

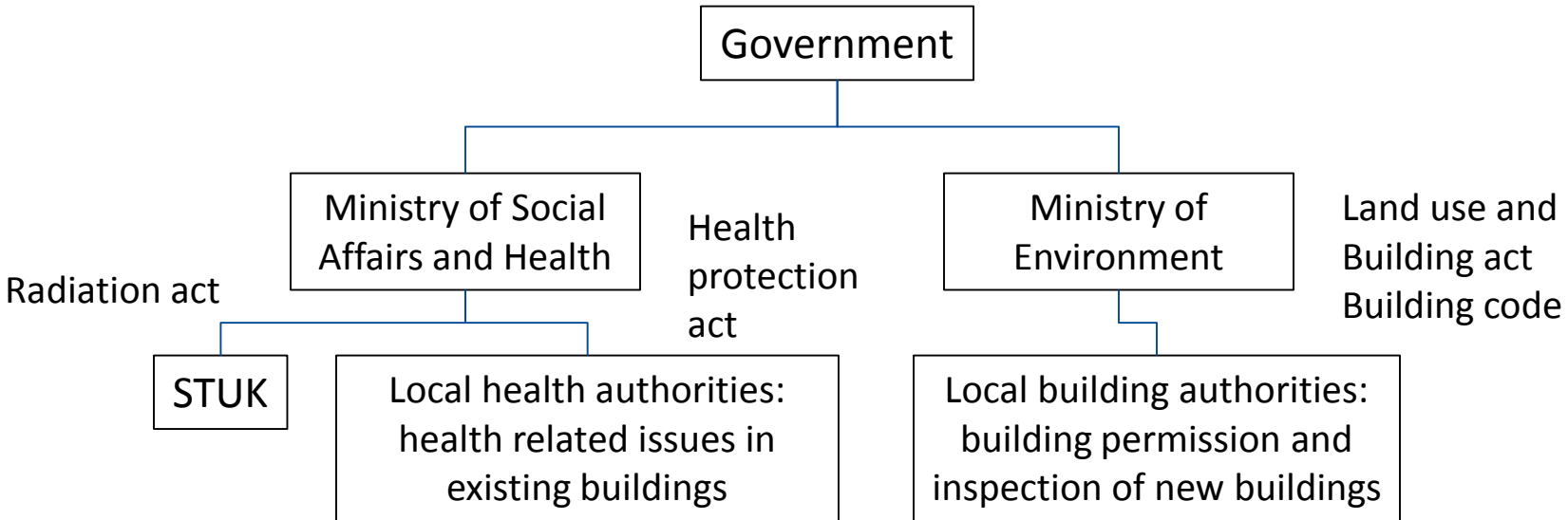


Supervision of homes and work places

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Organisations related to indoor radon in dwellings



Non governmental organizations

- Universities: research
- Societies in the area of indoor air: risk communication
- Private companies: remediation and prevention work, measurements

Successful radon policy requires good cooperation between governmental and local authorities as well as expert organizations

Supervision of indoor radon in dwellings

- Ministry of Social Affairs and Health
 - Health protection legislation, existing buildings
 - Local health authorities: health related issues in existing buildings
 - Supervision based on health protection act
- Ministry of Environment
 - Development and control of new construction, Radon in building code
 - Local building authorities: building permission and inspection
- **STUK** – Radiation and nuclear safety:
 - Governmental expert organization concerning radon in dwellings
 - (Regulatory control of radon in work places)

Supervision of indoor radon in dwellings

- Local health authorities: health related issues in existing buildings
- Supervision based on health protection act
- Difficult to interfere in private dwellings (single family houses)
- Regulatory control of housing association and rental apartments if the inhabitant makes a written request to the local health authority

STUK's role in radon in dwellings

STUK – Radiation and nuclear safety

- Radon mapping and surveillance
- Risk communication
- Development of guides on radon remediation and prevention
- (Research on radon remediation and prevention methods and health effects)

Radon in work places, Introduction

- In Finland, regular monitoring of radon in underground mines and excavations started in the early 1970's
- In 1992, an action level of 400 Bq/m³ for radon in workplaces, was adopted
- The action level is applied in underground mines and excavation sites, as well as, at conventional workplaces

Regulatory control of radon in workplaces 1/2

Radiation Act (since 1992), Chapter 12: Natural Radiation

The employer

- **is required to investigate the radiation exposure** if it is found, or
- **if there is reason to suspect,** that the work involve radiation to such an extent that it might cause a health hazard.

