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Disused radioactive sources – Security threats and vulnerabilities

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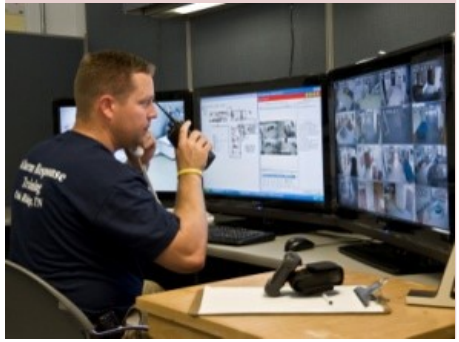
MISSION: The Office of Radiological Security enhances global security by preventing high-activity radioactive materials from use in acts of terrorism.

PROTECT

PROTECT radioactive sources used for vital medical, research, and commercial purposes



REMOVE

REMOVE and dispose of disused radioactive sources

REDUCE

REDUCE the global reliance on radioactive sources by promoting the adoption and development of non-radioisotopic alternative technologies

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Talk Overview

- General threat environment and trends
- Orphan and disused sources – risks?
- The link between end of life management and security

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Definitions

Disused Source	Orphan Source
a radioactive source which is no longer used, and is not intended to be used, for the practice for which an authorization has been granted.	a radioactive source which is not under regulatory control, either because it has never been under regulatory control, or because it has been abandoned, lost, misplaced, stolen or transferred without proper authorization

Malicious Use - Introduction

- ORS via Argonne National Laboratory (ANL) reviewed high level trends where the intent was to use radioactive material for malicious purposes, as reported in open source literature.
    - NOTE: The cases represented in this study are all open source.
        - **No Law Enforcement information is included**
        - **No Intelligence reporting**

- *Malicious Radiological Incident* – An incident that involves the release of, intended release of, threatened release of, or exposure to radiation from radioactive materials with the intention of either causing bodily harm or economic damage.

- More than 110 historical incidents involving actual, attempted or intended use of radioactive material for malicious purposes were identified based on open source information through 2017.

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Definitions

Attack Types	Motivations
• Dispersal • Direct Exposure • Poisoning • Sabotage	• Personal • Extortion • Terror

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Results overview

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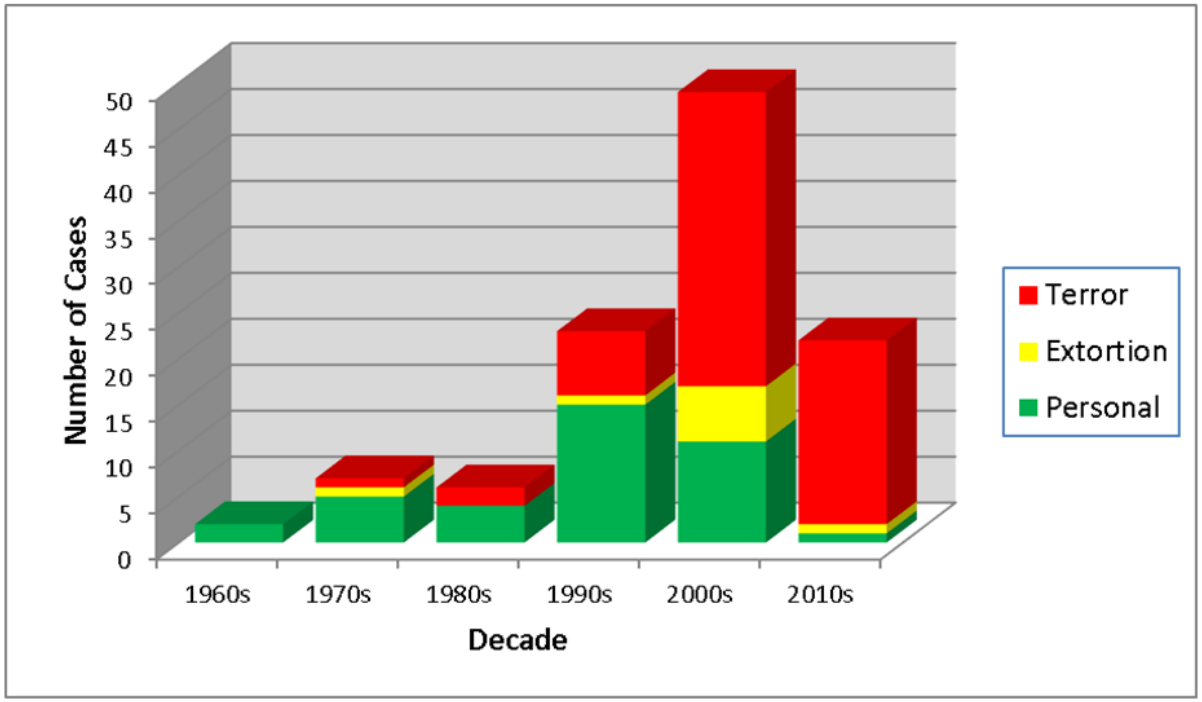
Malicious Intent

Finding: The number of malicious use cases increased in the past 20 years.



