

Experience of Georgian authorities in recovering orphan sources

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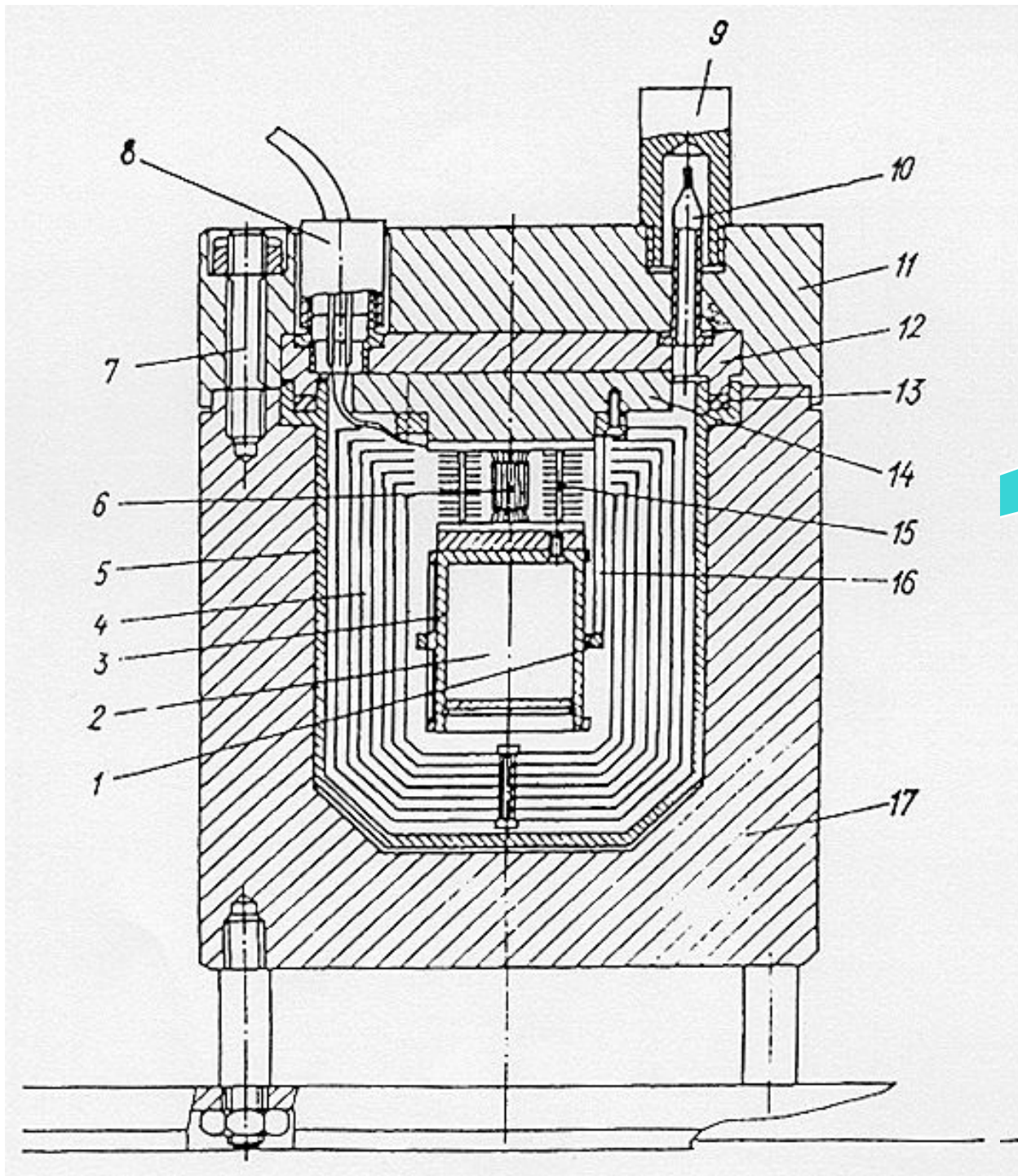
Ministry of Environment Protection and Natural Resources of
Georgia

ALARA in Safety and Security of Radiation Sources

Vienna, Austria - 21-23 October 2009

Introduction

- Georgia had serious problems with s.c. orphan radioactive sources. There were found and recovered 293 of such sources. The number of people was overexposed. The lethal events are also fixed.
- Among the found orphan sources the most important are s.c. RTG. Each of them contains radionuclide ^{90}Sr (initial activity of ^{90}Sr is 1 290 TBq). There were found and recovered six RTG-s.
- The sources were used to produce electric supply for antennas installed into the gorge of high mountain river Enguri. Due to braking radiation the sources are very hot, therefore using of thermocouples gives the possibility to receive enough electrical voltage to supply the antenna with energy. Usually the sources were installed into special device . Usually two sources were used to supply by electricity one antenna.



**Sr-90
SOURCE**

- Analyzing the situation with orphan radioactive sources in Georgia, it can be concluded that there were two ways for originating of orphan radioactive sources in Georgia: military and civil.
- Situation with orphan radioactive sources in Georgia is caused by complex of facts. At first it should be considered that a huge amount of militaries were deployed on Georgian territory. Many of them use radioactive sources were not under civilian regulatory control. At the troops withdrawal from Georgia no strong regulatory control existed. There was period of time of soviet empire ruining, when old regulatory system was destroyed, but new one was not established still.

