REPUBLIC OF ESTONIA
ENVIRONMENTAL BOARD

Estonian regulations on practices involving naturally-occurring radioactive material (NORM)

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Estonian legislation

- Radiation Act
  - The regulation of the Minister of the Environment „The bases for calculation of exemption levels of radionuclides and the exemption levels below which no radiation practice license is required“
  - The regulation of the Minister of the Environment „The clearance levels for radioactive substances and items contaminated with radioactive substances resulting from radiation practices and the requirements for their clearance, recycling and reuse“
  - Radiation practice license

Estonian legislation

- General Part of the Environmental Code Act
  - The Regulation of the Minister of the Environment „Detailed requirements and datasets for applications for an environmental permit, the procedure for granting an environmental permit, and the dataset of an environmental permit“
    - If the activities proposed under the environmental permit relate to the activities specified in the Radiation Act, the radiation safety assessment shall also be submitted in the application for authorisation.
  - Environmental permit, *inter alia*, for special use of water

Estonian legislation

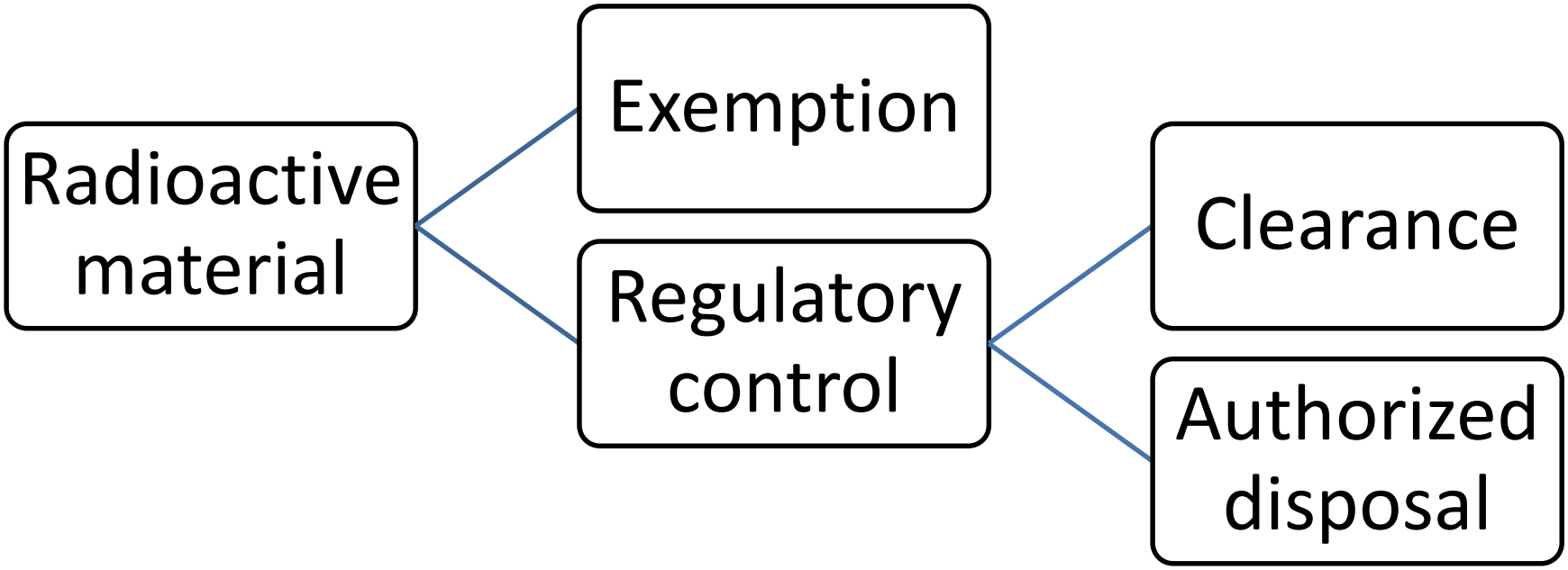
- Water Act
  - The regulation of the Minister of Social Affairs „The quality standards and inspection requirements for drinking water, and the methods of analysis“
    - in the case of drinking water from the Cambrian-Vendian, Ordovician-Cambrian or Ordovician aquifer and drinking water from other aquifers mixed with these layers, the drinking water handler shall determine the concentration of radium isotopes Ra-226 and Ra-228 in the drinking water
    - indicative dose assessment based on the radium content
    - to remove radium may required at water filtration facilities

Competent authorities

- **Environmental Board** issues
  - Environmental permit
  - Radiation practice licence
- **Environmental Inspectorate** inspects the compliance with requirements of
  - Environmental permit
  - Radiation practice licence

- **The Health Board** inspects the compliance of drinking water with the quality requirements defined

Exemption and clearance



Exemption levels

- The exemption level is the value of activity or activity concentration of radionuclide at or below which no radiation practice licence is required
- In case of NORM, the practice is exempted if annual efective dose to workers is or less than 1 mSv
- Automatic exemption of material without the need for a safety assessment

Radionuclides	**Activity concentration**
Ra-226	≤ 10 kBq/kg
Ra-228	≤ 10 kBq/kg
Th-228	≤ 1 kBq/kg

Clearance levels

- Clearance level is the value of activity or activity concentration at or below which the radionuclide generated in the course of any radiation practice subject to the requirement of a radiation practice licence may be released from radiation safety requirements
- Unconditional release from regulatory control is clearance of material without the need for a safety assessment if the activity or activity concentration of radionuclides is below clearance levels
- Conditional release from regulatory control
  - Safety assessment (in case of NORM, the annual effective dose to workers is or less than 1 mSv)
  - Case-by-case approach