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Data and results from unpublished ANL study

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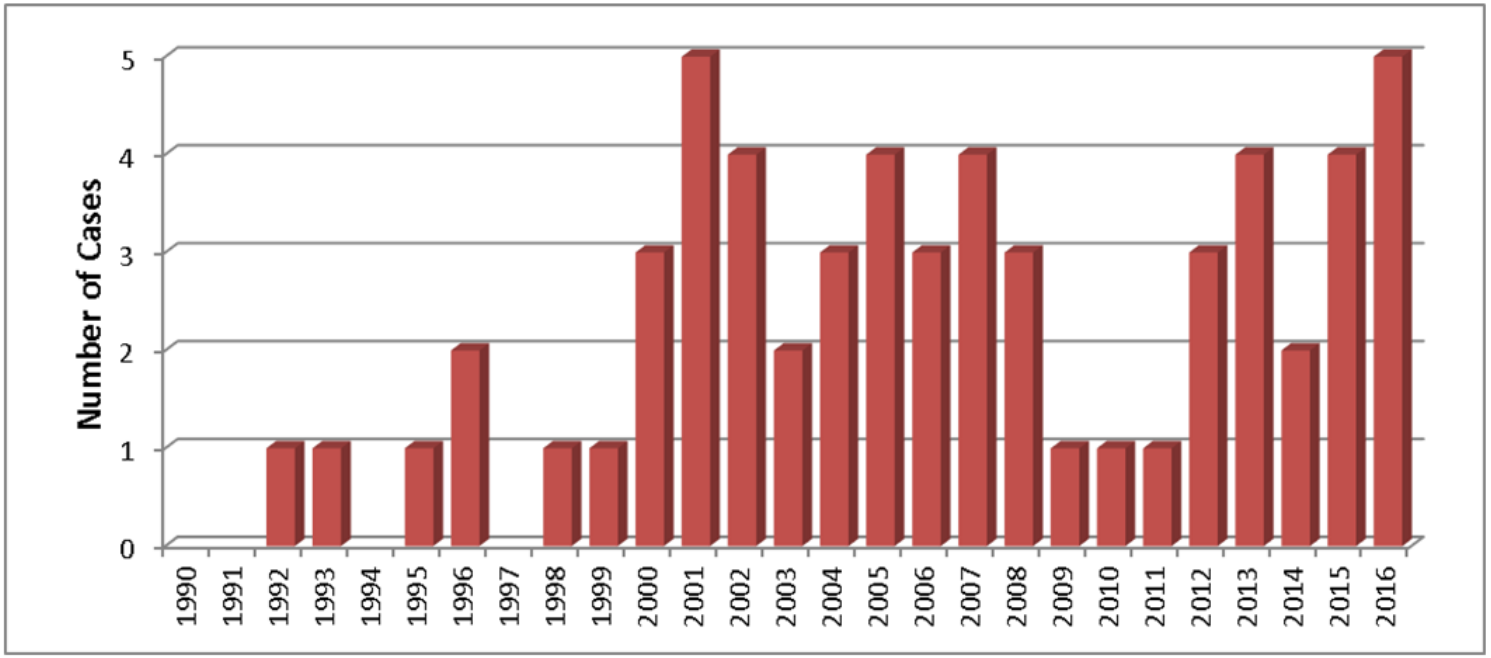
Better reporting does not explain the relatively larger surge in terror motivated cases or the decrease in personal cases in the last 15 years. This figure disaggregates terror cases for the last 20 years.