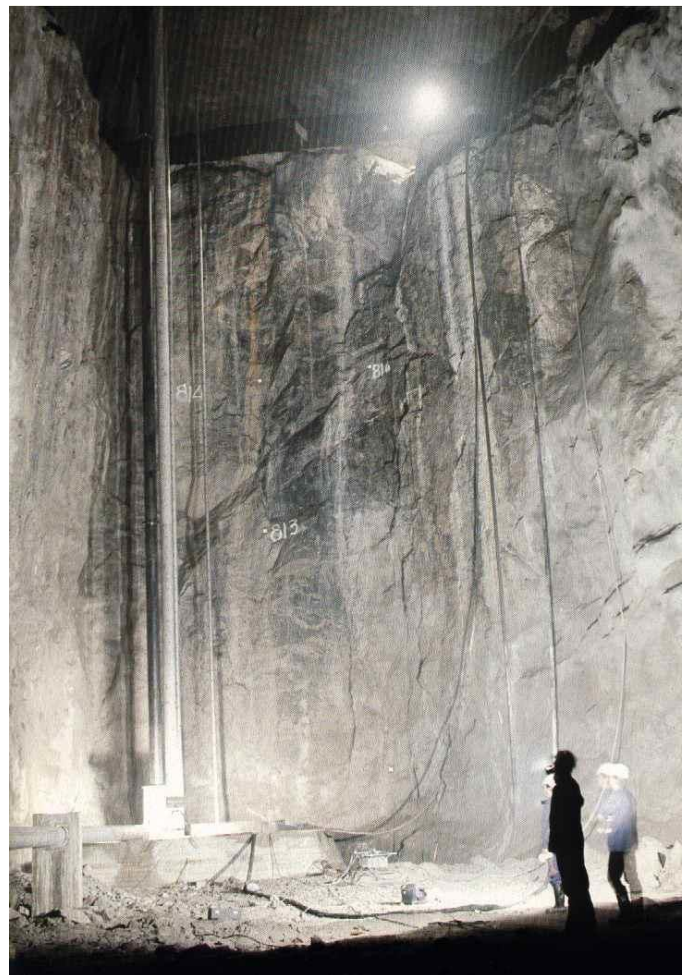
Regulatory control of radon in workplaces 2/2

Position taken by STUK:

At identified radon prone areas there is “reason to suspect that radon in workplaces might cause a health hazard”.

→ **Radon measurements in workplaces compulsory**
(unless it is evident that high radon concentrations can not occur, e.g. in an office on higher floors of a building)

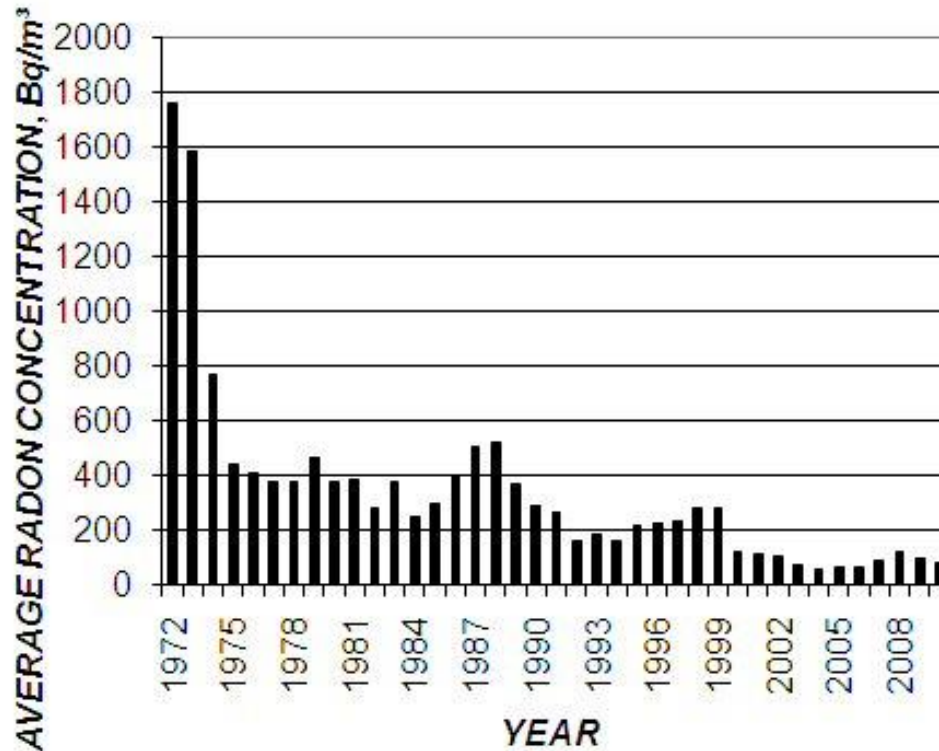
1. Mines and underground excavation works



Underground mines

- Radon measurements in the Finnish underground mines were started in 1972
- In 1972 there were 23 operating mines
- Since 1992 radon in underground mines under regulatory control
- In 2010:
 - 10 operating mines
 - Typical concentration $\sim 100 \text{ Bq/m}^3$
 - Inspections every second year

Average radon concentration in mines 1972-2010



Underground excavation works

- All underground works lasting longer than 2 months shall be notified to STUK
- About 15-20 places inspected for radon every year



How is the radon measured?