- At the same time weakening control within military deployments gave the possibility to sell or even abandon (to avoid fees for transportation and disposal) radioactive sources.
- Simultaneously many enterprises owned the sources due to economical difficulties stop their activities or changed the profile. As a result, in absence of regulatory control, number of sources becomes uncontrolled.
- To take into account main causes for loss of control over the sources it is possible to conclude that the main aspect loss of control and originating of orphan sources was Financial Motive . This motive was existed when some people found abandoned radioactive sources. They just tried to earn money and improve their wealth in difficult economical situation.

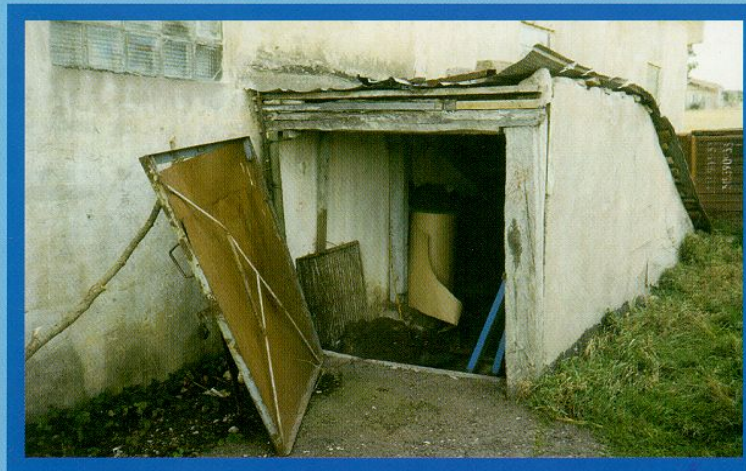
Based on above-mentioned there is possible to identify three main causes for originating of orphan radioactive sources in Georgia:

- Temporary absence of regulatory control;
- Absence of radioactive waste management system
- Difficult economical situation

Accidents

- Several radiological accidents have been developed in Georgia since 1997.
- The first great radiological accident took place at the military base in Lilo, when 11 soldiers were irradiated by ^{137}Cs (orphan ^{60}Co and ^{226}Ra sources also were found) .
- In the scope of IAEA TC project GEO/9/004 “Radiological Emergency Assistance to Georgia” some analytical and monitoring equipment was provided to Georgian specialists to enable them to locate any additional sources left behind by the former Soviet Army on the territory of Georgia.

The Radiological Accident in Lilo



Medical aspects

- There were eleven victims in Lilo accidents.
- Considering the necrotic lesions, the local doses probably exceeded 25-30 Gy.
- Since 1997 the initial treatment and observation have been carried out in Georgia at #1 clinic of Tbilisi State Medical University.



Radiological Accident in Tsalenjikha (Lia)

December 2001, Georgia

- Two orphan sources (Sr-90) were found in the northern part of the country.
- The dose rate from abandoned sources on the distance of 250-300 meters was 1 microGy/h.
- A group of specialists placed the material in special lead containers.
- After transferring these sources in the container the dose rate on the surface of the container was 0.8 microGy /h. At a distance of 1 meter the dose rate was equal to natural background.