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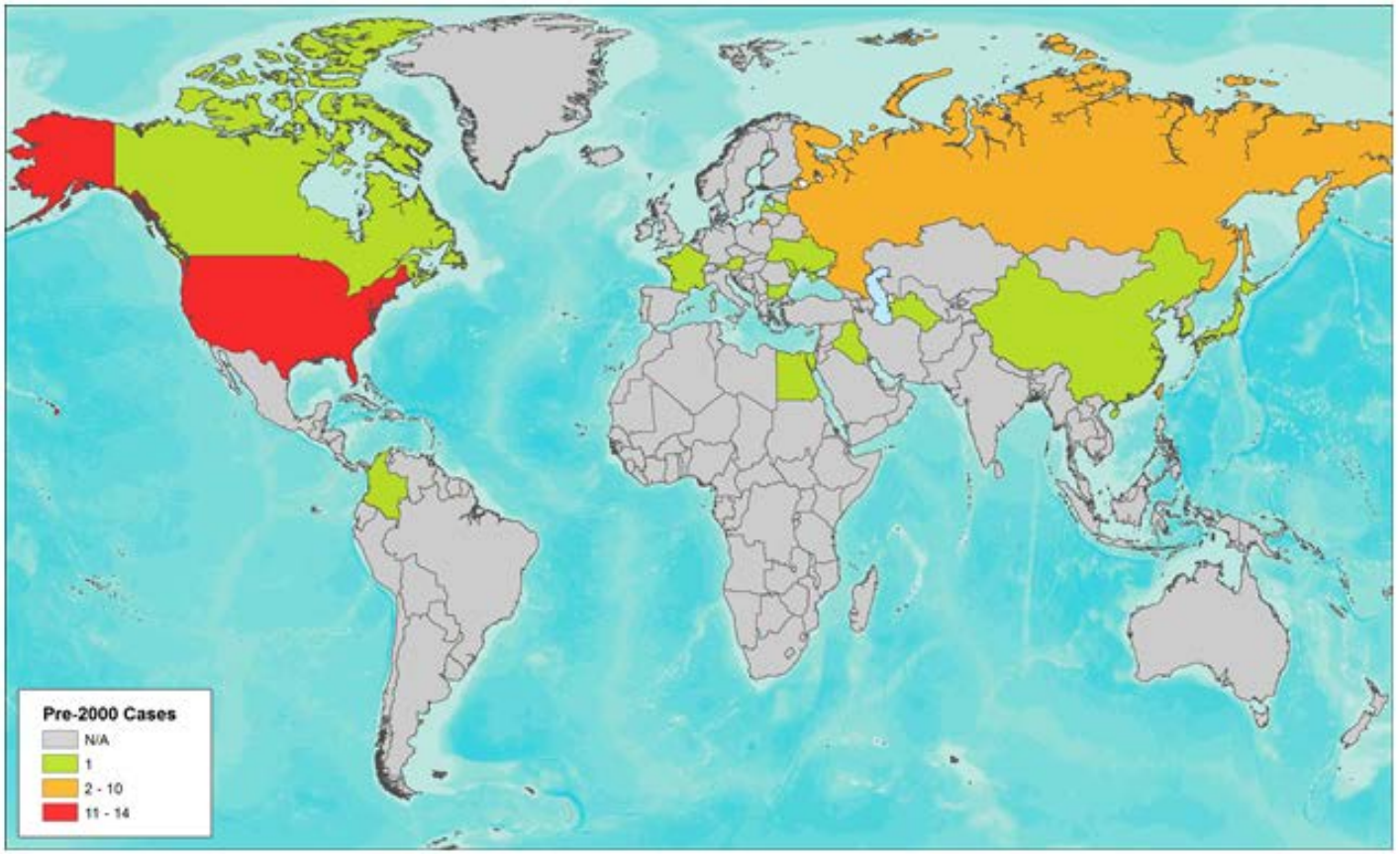
Case distribution pre-2000



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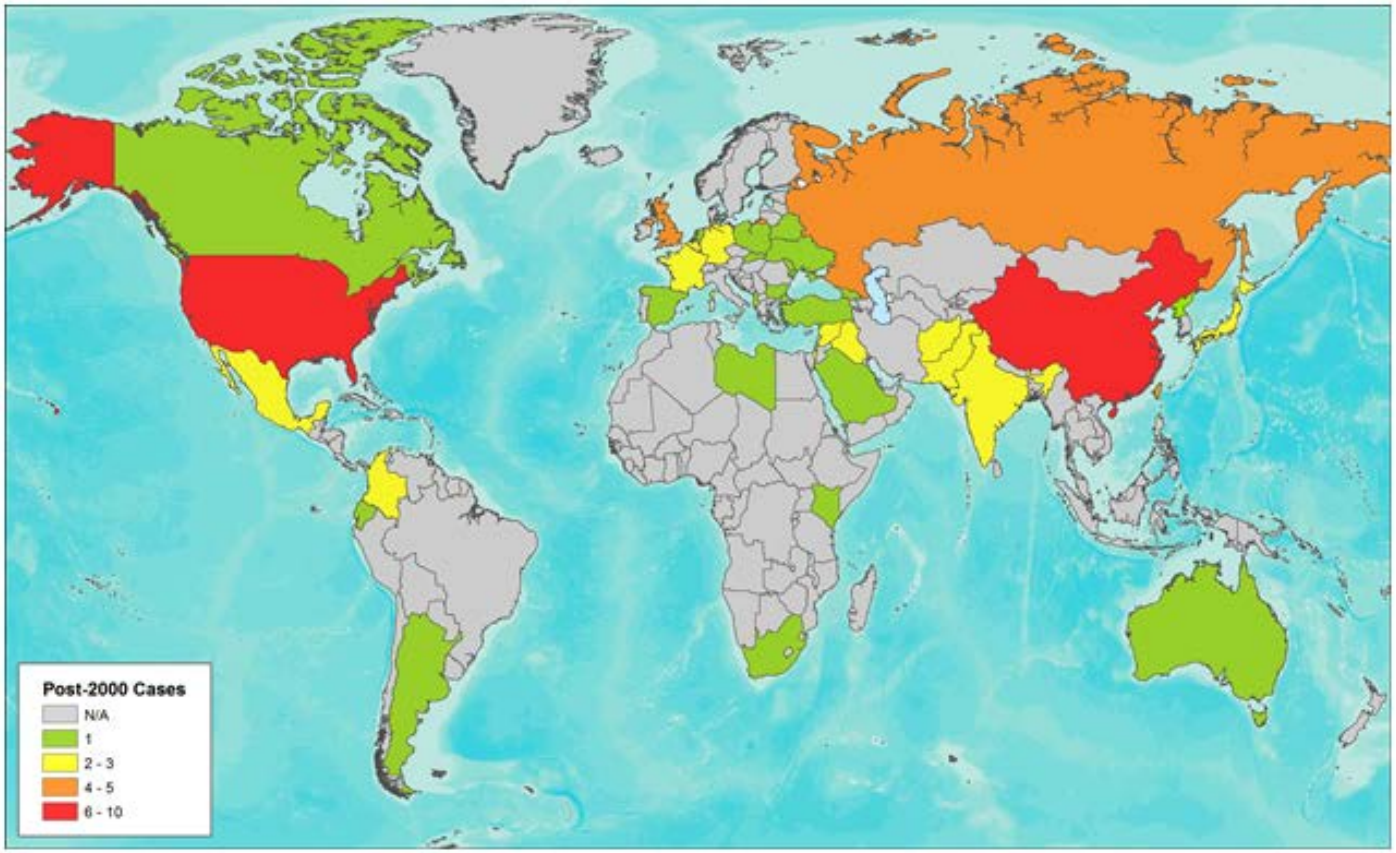
Case distribution post-2000



