

Overview of radon management in the Nordic countries

THE RADIATION SAFETY AUTHORITIES IN DENMARK, FINLAND, ICELAND, NORWAY AND SWEDEN



Report from Nordic-Nat

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NSFS XX conference, Lillehammer, 28th August 2025

Norwegian Radiation
and Nuclear Safety Authority



Content

- Nordic radiation safety authorities collaboration



- What is radon, and why should we measure and mitigate?
- Overview of radon management in the Nordic countries



Nordic radiation safety authorities collaboration



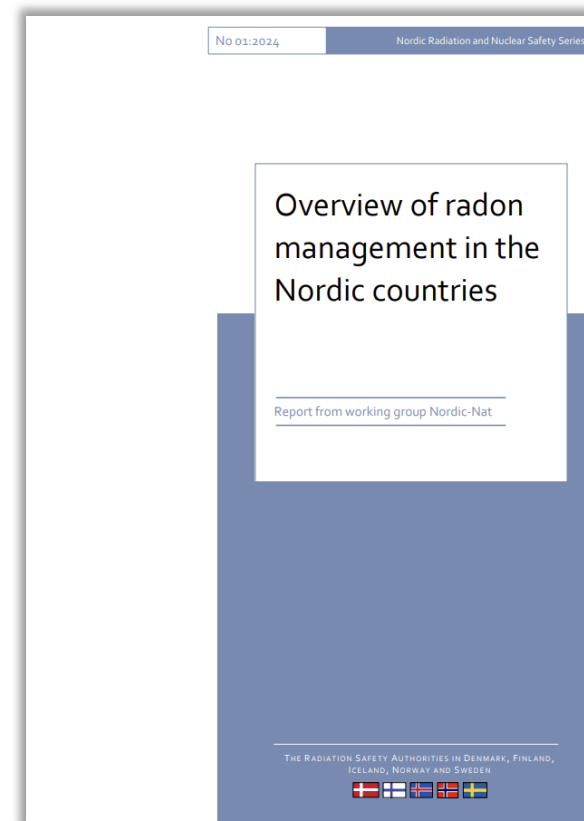
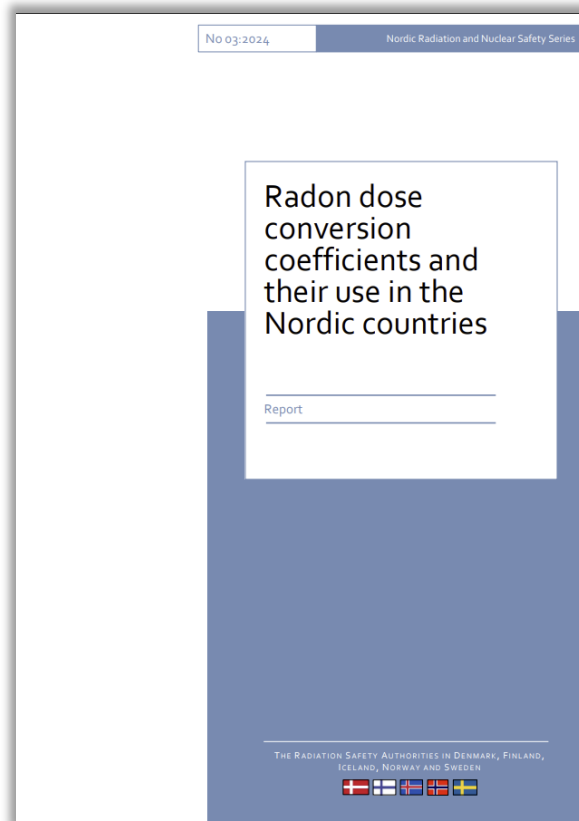
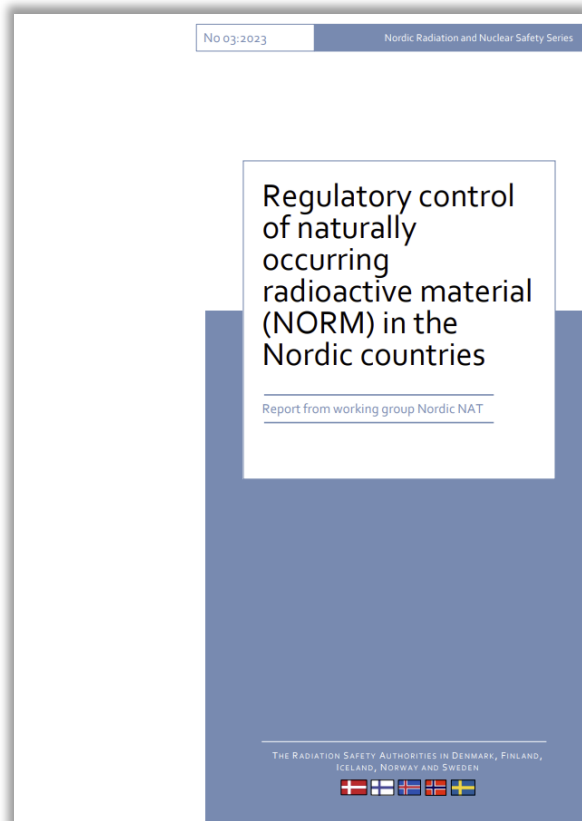
The following groups report annually to the Nordic Chiefs meeting:

- NORDOS (Dosimetry)
- NEP Emergency Preparedness
- Medical Applications
- Non-ionizing radiation
- Non-medical Applications
- NPC (Public Communications)
- NORDIC-NAT (Natural Radiation Sources)

