

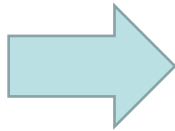
# Management of radioactive wastes in Cuba

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# Main sources of radioactive wastes

**Radioactive waste is generated in a broad range of activities involving the use of radioactive material in medicine, industry, agriculture, research and education.**



# National waste inventory

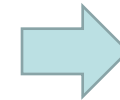
Collected and carried RW for the temporal storage facility until 2009

Year	Number of visited institutions	Collected and carried RW				
		Disused sealed sources	Solid wastes, m <sup>3</sup>		Liquid wastes, m <sup>3</sup>	
			T <sub>1/2</sub> <100d	T <sub>1/2</sub> >100d	T <sub>1/2</sub> <100d	T <sub>1/2</sub> >100d
1996	19	395	1.060	0.310	0	0.001
1997	15	16	0.555	2.201	0.110	0.445
1998	29	70	3.09	0.552	0.032	0.233
1999	27	6 277	2.60	0.060	0	0.022
2000	21	768	0.888	0.615	0.099	0.017
2001	32	2226	4.80	2.0	0.017	0.207
2002	23	373	13.40	1.80	0.045	0.030
2003	52	653	4.92	2.025	0.107	0.293
2004	39	3712	3.79	18.90	0.101	0.103
2005	37	1955	4.612	2.066	0	0.195
2006	28	1495	6.20	1.175	0.015	0.040
2007	25	2663	4.15	0.400	0	0
2008	28	3714	2.85	1.070	0.11	0.046
2009	30	1540	3.53	0.100	0.23	0

# National waste inventory

Radioactive wastes with  $T_{1/2} > 100$  days, in the temporal storage facility until December 2011

Type of wastes	Principal issues	Estimated volume (m <sup>3</sup> )	Observations
Liquid	Cs-137, Co-60, Eu-152, H-3, C-14	2.95	
Solids	Treatment with volume reduction	3.00	
Solids	Without treatment	36.52	There are included wastes from operations of decontamination in the main service of radiobiology and radiotherapy in Cuba.



# National waste inventory

## Disused radioactive sources in the temporal storage facility until December 2011

Radionuclide	Amount	Total estimated activity (Bq)
Am-241	26766	8.72E+10
Am-241/Sr-90	1	1.00E+05
AmBe	27	1.48E+12
AmBo	2	2.22E+11
Ba-133	7	1.52E+07
Bi-207	1	3.00E+04
C-14	15	8.52E+05
Cf-252	6	6.26E+08
Co-60	626	6.77E+15
Cs-137	1093	1.30E+14
Eu-154	3	8.84E+05
Eu-152	3	2.14E+09
Eu-155	1	1.85E+05
H-3	96	5.00E+10
Hg-203	5	1.48E+06
I-129	2	4.47E+03

Radionuclide	Amount	Total estimated activity (Bq)
Kr-85	2225	2.31E+10
Ni-63	8	2.66E+09
Pb-210	84	2.37E+06
Pu-238	20	1.56E+10
Pu-239	41	1.86E+07
Pu <sup>238</sup> -Be	9	7.24E+11
Pu <sup>239</sup> -Be	6	1.34E+12
Pu (smoke detectors)	1000	1.85E+10
Ra-226	1084	1.79E+11
Sr-90	1808	6.71E+11
Th	1	3.70E+08
U-238	4	1.48E+03
Kits of disused calibration sources	33	4.07E+06

# National policy / national plan for managing RW

**The national policy is to deal with radioactive waste in a manner that protects human health and the environment now and in the future without imposing undue burdens on future generations.**

## **Purpose**

This policy sets out the aims and goals for the safe management of radioactive waste in Cuba. It also establishes the roles and responsibilities of the organizations and bodies concerned with radioactive waste management (**regulatory body, the waste management organization or technical support organization (TSO) and facilities generating radioactive waste**).