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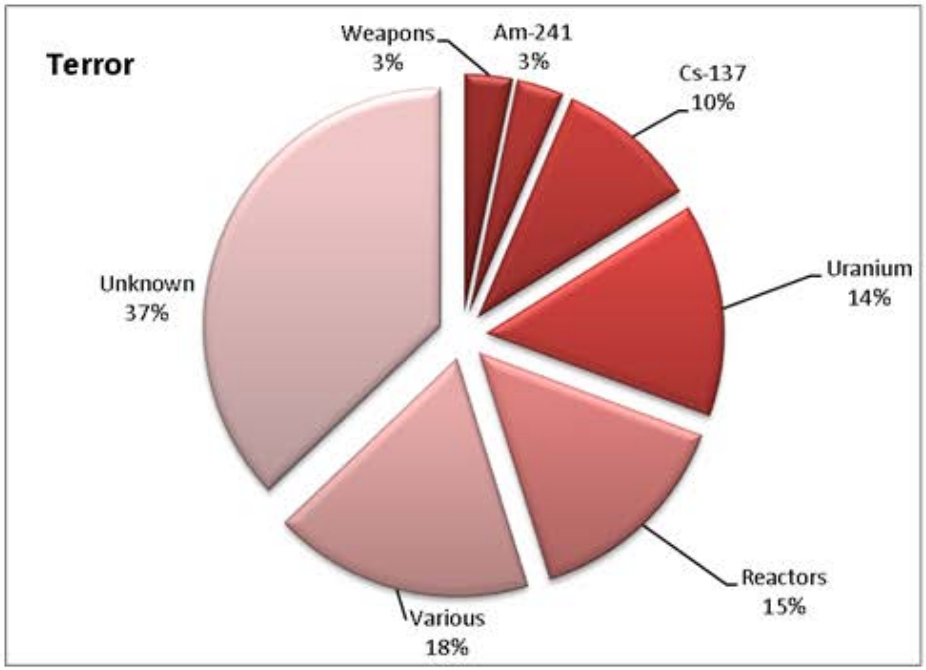
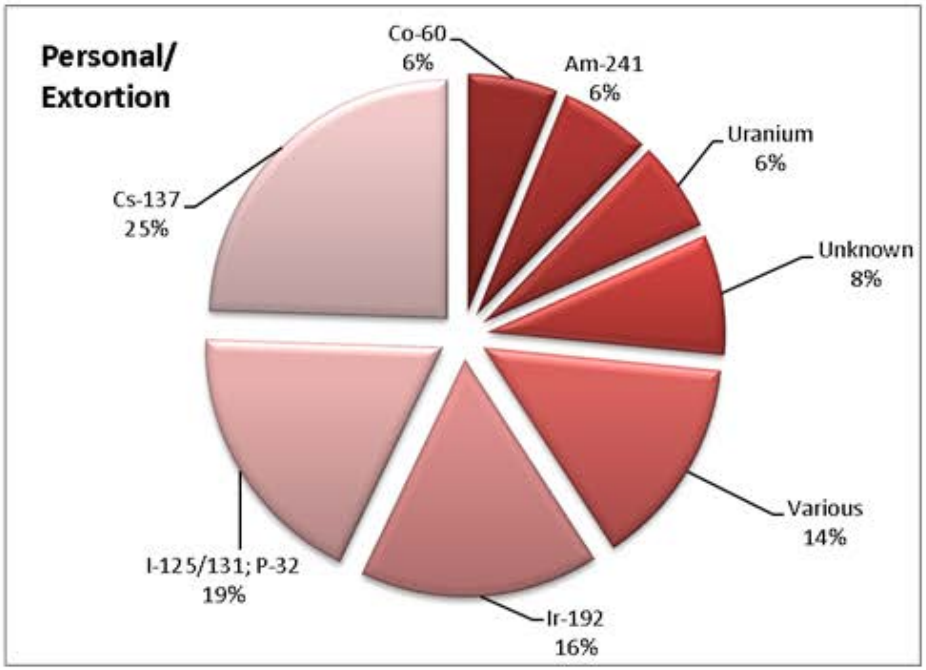
Material