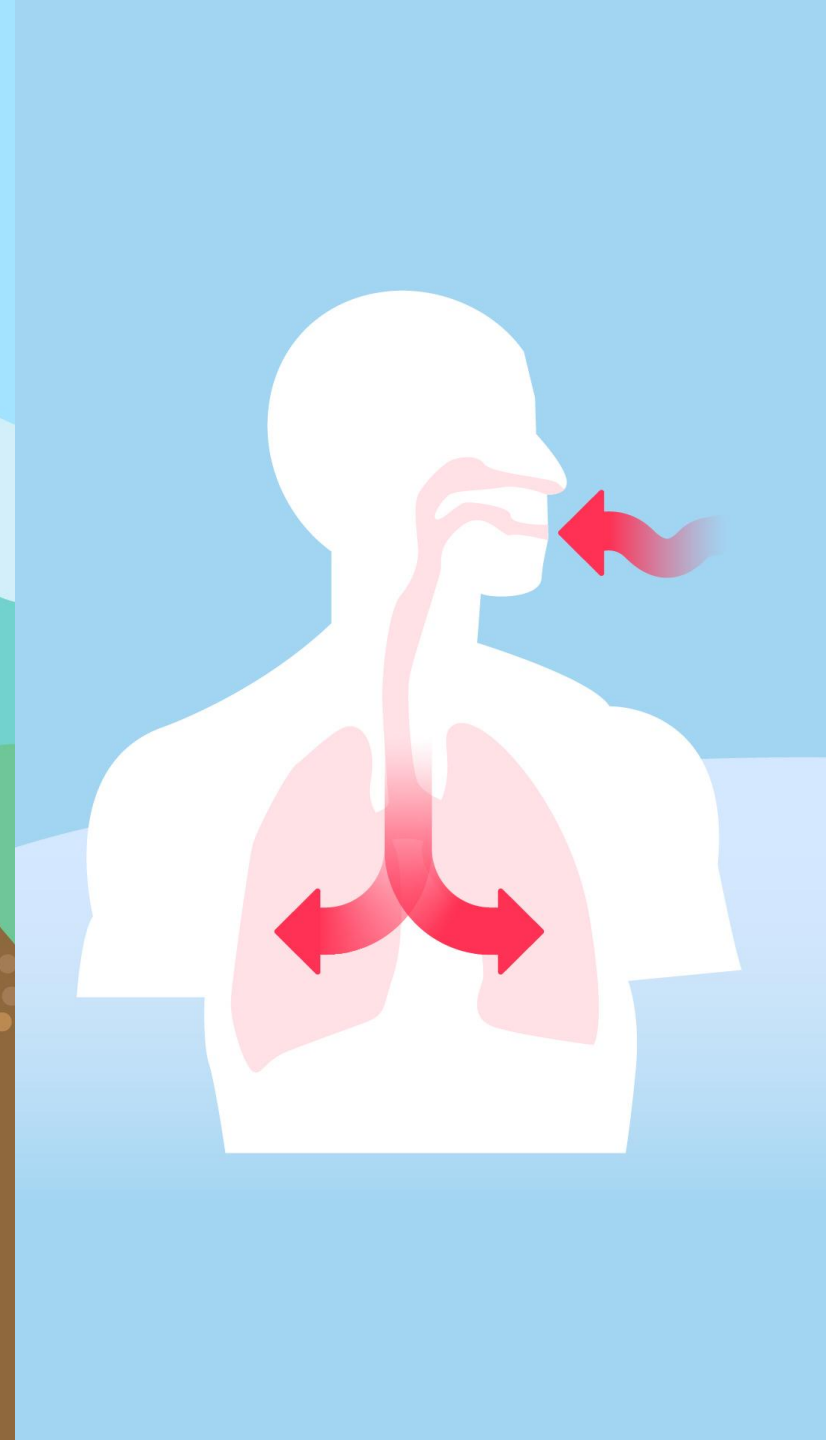
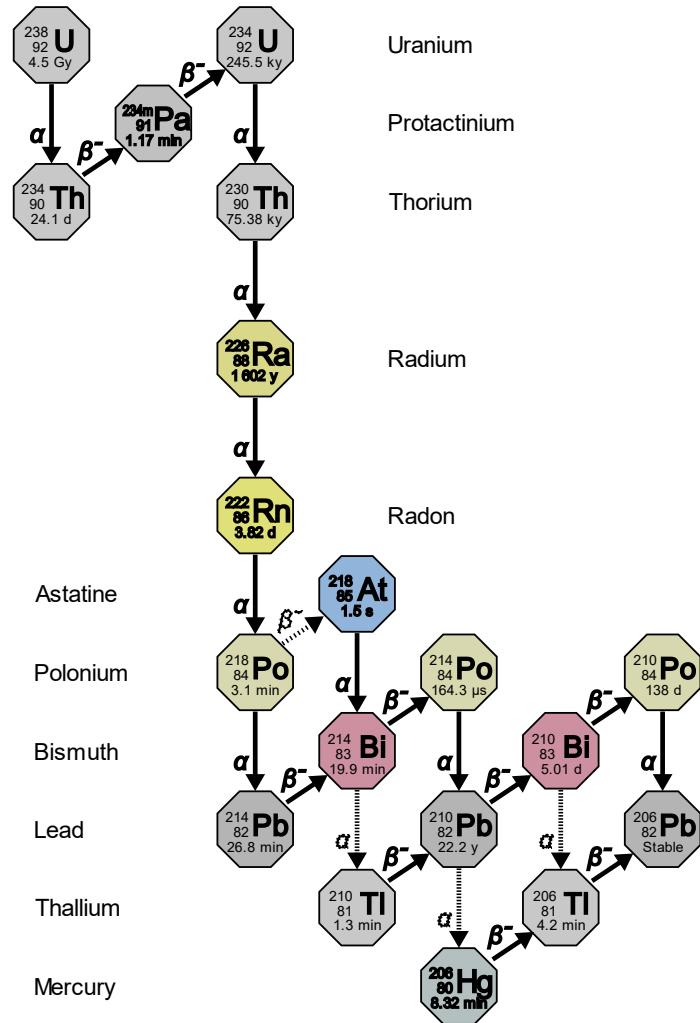
Reports are published in the **Nordic Radiation and Nuclear Safety Series**

Nordic-Nat scope

Exposure to natural ionising radiation, such as radon, thoron, NORM and building materials (gamma and radon).