Identification practices involving NORM

- **Environmental Board identifies** by means of studies or other appropriate methods the **practices**, in which workers of member of public receive or may receive **exposure higher than 1 mSv per year**
- **The Radiation Act** contains **the indicative list of such practices,** including groundwater filtration facilities
- If workers or members of public receive from the practice the **exposure exceeding the 1 mSv per year**, the Environmental Board has the right to demand from the employer to **apply the measures** to protect workers and members of public **to control exposure**, *inter alia*, **submission of safety assessment**
- If implentation of the **measures** is **insufficient** and the workers may recieve an annual effective **dose exceeding 1 mSv**, the employer must **apply for a radiation practice license**

Safety assessment

- Describes of all aspects of radiation practices which are relevant to protection of people and safety of radiation sources, including of the protective and safety measures used,
- Evaluation of the potential exposure to the exposed workers and members of the public in normal working conditions and in the cases of accidental exposure situations
- The assessment of exposures includes:
  - External gamma exposure
  - Inhalation of airborne dust
  - Inhalation of radon
  - Ingestion (usually only for public exposure)

Estonian National situation

- 2014-2015, Generation of radioactive waste at water treatment plants using water abstraction from Cambrian-Vendian aquifer
  - the study by the University of Tartu, Institute of Physics, funded by the Environmental Investment Centre
- Radionuclides' activity concentrations in filter material and annual increase of activity concentration, age of filtermaterial

	Age of filter material, years	Ra-226, kBq/kg		Ra-228, kBq/kg		Th-228, kBq/kg	
		Filter material	Annual increase	Filter material	Annual increase	Filter material	Annual increase
Average	7,4	6,44	1,81	7,16	1,96	3,5	0,62
Min	0,1	0,21	0,01	0,32	0,02	0,09	0,01
max	20,2	28,3	8,71	42,3	9,23	21,2	4,06

Estonian national situation

- 1 operator has the radiation practice licence for removal and storage of filter material
  - average activity concentrations higher than average values presented in the study of University of Tartu
- 1 waste management company has integrated environmental permit that sets out, *inter alia*, the conditions for receiving and storing filter material
  - Special clearance level for Ra-226, Ra-228 and Th-228 is 50 kBq/kg

Estonian national situation

- 884 operators have the environmental permit for abstraction of water
- 91 operators out of 884 use and treat raw water from Cambrian-Vendian and Ordovician-Cambrian aquifer for drinking water

Planned regulatory measures

- The requirements will be set out in the environmental permit
  - At present, the environmental permits do not contain requirements to control of radioactivity in filter material
- The need for a radiation practice licence is assessed for activities related to removal of filter material, the decision will be based on safety assessment
- Primary target group are operators which use raw water from Cambrian-Vendian and Ordovician-Cambrian aquifer for drinking water

Planned regulatory measures

- The environmental permit may define
  - sampling frequency for filter material
  - requirements for radioactivity analyse of filter material
  - safety assessment on activities related to removal of filter material
  - management route of removed filter material, taking into account both radioactive and non-radioactive contaminants

Transport of NORM

- International NORM transport regulations
  - UN Recommendations on the Transport of Dangerous Goods. Model regulations. 21st revised edition. 2019
    - European Agreement on International Carriage of Dangerous Goods by Road (ADR)
  - IAEA. Regulations for the Safe Transport of Radioactive Material. 2018 Edition. Specific Requirements No. SSR-6. Vienna, 2018

Transport of NORM

- National transport regulations
  - Road Transport Act and its regulations
    - The European Agreement on International Carriage of Dangerous Goods by Road (ADR)
  - Radiation Act
    - Radioactive substances and apparatuses containing radioactive substances in which the activity or activity concentration of radionuclides exceeds the exemption level shall be transported by road, railway and air and waterway pursuant to the procedure provided for in legislation concerning hazardous loads.

Transport of NORM

- **Applies to natural material and ores containing naturally occurring radionuclides** that are in their natural state, or which has been processed for purposes other than for extraction of its radionuclides, and which is not intended to be processed for use of these radionuclides, provided that **the activity concentration radionuclides in the material exceeds 10 times of exemption level**

Transport of NORM

- If material contains several radionuclides, the following formula applies

$$\sum_j \frac{C_i}{X_i} > 10$$

C_i is concentration of radionuclide i

X_i is appropriate exemption level of radionuclide i

j is number of radionuclides

Transport of NORM

- Consignor's responsibilities
  - Description of radioactive materjal
  - packaging of radioactive material and control of package
  - labelling the packages, placarding overpacks
  - information on the consignor and consignee
- Carrier's responsibilities
  - Placarding the cargo
  - Dose rate measurement of the cargo
  - means of communication
  - make sure cargo documents are available
  - radiation protection programme
  - emergency response plan

Transport of NORM

- UN number
- Labelling
  - 2 per package
- Transport Index
  - Calculated by the dose rate measured at 1 m from the package surface
- Category
  - Calculated by the dose rate measured from the package surface

Transport of NORM

- Transported as low specific activity material (LSA)
  - means radioactive material that by its nature has a limited specific activity, or radioactive material for which limits of estimated average specific activity apply
  - uranium and thorium ores and concentrates of such ores, and other ores containing naturally occurring radionuclides; natural uranium, depleted uranium, natural thorium or their compounds or mixtures, that are unirradiated and in solid or liquid form.
- Examples of UN numbers relevant to NORM
  - Excepted package: UN2910
  - LSA: UN2912, UN3321, UN3322
  - Surface Contaminated Objects: UN 2913

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Thank you!