



Sustaining Physical Protection Regimes of nuclear facilities in Madagascar

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Legal and Regulatory Framework [1/4]

The Law N° 97-041 on the protection against harmful of ionizing radiation and radioactive waste management in Madagascar, promulgated on 2nd January 1998.



Legal and Regulatory Framework [2/4]

- The decree N° 2002-1199 on 07th October 2002 dealing general principles of the protection against ionizing radiation
- The decree N° 2002-1274 on 16th October 2002 dealing the general principles of the Management of Radioactive Waste
- Decree n° 2002-1161 on 09th October 2002 dealing the possession and use of ionising radiation sources in medical field.
- The decree N° 2012-1112 on the reorganization of the ANPSR promulgated on 04th December 2012.
- The order N° 2735/94 dealing the transport of radioactive materials promulgated on June 1994 governs all activities related to the transport of radioactive materials.
- Code of Conduct on the Safety and Security of Radioactive Sources, endorsed on February 2008.
- Guidance on the Import/Export of Radioactive Sources, endorsed on February 2008.



Legal and Regulatory Framework [3/4]

Treaties and Conventions

- TNP, ratified on October 1970.
- Additional Protocol, ratified on September 2003.
- CPPNM, entry into force on November 2003.
- UN Resolution 1540, 1st Report on 2008.
- CPPNM/Amendment, entry into force on March 2017.
- Convention on Assistance in case of a Nuclear Accident or Radiological Emergency, entry into force on April 2017.
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of radioactive Waste Management, entry into force on June 2017.
- Convention on Early Notification of Nuclear Accident, entry into force on April 2017.
- Convention on Nuclear Safety, entry in force on June 2017.
- ICSANT, entry into force on March 2017.



Legal and Regulatory Framework [4/4]

The Radiological Safety and Nuclear Security Directorate (DSRSN) of the “*Institut National des Sciences et Techniques Nuclaires (INSTN-Madagascar)*” is the Radiation Protection and Nuclear Security Regulatory Authority. It is established by the Decree N°2012-1112 on the Reorganization of the “*Autorité Nationale de Sûreté et de Protection Radiologique (ANPSR)*” and chaired by the Prime Minister.



Utilizations of Radioactive Sources

1. Medical field

- Teletherapy
- Brachytherapy
- Nuclear medicine

2. Industry

- Industrial radiography
- Nuclear gauging
- Well logging

3- Research and Education

- Irradiator (radioagronomy)
- Calibration
- Radioactive tracer

4- Exploration and exploitation of ores containing radioactive materials (U-238, Th-232).



Inventory of Radioactive Sources in use [1/2]

- Updated inventory of radioactive materials and security categorization of radioactive sources are completed and maintained using RAIS 3.3 Web
- Import and export of ionizing radiation sources are submitted by the operator via the MIDAC (Ministries, Departments and Control Agencies) module
- Individual storage with appropriate Physical Protection systems provided by the owner



Inventory of Radioactive Sources in use [2/2]

Radionuclide	Number	Application	Category
Ir-192	07	gammagraphy	2
Cs-137	74	Density gauge	3
Cs-137	73	Level gauge	
Co-60	15	Level gauge	3
Am-241/Be	01	Well-logging	3
Cs-137	01		
Am-241/Be	16	TROXLER gauges	4
Cs-137	16		
	Total: 203		



Madagascar's Physical Protection Regimes

The strategies:

- establishment of jurisdiction,
- security planning and training, transportation security,
- response plans,
- strengthening of inspection and enforcement regimes.

The following strategies have been considered to enhance security:

- protect radioactive sources used for vital medical, industry and research purposes,
- remove and dispose of disused radioactive sources.



What have been done? [1/2]

- Participation to the Integrated Nuclear Security Support Plan (INSSP)
- Ratification of The Amendment to the Convention on Physical Protection of Nuclear Material (CPPNM/A) and its entry into force
- Ratification of the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) and its entry into force
- Revision of the existing legal and regulatory framework by adding dispositions to Nuclear Security
- Establishment of an interim secure centralized storage facility with proper physical protection elements for disused and orphan sources



What have been done? [2/2]

- IAEA International Physical Protection Advisory Service (IPPAS) Mission conducted from 12-23 August 2019 at the request of the Government of Madagascar
- Comprehensive inventory of radioactive sources and users is conducted and has proved to be a necessary condition for an effective regulatory control of radioactive sources in the country



Inventory of spent and disused sources [1/3]

Location of the source	Radionuclide	Utilization	Number	Country of origin	Type of device or facility housing the source
CHU-JRA Antananarivo	Ra-226	Brachytherapy	56	France	Conditioned in steel drum
			5	France	In lead container
CHU-HJRA Antananarivo	Co-60	Teletherapy	1	China	Moved to CHU-JRA
LRI Antananarivo	Co-60	Seed Irradiator	1	NORATOM Norway / Russia	Seed Irradiator



Inventory of spent and disused sources [2/3]

Location of the source	Radionuclide	Utilization	Number	Country of origin	Type of device or facility housing the source
INSTN-Madagascar	Ir-192	Industrial Radiography	3	South Africa and France	In their projector
INSTN-Madagascar	Am-241/Be and Cs-137	Density and Moisture Gauges	1	USA	In the package Transferred to INSTN-Madagascar
INSTN-Madagascar	Cs-137	Brachytherapy LDR Nucletron	36	Netherland	In lead pot Transferred to INSTN-Madagascar



Inventory of spent and disused sources [3/3]

Location of the source	Radionuclide	Utilization	Number	Country of origin	Type of device or facility housing the source
LRI Antananariv o	Am-241/Be	Moisture gauge	20	France	In the room storage
INSTN- Madagascar	Am-241/Be and Ra-226/Be	Analysis/ Mostiure gauge	2	Unknown/ Bitatron	In the room storage
LRI Antananariv o	Ra-Be	Unknown	6	Unknown	Unknown
	Cs-137	Unknown	4	-	-
	Ir-192	Unknown	1	-	-
	Ra-226	(Ores standard)	11	-	-
	Unknown	Unknown	2	-	-
	Am-241/Be (very low activity)	-	-	2	-



IAEA IPPAS Mission in Madagascar [1/2]

- **Legal and regulatory framework for the security of radioactive sources and facilities:**
 - during transport,
 - coordination among authorities and other stakeholders involved in nuclear security
- **Team visit:**
 - storage facility for radioactive sources operated by INSTN-Madagascar,
 - medical facilities with radioactive sources,
 - radioisotope laboratory,
 - mine that uses radioactive sources



IAEA IPPAS Mission in Madagascar [2/2]

- **At the end mission, the team provided :**
 - recommendations and suggestions to support Madagascar in further enhancing and sustaining nuclear security
 - Good practices that can serve as examples to other IAEA Member States to help strengthen their nuclear security activities
- **IPPAS mission demonstrates strong commitment of the Government of Madagascar to nuclear security and its continued enhancement**
- **IPPAS outcome will be incorporated in Madagascar's Integrated Nuclear Security Support Plan**



Challenges

- **Implementation of the Nuclear Law**: Draft of the Nuclear Law including Security aspects, Safeguards and Liability, has been sent in October to the IAEA Office of Legal Affairs for assessment
 - Carry out inspection to ensure compliance with requirements
 - Establish an independent and sustainable Authority for Radiation Protection and Nuclear security.
 - Establish National Committee for Nuclear security



Thank You