Radon



Content



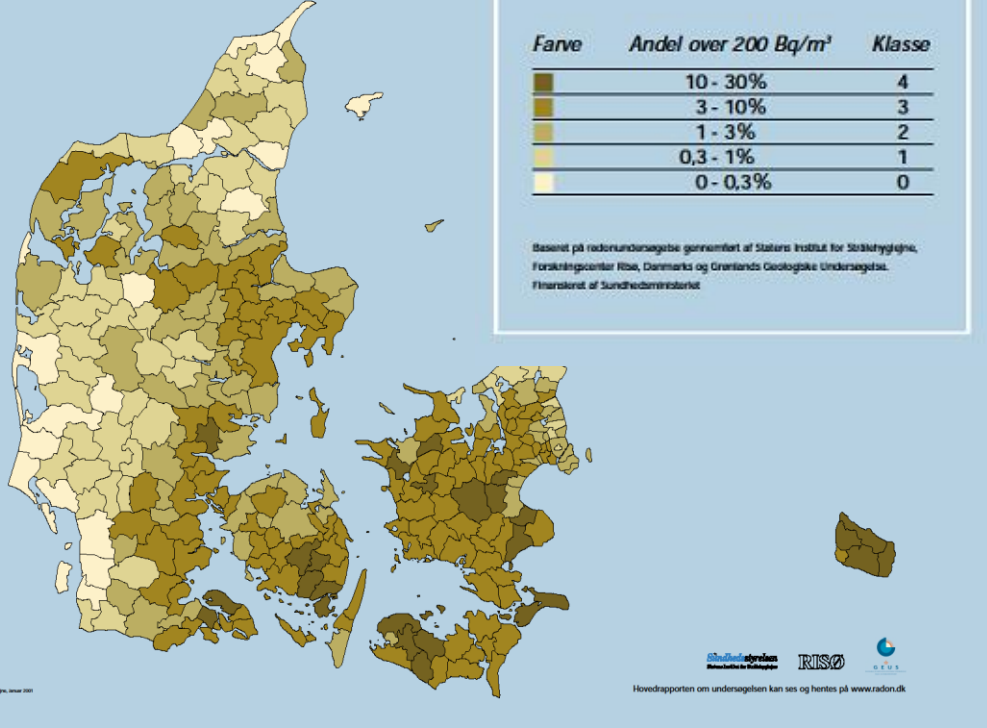
- Dwellings
 - Reference values and limit values
 - National average radon activity concentrations
- Workplaces
 - Reference values and limit values
 - National average radon activity concentrations

Reference levels and limit values in dwellings

	Reference level in existing dwellings and premises where the public have access (Bq/m ³)	Limit or reference value in new buildings (Bq/m ³)
Denmark	100	100
Finland	300	200
Sweden	200	200
Norway	Action level: 100 Bq/m ³ Maximum level: 200 Bq/m ³	200

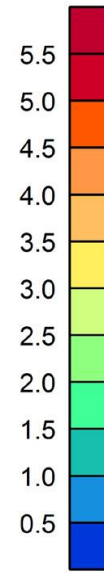
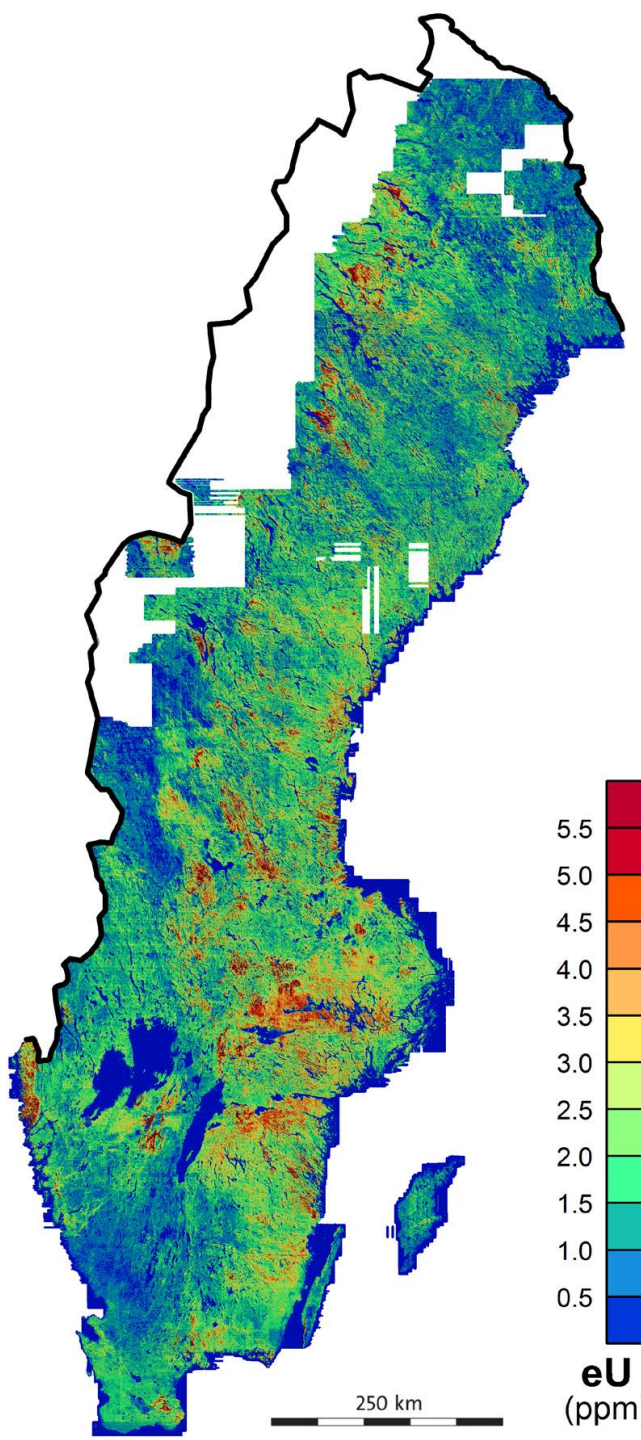
Farve	Andel over 200 Bq/m ³	Klasse
	10 - 30%	4
	3 - 10%	3
	1 - 3%	2
	0,3 - 1%	1
	0 - 0,3%	0

Basert på radonundersøgelser gennemført af Statens Institut for Strålingssikkerhed, Forskningscenter Ribe, Danmarks og Grønlands Geologiske Undersøgelse, Finanstorvet af Sundhedsministeriet



Statens Institut for Strålingssikkerhed RISØ

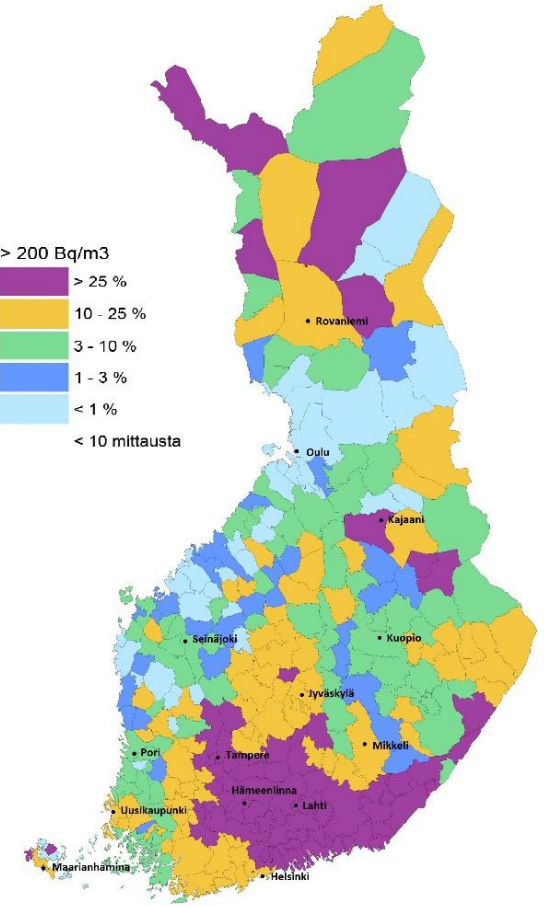
Hovedrapporten om undersøgelsen kan ses og hentes på www.radon.dk