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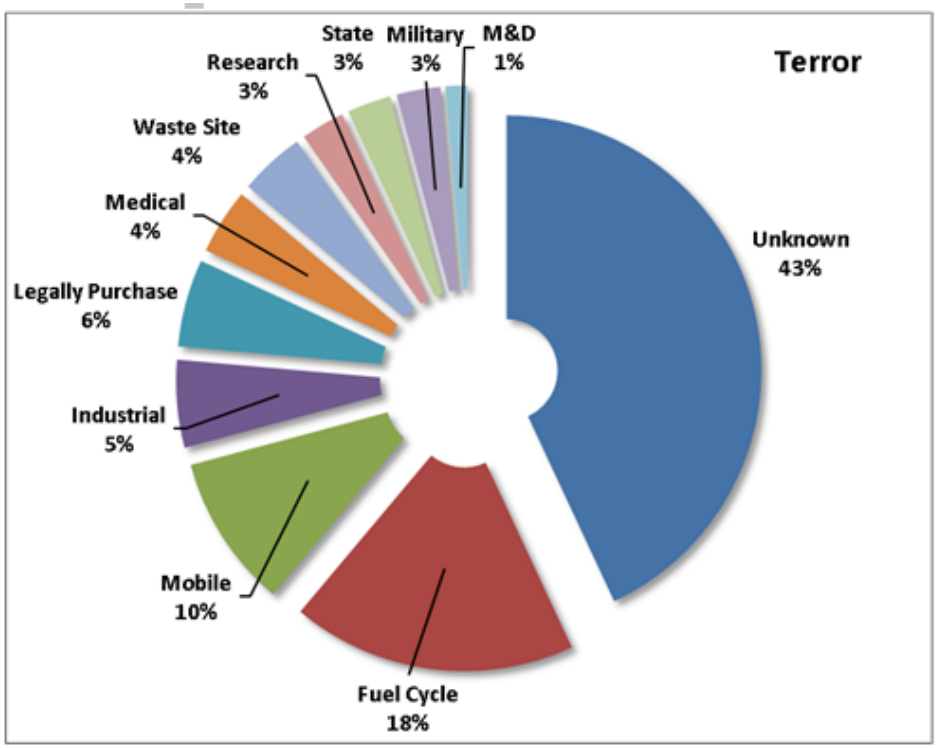
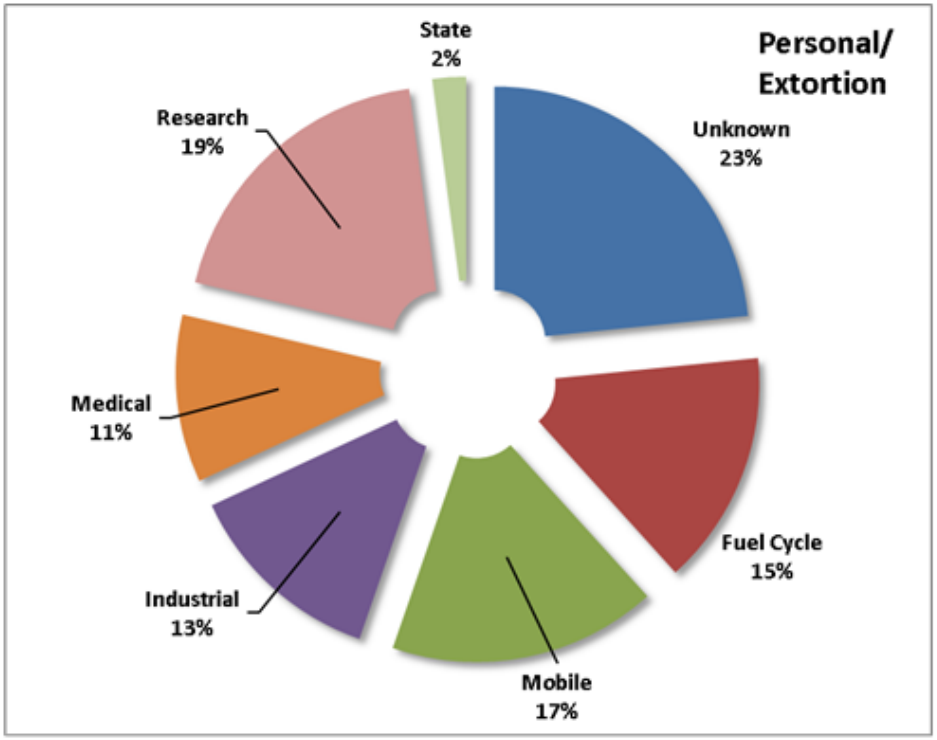
Source of Material