# National policy / national plan for managing RW

## General principles

**The policy is consistent with the requirements of the national legislative system, relevant international principles and all international agreements to which Cuba is signatory.**

# National policy / national plan for managing RW

## Policy statement

- (a) The Cuban Ministry of Science, Technology and Environment establishes the legislative and regulatory framework regarding the safe management of radioactive waste. The framework include a system for licensing radioactive waste management activities. It appoints a regulatory body to enforce the legislation and regulations, and to issue licenses;**
- (b) This Ministry establishes a national waste management organization responsible for the management of radioactive waste in the country (i.e. collection, processing, storage and temporal disposal);**
- (c) The government of Cuba establishes arrangements for providing the resources (financial, technical and human) to sustain the waste management organization and the regulatory body, and for the implementation of the radioactive waste management strategy;**



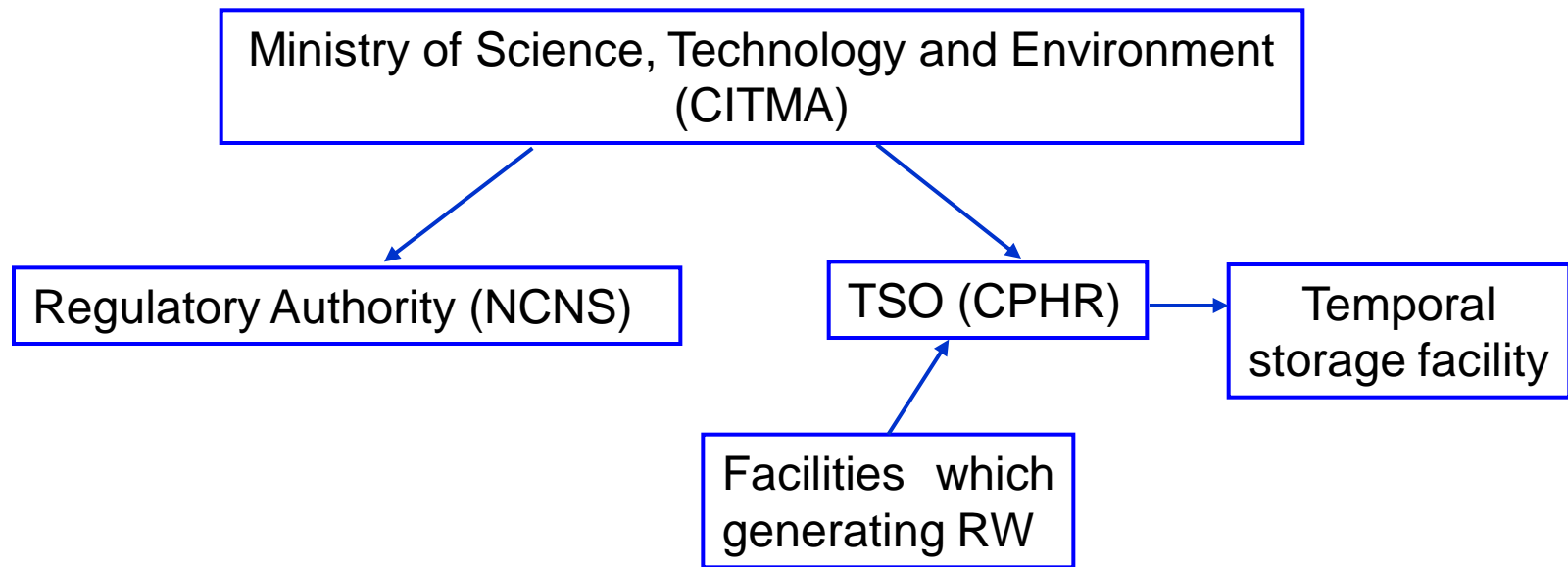
# National policy / national plan for managing RW

- (d) The license holders of facilities generating radioactive waste are responsible for the safe management of radioactive waste, until the waste is accepted by the waste management organization. The waste management organization will be responsible for the safe management of radioactive waste, including disused radioactive sources, for which no owner can be identified;**
- (e) The license holders of facilities generating radioactive waste will adopt measures for minimizing the generation of radioactive waste;**
- (f) The waste management organization will prepare a strategy detailing arrangements for the long term management of radioactive waste in Cuba for approval by the government;**
- (g) The government of Cuba suggest for approve the import of sealed radioactive sources the condition that they are accepted for disposal at the end of their useful lives by the supplier;**