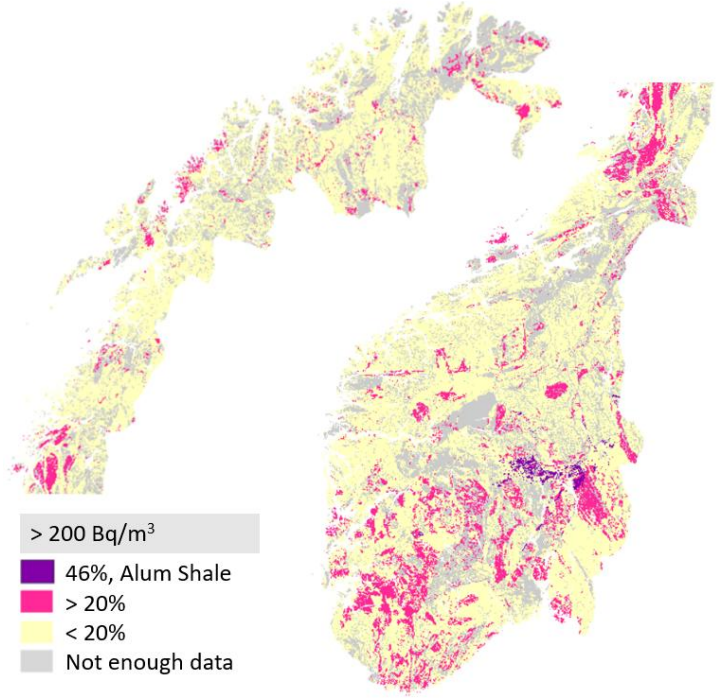
eU (ppm)