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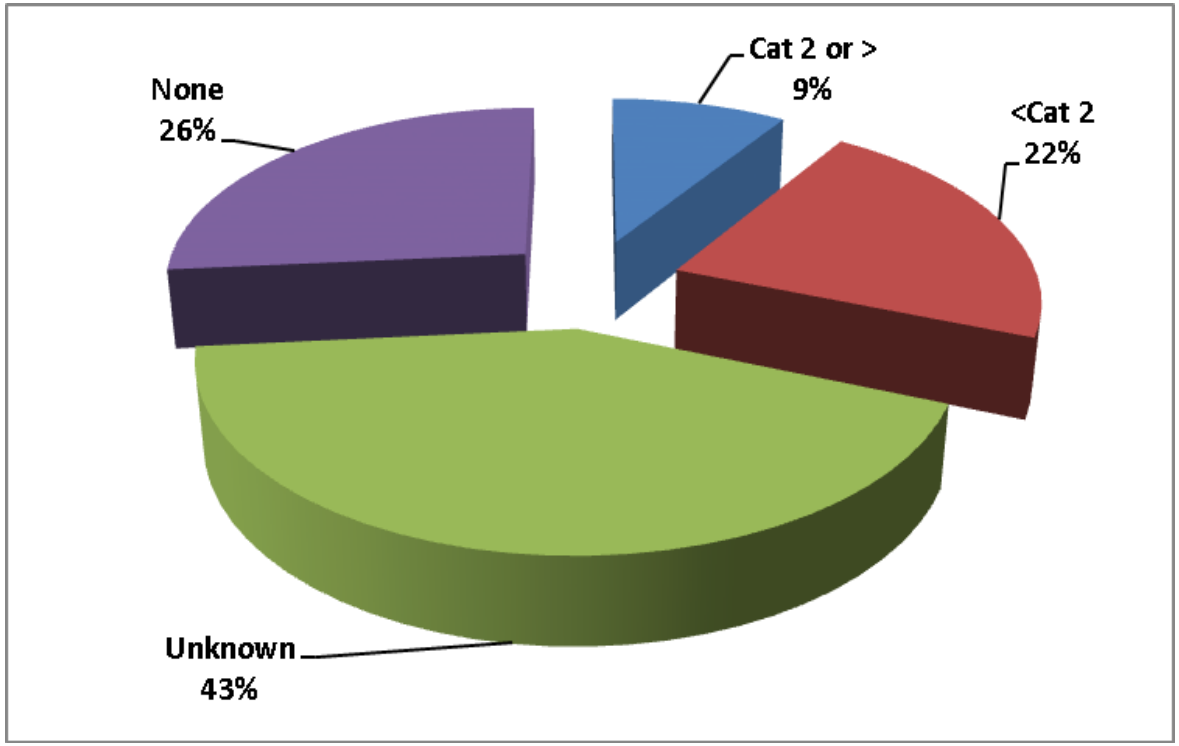
Amount of Material



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Perpetrators

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Orphan sources - Introduction

- What kinds of sources become orphaned?
- With what frequency?
- How are sources orphaned?

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Commonly Orphaned Sources

Soil Moisture/Density Gauges - 1.4 GBq Am-241 & 0.3 GBq Cs-137

Oil and Gas Exploration Logging Devices – Cs-137 & Am-241 GBq range

Industrial Gauges (Am-241, Co-60, Cs-137) - MBq to GBq range

Radiography Cameras (Ir-192, Se-75, Co-60) - GBq to TBq range

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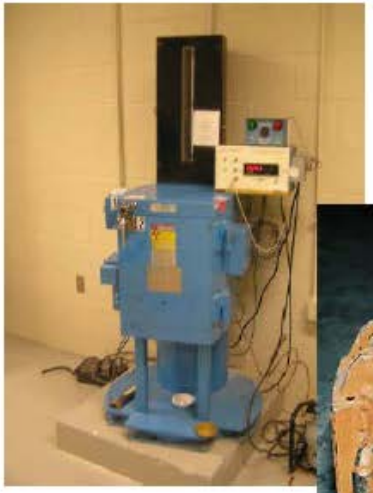
Commonly Orphaned Sources



