



THE RADIATION PROTECTION INFRASTRUCTURE IN MADAGASCAR

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Abstract. Madagascar is participating in the Model Project RAF/9/024 on "Upgrading Radiation Protection Infrastructure". Its radiation protection legislation is based on the BSS. The efforts being made to upgrade the country's regulatory infrastructure and the problems encountered are described below, as is the national information and training programme for the authorities, the public, workers and students .

NATIONAL INVENTORY OF SIGNIFICANT RADIATION SOURCES AND RADIOACTIVE MATERIALS

In Madagascar, work on drawing up an inventory of radiation sources for safety and security reasons was initiated in 1995 by the INSTN, acting as the technical body of the competent authority. The INSTN started with the capital, Antananarivo, and then extended its activities to other regions. At least once a year, users are now being made aware through the mass media of the need to notify the competent authority regarding the radioactive materials and other radiation sources in their possession. Customs officers have been trained by the INSTN to identify radioactive packages, and co-operation between the INSTN and the customs authority has helped to increase the number of radiation sources discovered entering Madagascar illegally.

Most activities involving radiation sources are still in the medical field, but there is some utilization of radiation sources in industry and in laboratories too.

In medicine

Source	Application	End user	Number
X-ray generator	Radiography	Hospitals	70
X-ray generator	Radiography	Dentists	17
X-ray generator	Mammography	Hospital	1
X-ray generator	Scanning	Hospital	1
X-ray generator	Contact therapy	Hospital	1
Co-60	External therapy	Hospital	1
I-131	Diagnosis	Nuclear medicine	unsealed
Cs-137	Brachytherapy	Hospital	1

In industry

Sources	Application	End user	Number
Sr-90	Density gauging	Tobacco industry	2
Kr-85	Density gauging	Paper industry	1
Co-60	Level indicating	Oil industry	2
Co-60	Level indicating	Shipbuilding	1
Am/Be	Density gauging	Civil engineering	1
Am/Be	Level indicating	Dairy industry	1
Am/Be	Level indicating	Aircraft	1
Am/Be	Industrial gauging	Oilwell logging	2
Cs-137	Industrial gauging	Oilwell logging	1
Ir-192	Gamma radiography	Oil industry	1
U-Th	Standard	Mining	1
X-ray generator	Radiography	Shipbuilding	1

In laboratories

Sources	Application	End user	Number
Ni-63	Chromatography	Research laboratory	1
H-3	Liquid scintillation counting	Research laboratory	unsealed
Co-60	Irradiation	Calibration laboratory	1
Cs-137	Irradiation	Calibration laboratory	1
x-ray	Irradiation	Calibration laboratory	1
Sr-90	Irradiation	Calibration laboratory	2
Sr-90	Calibration checking	Calibration laboratory	2
Cd-109	X-ray fluorescence	Research laboratory	1
Fe-55	X-ray fluorescence	Research laboratory	1
I-125	Radioimmunoassay	Research laboratory	unsealed

THE NATIONAL REGULATORY INFRASTRUCTURE

Law 97-041 on protection against the harmful effects of ionizing radiation sources and on radioactive waste management was promulgated on 2 January 1998. It is based on the BSS.

Pursuant to this law, the regulatory authority is the Autorité Nationale de Protection et de Sûreté Radiologiques (ANPSR). For activities related to the use of radiation sources and to radioactive waste management, ANPSR has to

- prepare the necessary regulations,
- issue the necessary authorizations,
- specify the responsibilities of the parties involved, and
- take decisions regarding the application of the law and the regulations.

In the field of radiation protection, ANPSR is assisted by the Organe Technique de Radioprotection (OTR).

In the field of radioactive waste management, ANPSR is assisted by the Office Central de Gestion de Déchets Radioactifs (OCGDR).