250 km

> 200 Bq/m ³	
	> 25 %
	10 - 25 %
	3 - 10 %
	1 - 3 %
	< 1 %
< 10 mittausta	

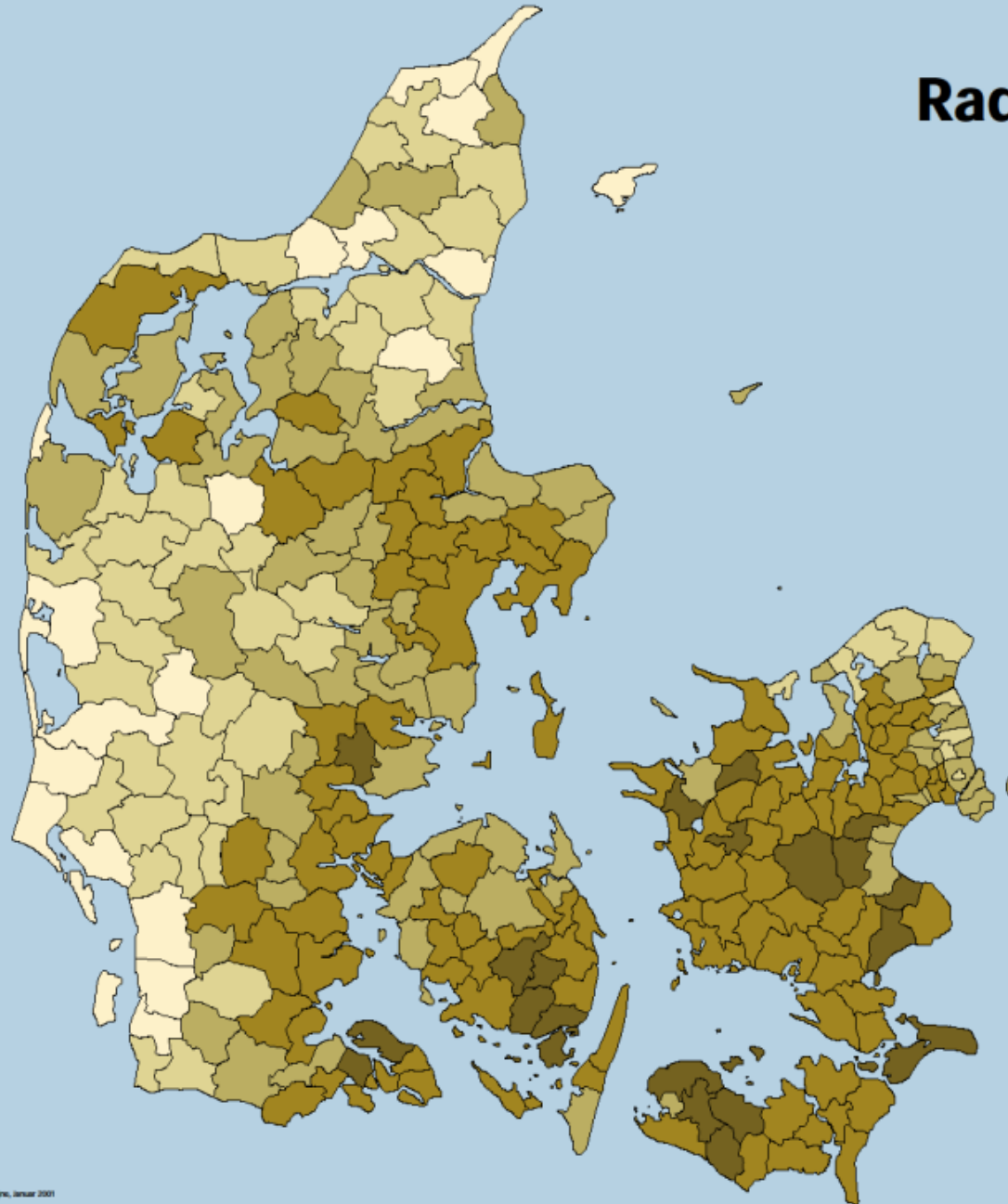


dsa.no








> 200 Bq/m ³	
	46%, Alum Shale
	> 20%
	< 20%
	Not enough data

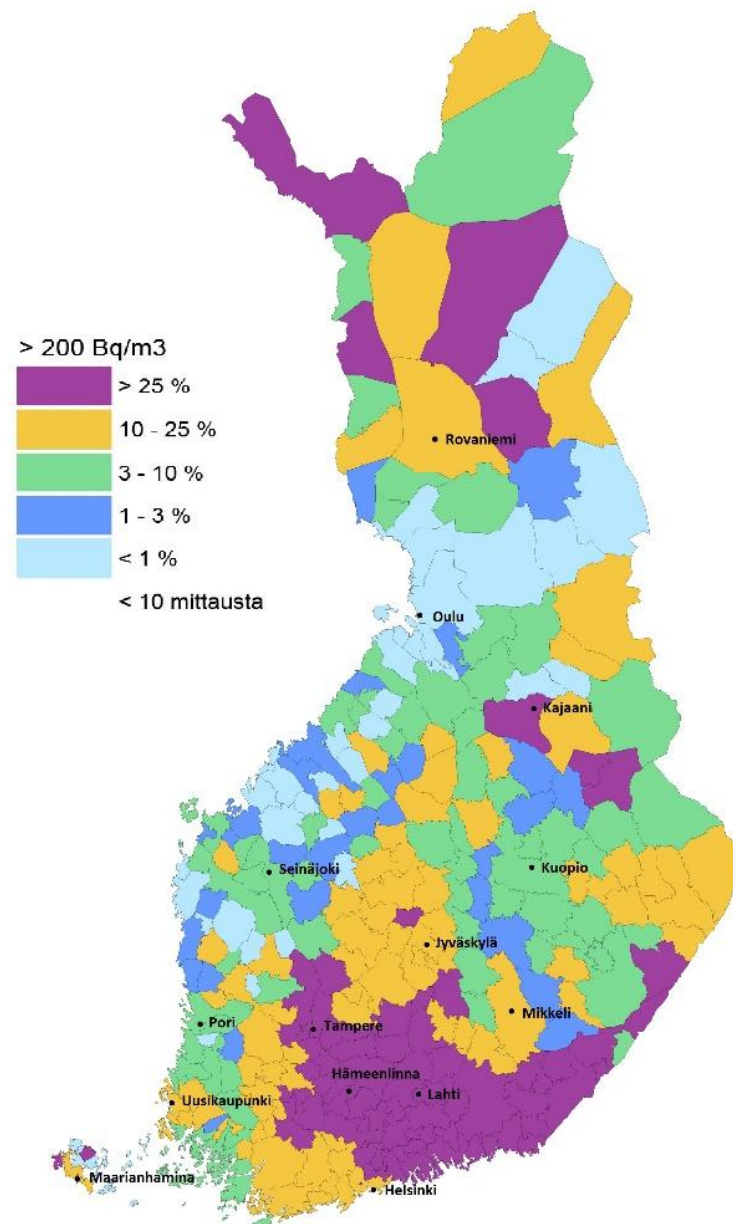
Radon i danske boliger

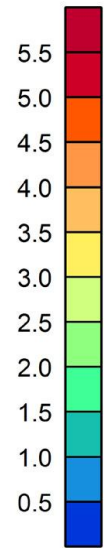
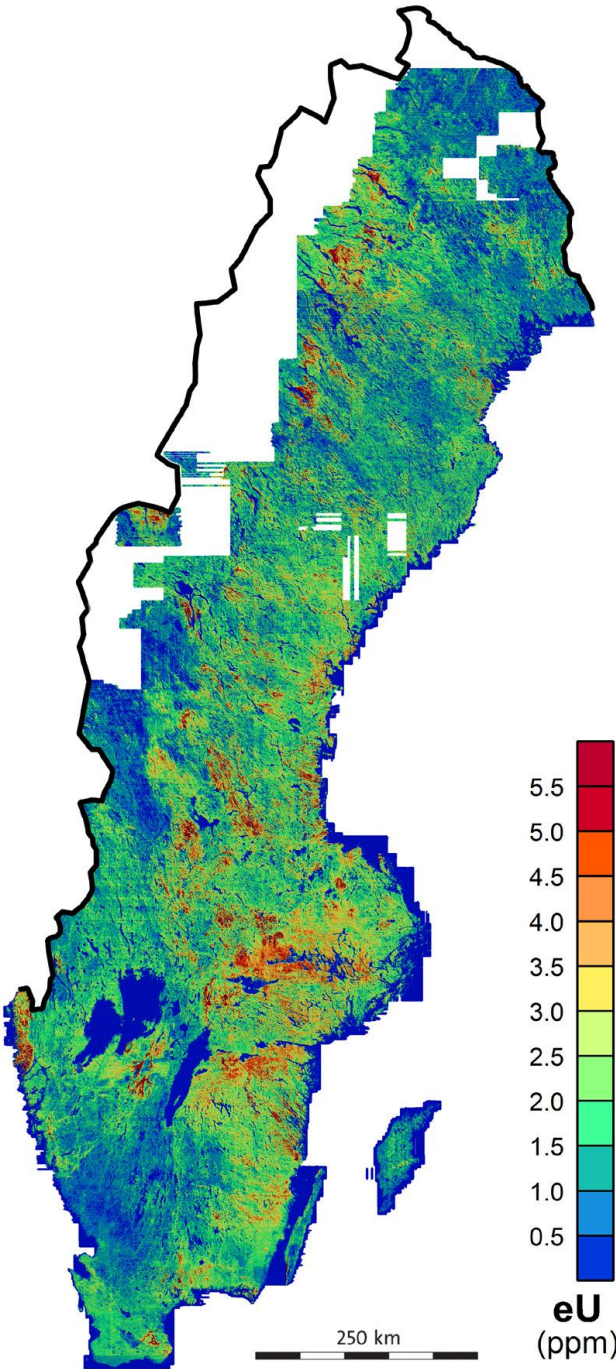


Kommunekortet viser hvor mange procent af de enkelte kommuners enfamiliehuse, som vurderes at have en radonkoncentration over 200 Bq/m³. Kommunene er ind delt i fem klasser med tilhørende farve på følgende måde:

Farve	Andel over 200 Bq/m ³	Klasse
	10 - 30%	4
	3 - 10%	3
	1 - 3%	2
	0,3 - 1%	1
	0 - 0,3%	0