Self-Shielded Irradiators (Cs-137 & Co-60) - TBq range

Teletherapy (Co-60) - TBq range

Radioisotope Thermoelectric Generators (Sr-90) – PBq range

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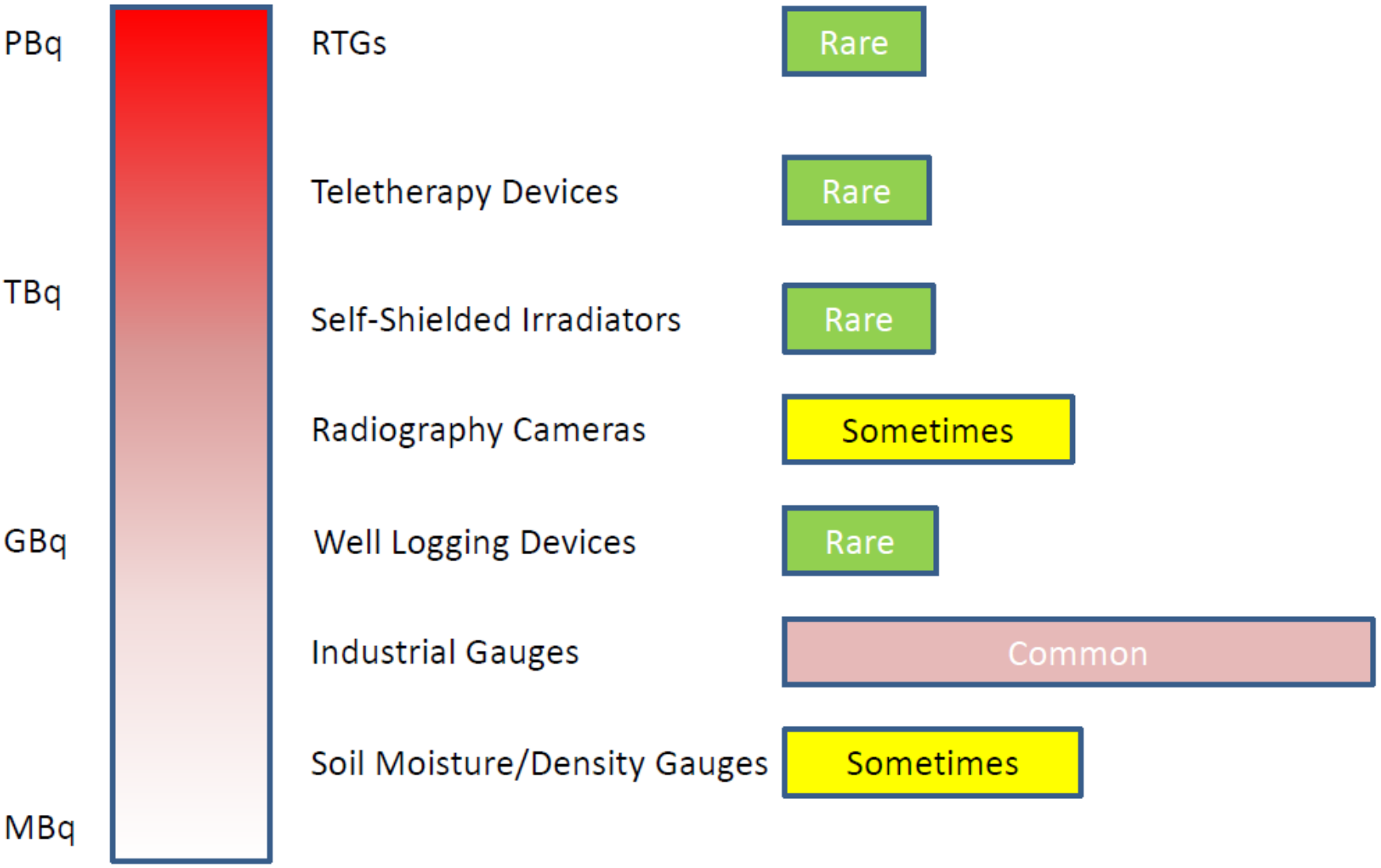
With what frequency



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How are sources orphaned?

- Bankruptcy/facility closure
- Neglect
- Abandonment
- Theft
- Transportation loss
- Improper disposal

Once lost they can be difficult to recover

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Cases

Improper Disposal (India, 2010)

- End of life Co-60 research irradiator sold for scrap by a university
- Scrap dealers dismantled the equipment, resulted in 7 injuries, 1 death

Abandonment (Russia, 2019)

- A local reported radioactive “flasks,” found in abandoned garage, to authorities
- Sources transferred to waste site, investigation into garage ownership

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Cases

Loss (Japan, 2019)

- University lost disused "authentication device" containing Co-60, but recovered
- University took steps to improve its RS storage system

Facility Closure (US, ~2015)

- Small biotech firm lost access to facility due to a rent dispute with landlord, 600 Ci Cs-137 research irradiator remained on site
- Landlord disabled security features
- State regulator eventually allowed company to retain source license with conditions

