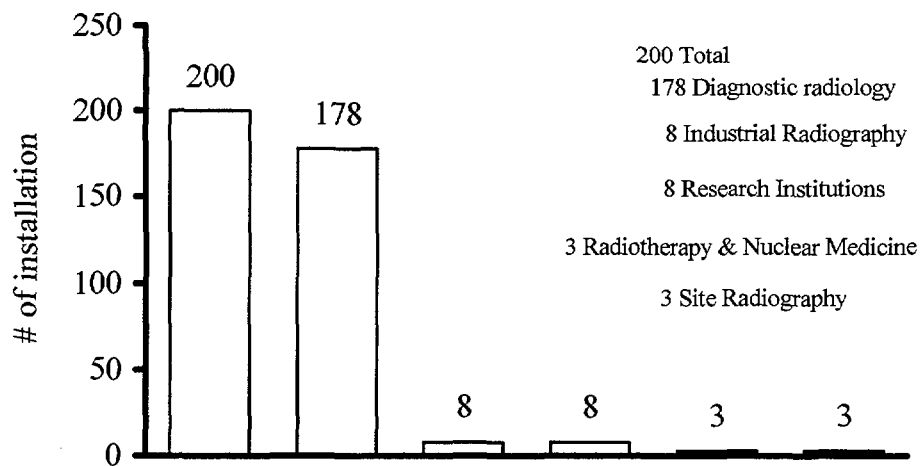


FIG. 4: THE NUMBER OF IONIZING RADIATION INSTALLATIONS BY PRACTICE



THE NATIONAL SYSTEM OF NOTIFICATION, REGISTRATION AND LICENSING, AND INSPECTION OF RADIATION SOURCES AND RADIOACTIVE MATERIALS

Figure 1 shows a total number of 324-registered radiation sources and radioactive materials in the country at the beginning of 2000. The number does not include dental units since they safety are not subjected to license. The Act requires every radiation user, radiation-generating device and mobile radioactive apparatus be registered. It further requires that every person wishing to import and/or install any instrument, which is a source or is intended to emit ionizing radiation should be licensed to do so. However, in practical terms, whoever/whichever is registered should be licensed.

Any person/party intending to import and/or use a radioactive source/material or radiation emitting devices should notify the regulatory authority. Registration and licence application forms will be immediately sent to the applicant to fill in all the necessary information regarding the substance to be imported. The NRC will evaluate the form and permission will be granted if the radiation practice is justified. After the source or device is imported, a team of inspectors will visit the premises to perform a thorough radiation safety inspection. The radiation safety report will be evaluated, and if it conforms to the stipulated safety standards, both registration and licence certificates to use the radiation source will be granted. The licences, which last for one year, are renewable subject to confirmation of the safety status of the installation. In that case, a reinspection is done prior to evaluation of licence. On the other hand, if the safety criteria are not met, recommendations to improve the situation will be made. The Act empowers the NRC to take legal action against offenders.

THE NATIONAL PROVISIONS FOR:

MANAGEMENT OF DISUSED SOURCES

In Tanzania, regulations for the management of radioactive waste exist [2]. According to the regulations, the management of disused sources is the same as that of spent sealed sources. The regulations require the return of the source to the supplier, and this can be implemented if there is a contract signed between the supplier and the user. It is the regulatory authority, which advises the future licensee on this need for a contract. If the option of the return of source to the supplier is not applicable either due to a contract not signed or the supplier no longer existing, then it remains the responsibility of the licensee to safely store the disused source till the responsibility is transferred to another person or organization. For this, each licensee is required to make interim storage available for the waste/disused sources. The regulatory body (NRC) is empowered to establish and operate a central radioactive waste management facility (CRWMF). At present, the NRC operates a temporary CRWMF and spent sources are in place including conditioned medical radium needles of a total activity of 3.5 GBq (95mg). However, for a such system to be operated by the regulatory authority is not in agreement with the BSS [3].

The NRC is yet to collect and condition other spent sources from various institutions, the total activity of which is not known due to the fact that most of them are historical sources and documentation is missing.