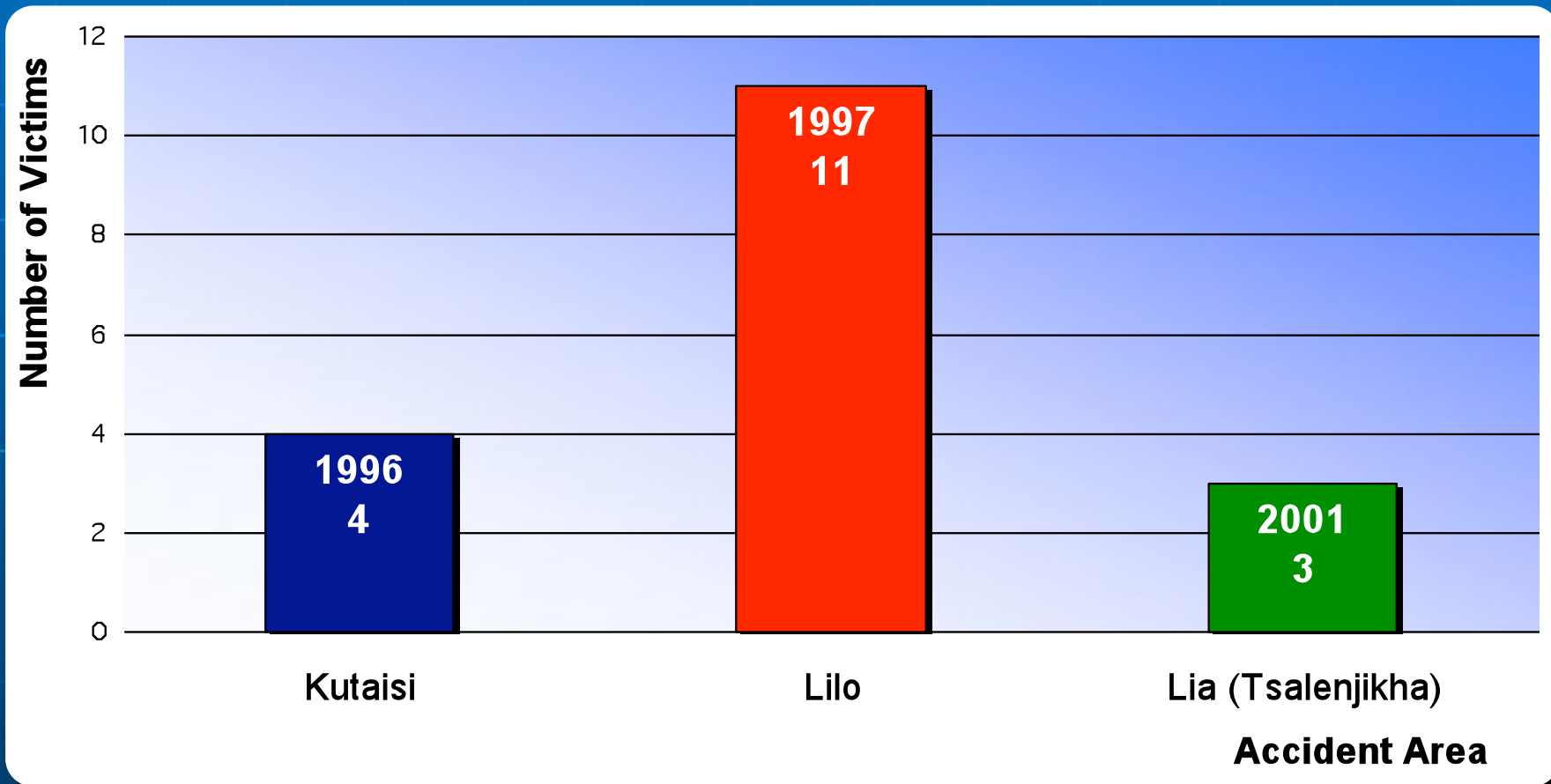


Medical Aspects

- In Lia, Tsalenjika region three inhabitants were irradiated and received heavy radiation burns.
- Despite of timely diagnostics and adequate treatment one of the patients' injuries was incompatible with life. The patient died after one year since overexposure.



Chronology of Accidents and Number of Victims



- Causes of Loss of Control of a
Radioactive Source

- **Inadvertent** : loss of, or damage to, sources **Misplaced, Forgotten, Accidents**
- **Intentional** : Damage(Sabotage), Malevolent Act, Acquisition, Financial Motive

Searching operations

- Georgia took necessary steps to establish regulatory control on every type of nuclear and radiation activity: radioactive waste management system is under development (some important parts are already implemented – centralized storage is under operation);
- Simultaneously with this it is important to search and recover the sources which already became orphaned. Administrative searching can be considered as a first phase for whole searching operation, which should be followed by physical searching. There are three main possibilities to conduct physical searching operation: Airborne survey, car survey and pedestrian survey.
- All types of survey were conducted in Georgia. Each type is characterized by its effectiveness and difficulties.

Airborne survey:

- The most effective to quickly find and identify sources or land contamination.
- Difficulties: Required expensive equipments. Not applicable for mountain regions.
- This type survey was carried out in Georgia within the scope of IAEA TC project GEO/9/006
- “Assistance for safe disposal of ^{90}Sr the thermogenerators” when 56 hours of airborne gamma
- survey of a large territory of the western part of Georgia and around Tbilisi was carried out at 2000

Searching for the other
generators



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LABORATOIRE MESURES SOL ET AEROPORTÉES

**Report on the Hélinuc team contribution
in the Georgia survey.**

May 26th – June 17th

Project GEO9006-9002



Report No. 12/2000, issued on November 20th 2000.

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Car and pedestrian survey

- Effective to allocate the source. Applicable for mountain relief. (Not so expensive as airborne survey)
- Difficulties: Covering of large regions
- Car survey can be effective if it is accompanied with pedestrian searching. These types of surveys were conducted in Georgia at 2002, 2003 and 2005. All these activities were actively supported by IAEA in close collaboration with USA, France, Indian and Turkish experts.

Recovery operations

All found orphan radioactive sources should be recovered. There is possible to distinguish types of recovery operations: recovery operation during searching activity and large scale recovery operation. Large scale recovery operation is required when powerful orphan radioactive source was found. Usually large scale recovery operations usually contain three phases:

- Assessment
- Actions planned
- Implementation

Recovery operations

- During the first phase the relevant information should be gathered and determined the nature and magnitude of the problem.
- During the second phase evaluation of problem and remedial action should be carried out. The special recovery plan should be elaborated and taken all action for its implementation.
It is also important to consider actions to prevent such accidents in future as on legislation, as on regulation level.
- The third phase is implementation of the recovery operation and assessment of its results.