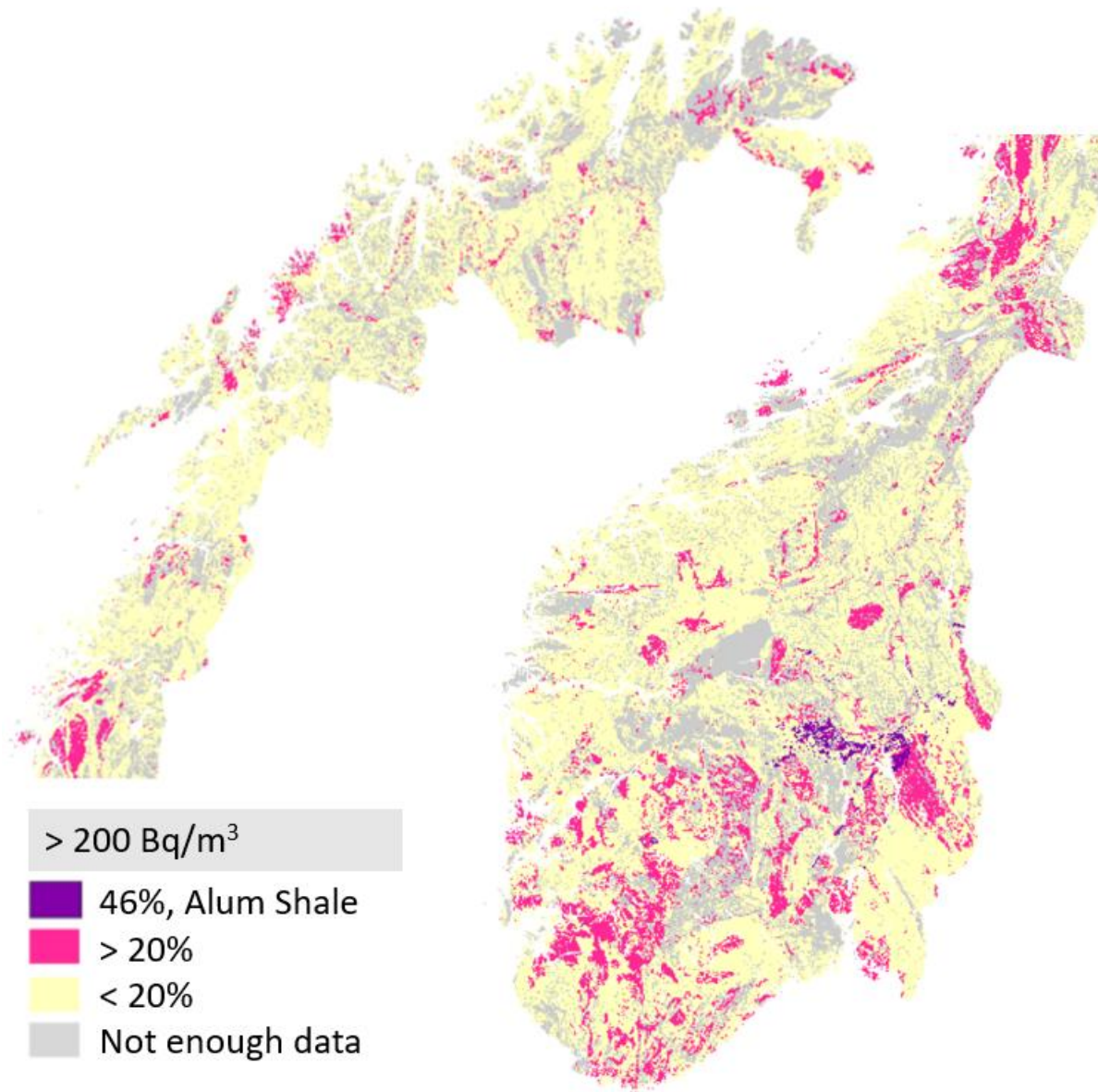
Baseret på radonundersøgelser gennemført af Statens Institut for Strålingssikkerhed, Forskningscenter Risø, Danmark og Grønlands Geologiske Undersøgelse, Hovedstaden af Sundhedsministeriet





eU
(ppm)