# Availability of resources (human and financial)

- ✓ **The government of Cuba establishes arrangements for providing the resources (financial, technical and human) to sustain the waste management organization and the regulatory body, and for the implementation of the radioactive waste management strategy**

# Institutional framework for managing RW (regulator, operator, TSO)

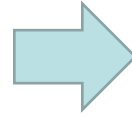


# Management options considered for DSRS, NORM, LLW, RR SF, other

- We applied conditioning in cement of disused radioactive sources. 
- There are studies on areas which NORM, but we do not have experiences on their control. Cuba has no definition about their management.
- For LLW there is a facility for temporal storage and it is applicable the volume reduction treatment.
- Cuba has not research reactor (RR) and Nuclear Power Plant, for this reason we have not spent fuel (SF).

## Disposal plan (if any)

**For this moment there is not a disposal plan.  
Temporal storage facility was improved for  
the increasing of the storage time.**



# Concerns, problems, challenges in managing RW

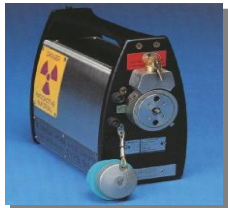
- ✓ *Final disposal of encapsulated unsealed sources in borehole.*
- ✓ *Management of NORM.*
- ✓ *Final disposal of RW.*

# Conclusions

- **The management of RW in Cuba is executed in a safe way and agreement with the international standards and IAEA's recommendations.**
- **There is a Regulatory Authority which control management of RW in Cuba and makes inspections to facilities and the TSO every year.**
- **A Latin-American project for the solution of disposal disused sources is executed.**

**Thank you  
for  
your attention !**





# Operations of decontamination in the main service of radiobiology and radiotherapy in Cuba

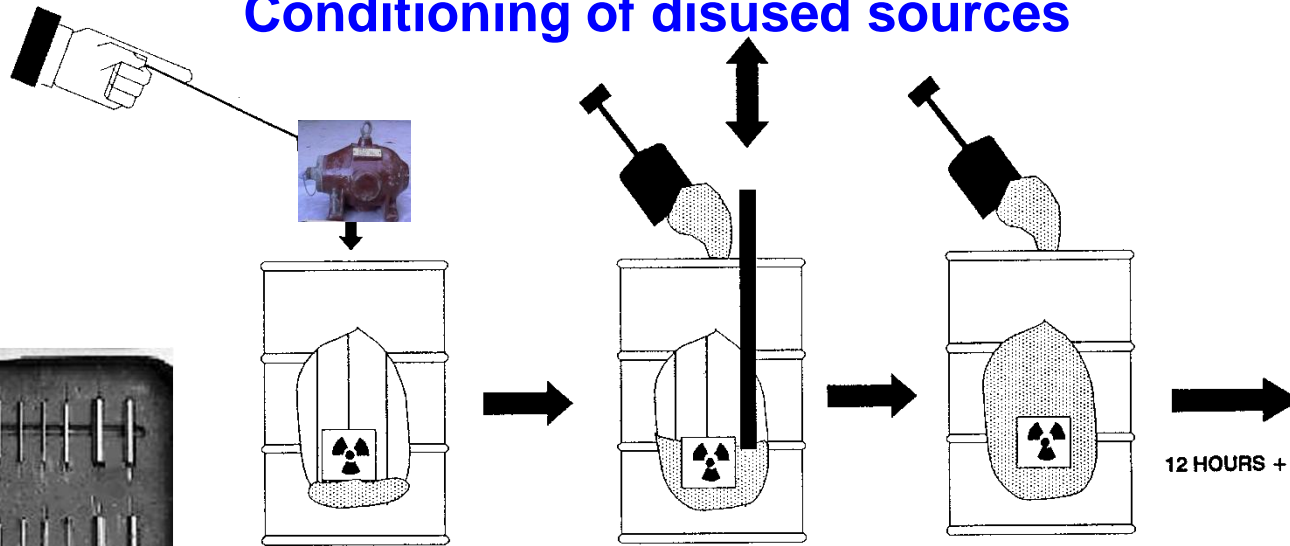




# Conditioning of disused sources



# Conditioning of disused sources



9. Place source in drum

10. Pour cement into drum and tamp. Repeat for other sources if necessary

11. Fill drum with cement

12. Wait for cement to cure