THE RECOVERY OF CONTROL OVER ORPHAN SOURCES

The regulations [2] require the NRC to take over the responsibility for the management of radioactive waste/sources where the owner is not capable of appropriate management of the source. This is also the case when either the license is revoked or the owner of the source no longer exists. The NRC has already experienced such a situation when police arrested a person for illegal possession/trafficking of an industrial gauging source. The source Cs-137 had calculated activity of 2.3 GBq as of 1997-04-24 and was in its assemble. After hearing the case, no adequate evidence was adduced to show that the suspect was in possession of the source; and therefore the court of law acquitted him. As per the regulations the control of the source become the responsibility of the NRC. The source is now stored at the NRC's temporary CRWMF.

INFORMING USERS AND OTHERS WHO MIGHT BE AFFECTED BY LOST SOURCES

Emphasis is placed on raising awareness of workers and members of the public about the hazardous effects of radiation sources. Radio and TV programmes are broadcast under the national radio/TV programme on science and technology. From 1994 to 1999, the NRC broadcast about 18 topics related to radiation safety issues, such as applications, hazards, protection, identifying a radiation source, legislation, regulations and the like. The programme is intended to inform radiation users and others who might encounter situations where a radiation source is involved.

In the case of a lost source, the licensee is required to inform the NRC within the shortest possible time. The NRC, upon receiving the information, takes the necessary measures depending on the circumstances. A team will visit the suspected area with radiation survey instruments. The process involves informing the local authority, disseminating information on the loss of the source through posters at the suspected locations, announcements made by local authorities that will be moving around the area with loudspeakers. Information is also broadcast through radio and TV, and announcements are made in the popular press. Photographs of the lost or similar source are displayed. The dangers are clearly documented and announced.

We have had the experience of a stolen Troxler surface density moisture gauge with Am-241 and Cs-137 sources. The theft took place on 31 July 1997. The above procedures of dissemination of information were followed of which the announcement/posters were made in *Kiswahili* (local language). To date the source has not been recovered.

EDUCATION AND TRAINING IN THE SAFETY OF RADIATION SOURCES AND THE SECURITY OF RADIOACTIVE MATERIALS

Training is the best precondition for enforcing the required protective measures within the institutions and the best precaution against unusual occurrences and unnecessary radiation exposure to radiation workers, members of the public and contamination of the environment. Training for all radiation workers and the staff of the NRC is well documented in the code of Practice [4]

Training Targets

Since 1986, the NRC has been conducting five-day training courses in radiation safety to radiation workers and customs officials (Table 1). Customs has also been essential to help the

NRC in enforcing the law by controlling the movement/trafficking of radioactive materials. Due to lack of funds by both trainees and the NRC, it has not been possible to conduct the training in some of the years.

Table 1. Years with corresponding number of trainees

| YEAR | # RADIATION WORKERS TRAINED | # CUSTOMS & BORDER OFFICIALS TRAINED |
|------|-----------------------------|--------------------------------------|
| 1986 | 28 | |
| 1991 | 50 | |
| 1992 | 20 | |
| 1993 | 16 | |
| 1994 | | 10 |
| 1995 | | 6 |
| 1996 | 28 | |
| 2000 | | 14 |

However, it should be noted that the radiation workers possess academic qualifications in the relevant fields and the courses conducted by the NRC are only intended to supplement their knowledge in radiation safety issues. The NRC neither issues State qualifications nor conducts examinations; however, records are kept for those who attend such training. Certificates of attendance are issued.

Training for the Staff of the Regulatory Authority

The level of education of the NRC staff ranges from university graduates to technicians. New employees receive in-house training prior to making applications to the IAEA for training courses or fellowships.

CONCLUSION

The current status of control of radiation sources and radioactive materials, and the whole system of notification, authorization, registration and licensing need to be improved in order to match the trade liberalization system that is taking place in the country. The amendment of the existing Act [1] and the current use of the RAIS program provided by the IAEA are steps ahead towards the improvement.

REFERENCES

- [1] The Protection from Radiation ACT, 1983, Dar-es-Salaam, Tanzania.
- [2] "Radioactive Waste management for the Protection of Human Health and Environment Regulations 1999", Dar-es-Salaam, Tanzania.
- [3] Safety Series No.115 (1996): International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Vienna, Austria.
- [4] The Protection from Radiation (Code of Practice) regulations, 1990, Dar-es-Salaam, Tanzania.