250 km



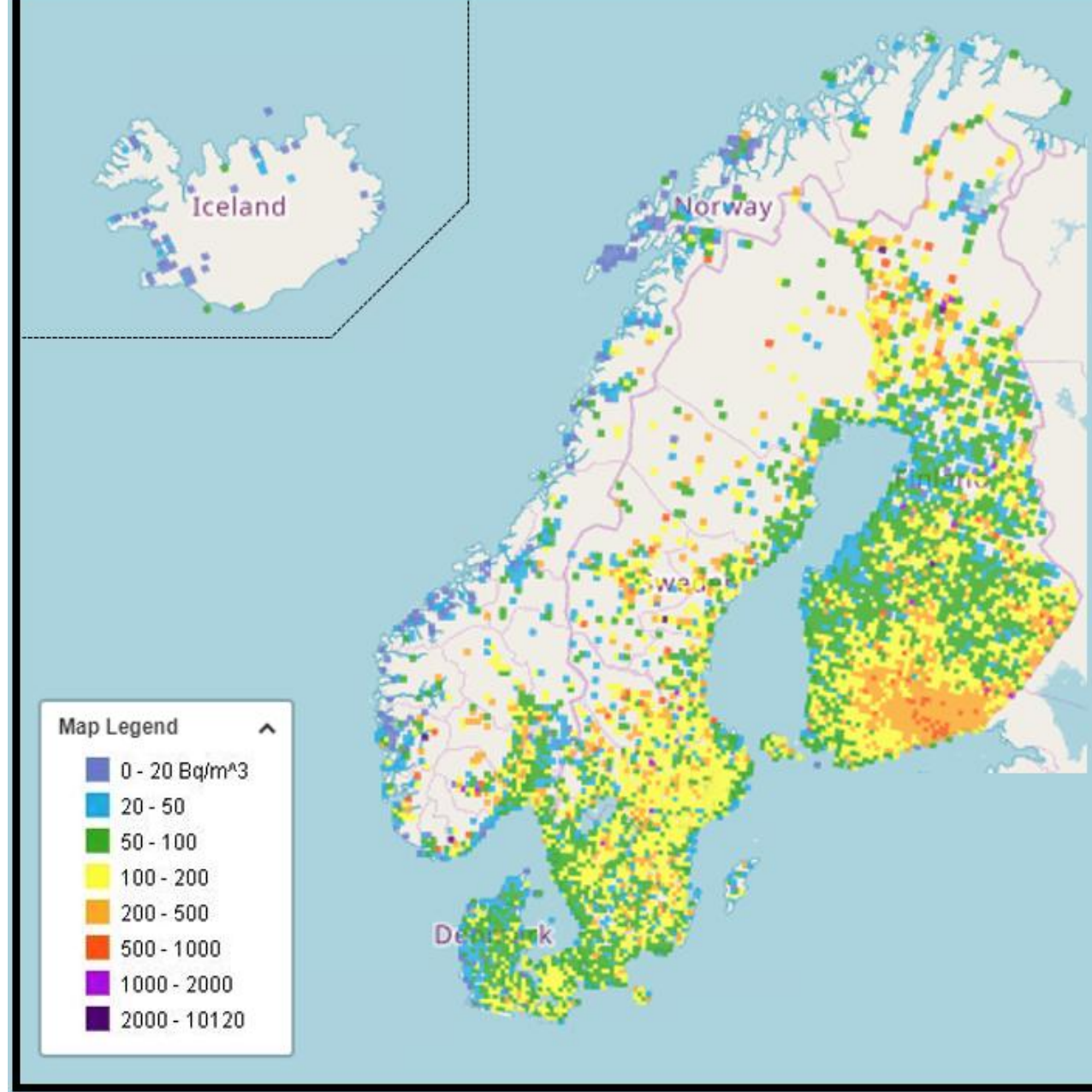
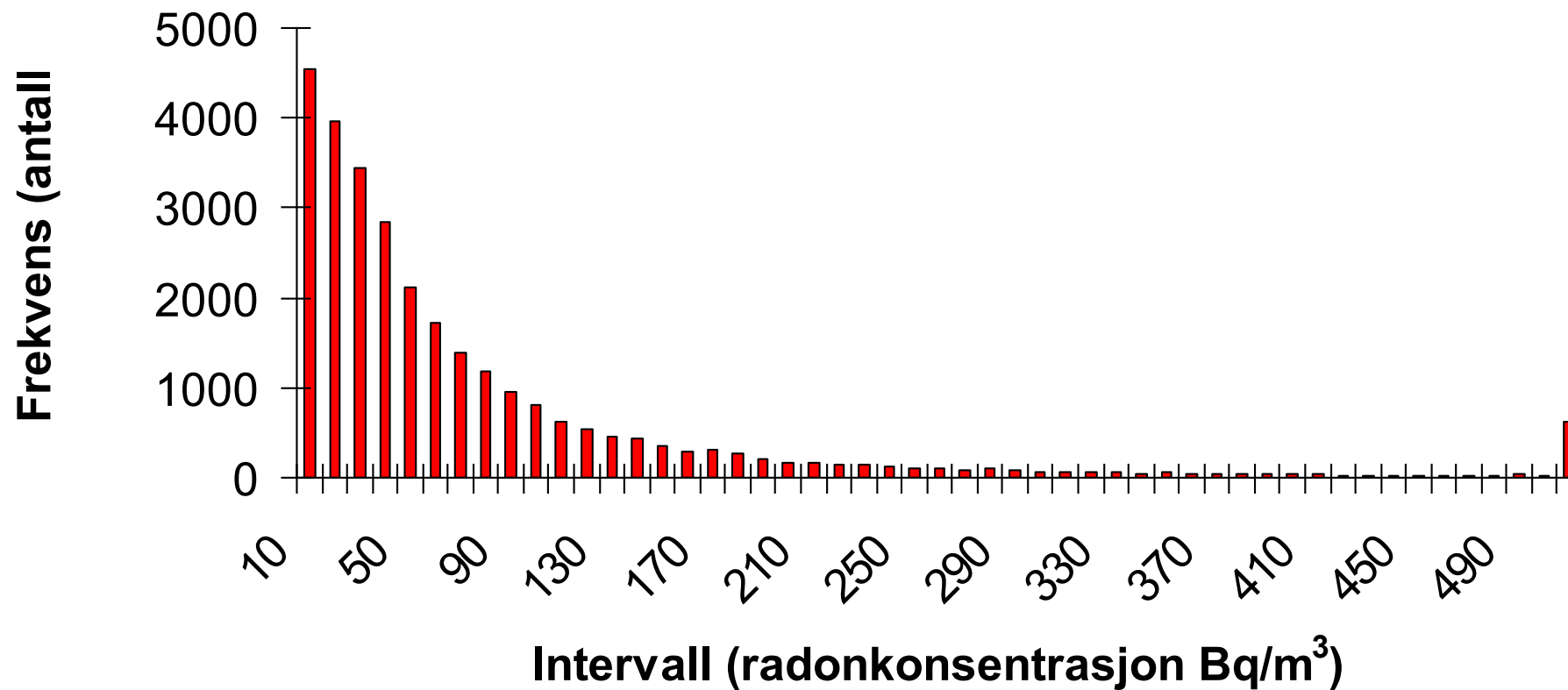


Figure composed of screenshots from the EU JRC Radon indoor map (2021). <https://remap.jrc.ec.europa.eu/Atlas.aspx?layerID=3>

National average radon activity concentrations in dwellings

Country	Radon activity concentration (Bq/m ³)	Note
Iceland	5-13	Arithmetic mean. Based on three surveys of radon in the years 1982, 2003 and 2012.
Norway	88	Arithmetic mean.
Finland	94	Arithmetic mean.
Denmark	77	Arithmetic mean, in single family houses . Geometric mean 57 Bq/m ³ Apartments have average radon concentrations that are about half or less than single-family homes.
Sweden	90	Arithmetic mean, apartments and detached houses
	144	Arithmetic mean in detached houses
	68	Arithmetic mean in apartment buildings .

Frekvensfordeling, landsomfattende kartlegging 2000/2001 (tot. 29100 målinger)



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Comparing national measurement protocols for dwellings

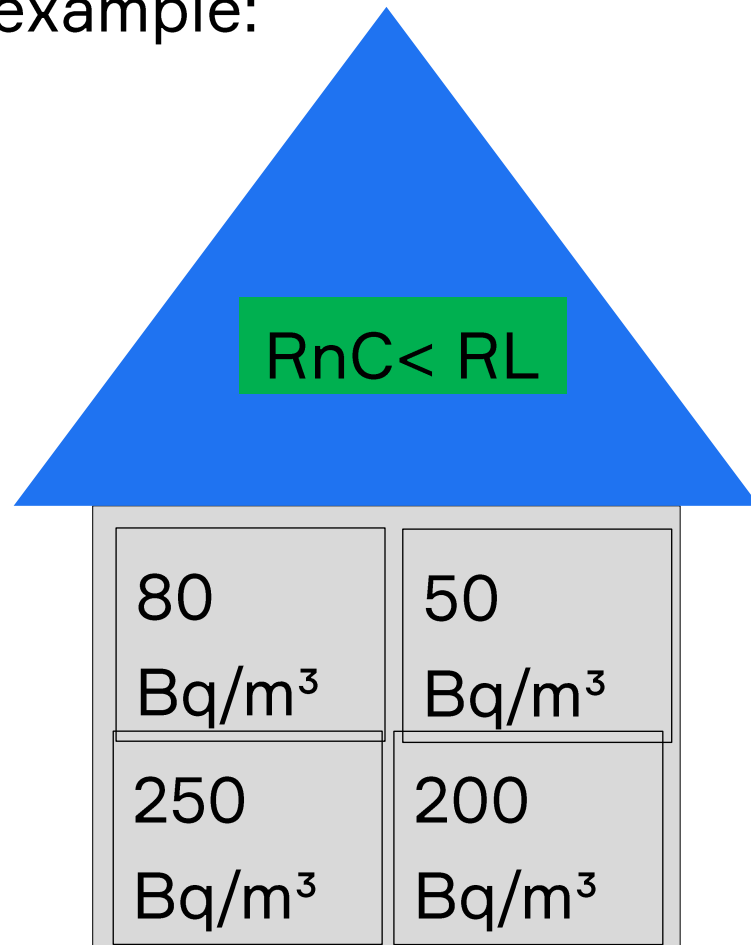
	Measurement length	Measurement period	Seasonal correction factor
Denmark	At least 2 months	1 Oct. – 30 April	No seasonal correction factor
Finland	At least 2 months	1 Sept. – 31 May	0.9
Sweden	At least 2 months	1 Oct. – 30 April	No seasonal correction factor
Norway	At least 2 months	15 Oct. – 15 April	15 Oct.-31 Oct: 1 1 Nov.-31 March: 0.75 1 April-15 April: 1