The law has following main sections:

- basic principles of radiation protection
- authorizations and controls
- conditions for workers exposed to ionizing radiation
- responsibilities in the production and management of radioactive waste
- sanctions and legal proceedings
- the fiscal and customs arrangements

Following the promulgation of Law 97-041, four drafts decree were prepared:

1. a draft decree dealing with the roles and functions of the regulatory authority;
2. a draft decree dealing with the basic principles of protection against ionizing radiation;
3. a draft decree dealing with the basic principles of radioactive waste management; and
4. a draft decree dealing with the possession and utilization of radiation sources in the medical field.

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

These draft decrees have been examined by lawyers of different ministries and been revised in order to be consistent with other national regulations. The last step will be their promulgation after examination in the Council of Government. Pending their promulgation, governmental decree 93/243 issued on 29 April 1993 and based on ICRP 26 is still in force. Under this decree, the Ministry of Higher Education is the competent authority in the field of radiation protection and the INSTN is its technical body. In application of this decree, nine national regulations have been issued:

Madagascar is currently in a transition period as ANPSR, OTR and OCGDR are not yet functioning. Therefore, the following activities are being carried out by the INSTN as the technical body of the competent authority:

AUTHORIZATION AND INSPECTION

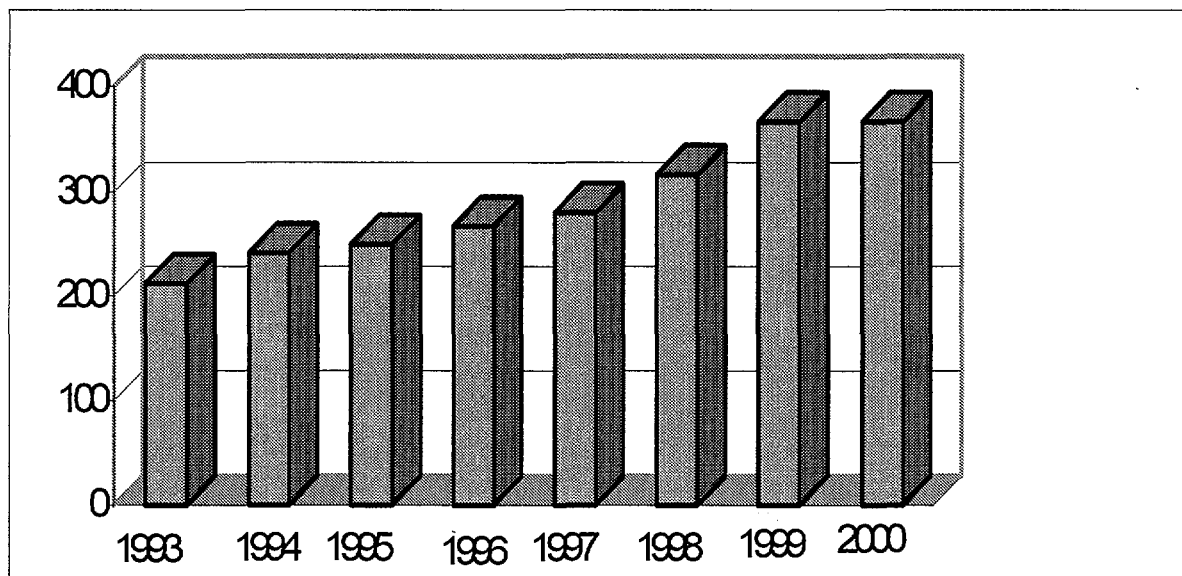
Any use of ionizing radiation must be authorized by the national competent authority. Exemption levels are defined in the regulations. A safety assessment must be carried out, on the basis of the technical documentation and an inspection, before an authorization is issued for the use of a source.

At present, the INSTN is responsible for carrying out inspections and safety checks. When the new regulations are issued, inspectors appointed and empowered by the regulatory authority will be in charge of inspections.

INDIVIDUAL MONITORING

The INSTN continues to carry out personal monitoring of those working with ionizing radiation. The thermoluminescence technique is used.