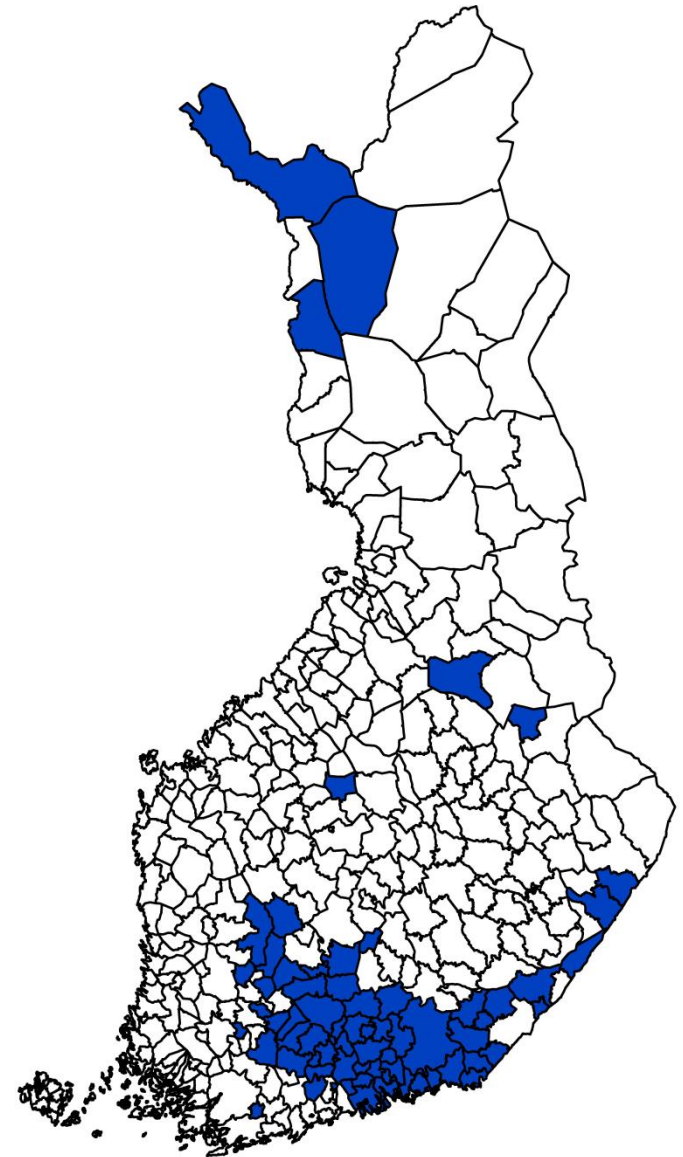
- Radon is measured with grab sampling (Lucas cells)
- The samples are counted with devices calibrated every two years (Pylon AB-5 equipment)
- Since 1993 only radon concentration measured, earlier also radon daughter concentration
- Measurements made in working areas
 - 10 to 15 samples per mine
 - 2 to 10 in excavation works

2. Above ground workplaces



Guide ST 12.1

- Radon in a workplace shall be measured if the workplace is situated:
 - In a region where over 10 % of dwellings or workplaces exceed 400 Bq/m³
 - On permeable soil (eskers)
 - All underground workplaces



Monitoring of radon in workplaces 1/2

Finnish strategy for above ground workplaces:

Integrating measurement during winter, length 2 months

- Offices and similar: 1 measurement per 200 m²
- Factory sheds and similar: 1-2 measurements/shed