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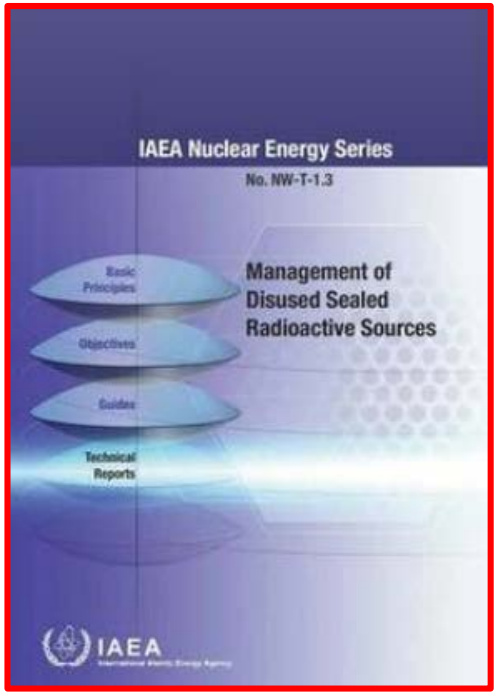
The International Community Agrees on Safety & Security for DSRS



International Atomic Energy Agency
INFORMATION CIRCULAR

INF

INFCIRC/546
24 December 1997

GENERAL Distr.

Original: ARABIC, CHINESE ENGLISH, FRENCH, RUSSIAN and SPANISH

JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

60 Years
IAEA Atoms for Peace and Development

Information Circular

INFCIRC/910
Date: 20 January 2017

General Distribution
Original: English, French

Communication dated 30 December 2016 received from the Permanent Mission of France concerning a Joint Statement on Strengthening the Security of High Activity Sealed Radioactive Sources

Joint Statement on Strengthening the Security of High Activity Sealed Radioactive Sources

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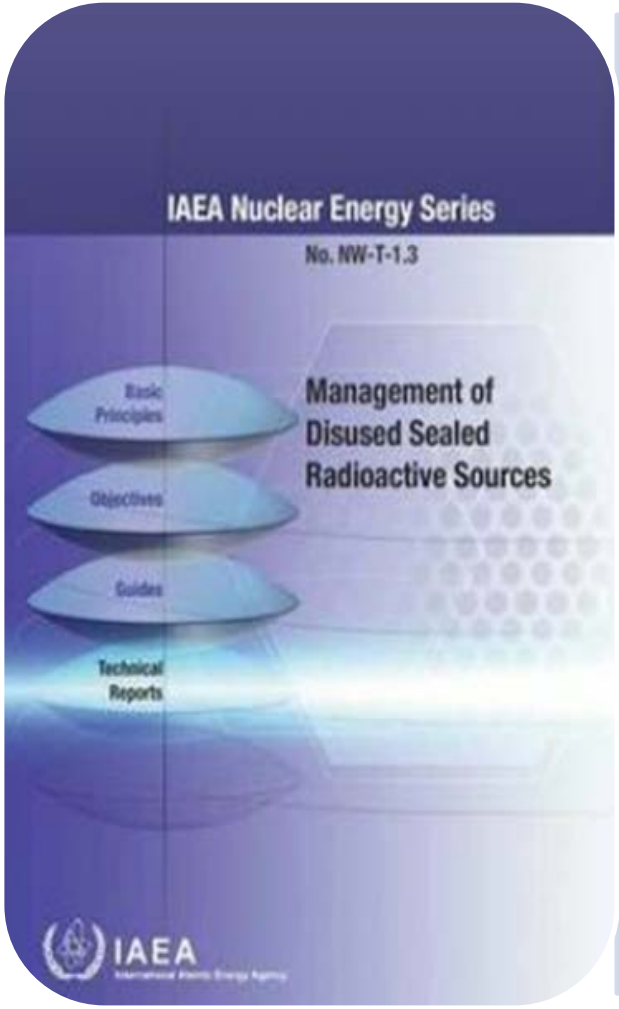
The International Community Agrees on Safety & Security for DSRS



- Regulatory control of sources throughout their life cycle will ensure continuity of control **when sources cease to be used and become potentially more vulnerable to loss**.
- The Code of Conduct [14] expects that every State should ensure that sealed sources are not stored for extended periods of time in facilities that have not been designed for the purpose of such storage. **Central storage of disused sources reduces the likelihood of loss**, particularly where generic regulatory control is applied.

What is secure end of life management?

- **Good end of life management policies & practices contribute to source security**
  - Sources generally more secure at storage/disposal facilities than at user sites
  - Ability to condition/consolidate sources → more storage space in future
  - Regulatory requirements for up-front planning (identifying mgmt. options, financial planning) may lessen likelihood sources will be neglected once disused
  - State has procedures and resources to manage orphan and legacy sources
  - State allows for the return of disused sources

- **But sources must also be secure while being returned or stored long-term**
  - Physical protection systems
  - Accounting and control
  - Safety and security of packaging/storage units
  - Transport security

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Conclusions

- The threat of malicious use of radioactive sources remains real
- Through good end of life management, we can prevent loss, neglect, theft, and ultimately mitigate the risk of a safety or security incident

End of life management is a critical aspect of source security

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Thank you!

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