The growth in the number of workers monitored by the INSTN between 1993 and 2000 is shown in the following graph:



QUALITY ASSURANCE IN MEDICAL PRACTICES

X-ray radiology

Under the regulations, each X-ray machine must undergo quality control at least once a year.

Radiotherapy

The INSTN is responsible for quality control and dosimetry measurements at the only cobalt therapy centre in Madagascar - the Oncology, Haematology and Radiotherapy Department of the Centre Hospitalier Universitaire; the two institutions have concluded an agreement for this purpose.

THE INSTN'S SECONDARY STANDARD DOSIMETRY LABORATORY (SSDL)

The SSDL at the INSTN was established in 1996 with the help of the IAEA. It has one therapy level standard and one radiation protection level standard for calibration.

The SSDL and the radiotherapy centre of the Centre Hospitalier Universitaire's Oncology, Haematology and Radiotherapy Department are involved in the IAEA/WHO Intercomparison Network in External Radiotherapy. Since 1997, they have participated in three TLD Postal Dose Quality Audits.

In April 1999 and April 2000, the SSDL participated in an IAEA TLD Postal Quality Audit for Cs-137 radiation protection calibration.

In November 1999, the SSDL participated in an intercomparison of radiological measurements for monitoring purposes. At a meeting held in February 2000, with 35 participating laboratories, the results for Madagascar were considered excellent.

THE NATIONAL PROVISIONS FOR EDUCATION AND TRAINING IN THE SAFETY OF RADIATION SOURCES AND THE SECURITY OF RADIOACTIVE MATERIAL

TRAINING

At the University

Radiation protection is included as a subject in the medicine, physics and chemistry programmes.

Training for users of radiation sources

Once a year, the INSTN organizes a training course in radiation protection for users of radiation sources. The course programme includes lectures and practical, on-site training. The first such course was held in October 1996.

Training for radiation protection technicians

The INSTN has, starting with the 1999-2000 academic year, introduced training for radiation protection technicians. The trainees (initially 25 of them), who must possess a "Baccalaureat" diploma, attend a theoretical and practical course followed by on-site training. After two years of study, those who qualify become responsible for radiation protection at their place of work.

SEMINARS AND WORKSHOPS

In April 1997, an information seminar on radiation protection was held in Antananarivo for the benefit of the staff of national authorities.

The INSTN and the Association Nationale de Radioprotection (ANARAP - a society for users of radiation sources which, in June 1999, was accepted for membership of the International Radiation Protection Association) held two-day information meetings on radiation protection for radiologists and industrialists in October 1997 and October 1999.

In May 1998, the INSTN and the Customs Directorate of the Ministry of Finance held a workshop for customs officers on the export-import control of foodstuffs and the use of X-ray baggage scanners.

THE NATIONAL PROVISIONS FOR RADIOACTIVE WASTE MANAGEMENT

As the decrees for implementing Law 97-041 on protection against the harmful effects of ionizing radiation and on radioactive waste management have not yet been promulgated, the decree on protection against ionizing radiation promulgated on 29 April 1993 still applies.

SPENT RADIUM SOURCES (BRACHYTHERAPY)

The conditioning of spent radium sources from the radiotherapy centre of the Centre Hospitalier Universitaire's Oncology, Haematology and Radiotherapy Department was carried out in February 2000 with the assistance of the IAEA and a South African team. These sources are now in temporary storage at the INSTN.

COBALT-60 (RADIOTHERAPY)

The selected option for the management of spent cobalt-60 sources is return to the original supplier.

IODINE-131 (NUCLEAR MEDICINE)

For this radionuclide (with a half-life of 8.04 days) the preferred option is storage for decay. In many cases, after storage for ten half-lives disposal as exempt waste is possible.

ORPHAN SOURCES

Under Madagascar's legislation, the State is responsible for orphan sources.