At least one measurement per each different structure/building



Monitoring of radon in workplaces 2/2

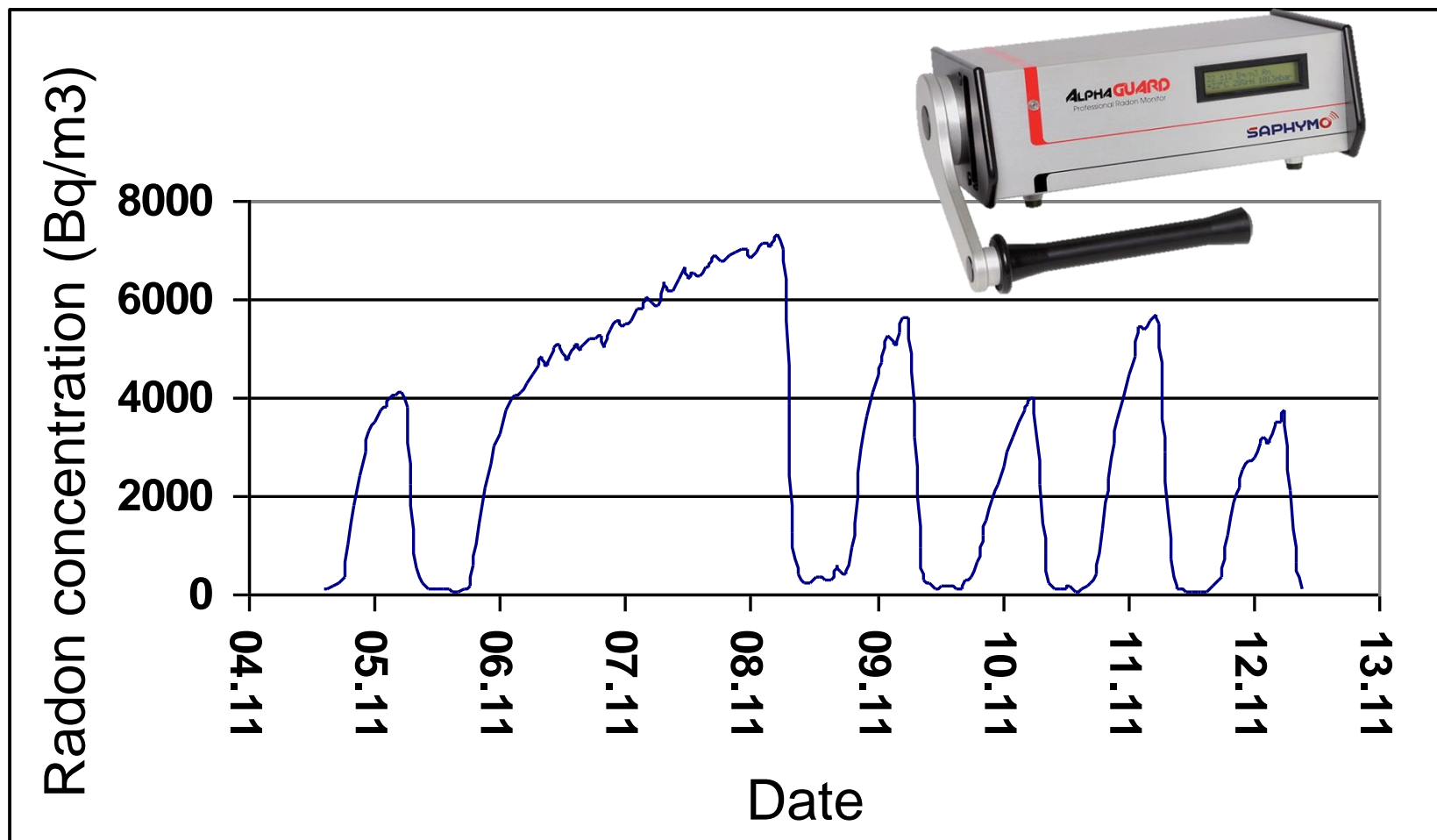
Finnish strategy for above ground workplaces:

Actions taken after integrating measurement

< 400 Bq/m³	No need for further action
400 - 500 Bq/m³	Complementary measurement in summer or an assessment of diurnal variations
>500 Bq/m³	An assessment of diurnal variations or remedial actions
>2000 Bq/m³	Remedial actions

Remedial action is required where measurements show that the Action level (**400 Bq/m³**) is exceeded

Radon concentration in a work place



Radon action level

- Concentration of radon above which action must be taken to reduce workers' exposure
- Defined as annual average concentration during working hours

Annual working hours	Action level
Regular work (1,600 hours per year)	400 Bq/m ³
Less than 600 hours	1000 Bq/m ³
Less than 300 hours	2000 Bq/m ³
Less than 100 hours	6000 Bq/m ³

- **If radon concentration is below the action level**
→ no action is required
- **If radon concentration exceeds the action level**
→ remedial action must be taken to reduce the exposure
- **If remedial action is not successful**
→ monitoring of working conditions must be arranged
(in such a way that doses of each worker can be assessed)

Monitoring of working conditions includes regular radon measurements and recording working hours

Radon remediations in work places

- Final outcome of the cases:
 - 35 % : remediation or the use of the premises stopped
 - 25 % : low occupancy time
 - 30 % : further measurements demonstrate that 400 Bq/m³ is not exceeded
 - 10 % : combination of different measures