In dwellings, the reference levels and limit values apply to...

Denmark	... an annual average for the dwelling, based on more than one measurement
Finland	... an annual average for the dwelling, based on more than one measurement
Sweden	... an annual average for the dwelling, based on more than one measurement
Norway	... an annual average for frequently occupied rooms, like bedrooms and living rooms.

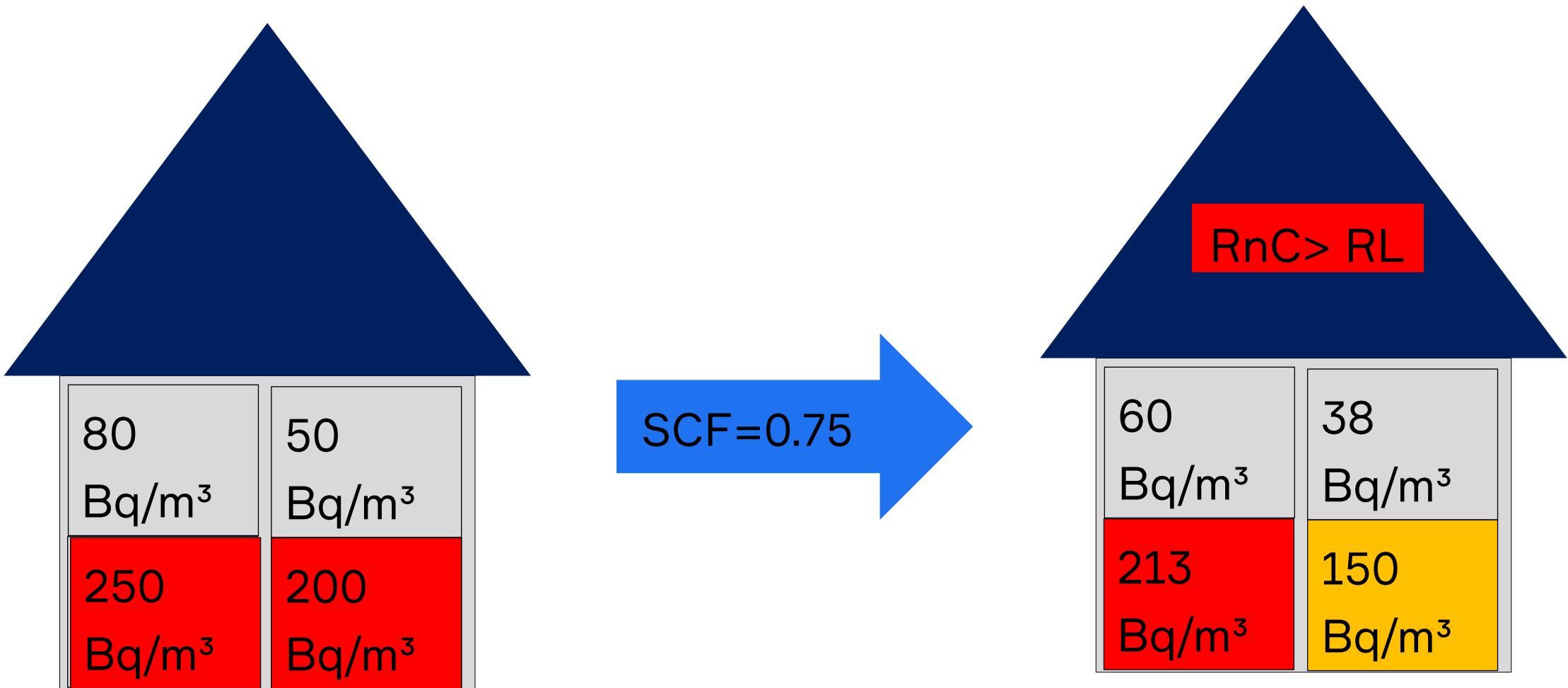
How to measure and calculate a value to be compared with the reference level varies from country to country

An example:



$$(((250+200)/2+(80+50)/2)/2 \text{ Bq}/m^3=145 \text{ Bq}/m^3)$$

How to measure and calculate a value to be compared with the reference level varies from country to country



Workplaces

	Denmark	Finland	Norway	Sweden
Reference levels and limit values	100 Bq/m ³	300 Bq/m ³	Action level: 100 Bq/m ³ Maximum level: 200 Bq/m ³	200 Bq/m ³



RLs during working hours

In underground workplaces and other special cases, there are regulations that take working hours into account.



National average radon activity concentrations at workplaces

Country	Radon activity concentration (Bq/m ³)	Note
Denmark	-	
Finland	AM: 33 GM: 19	During working hours. (Kojo et al., 2023).
Iceland	-	
Norway	-	
Sweden	AM: 106 Median: 79	The mean and arithmetic values are based on data from 3347 workplaces for different workplace types. Measurements are made with Radtrak2-detectors and values are not corrected for working hours (Rönnqvist, 2021).

Summary 1

- When comparing typical radon activity concentrations e.g. in dwellings, drinking water, etc. it can be seen that the challenges are relatively similar in Finland, Norway and Sweden.
- Denmark has a less widespread problem, and the radon activity concentrations are generally lower, but the problem is definitely present.
- In Iceland several national surveys have shown that the radon activity concentrations both in indoor air and drinking water are overall very low.

Summary 2

Comparisons between surveys or individually measured buildings in the different Nordic countries must be made with caution.

- Measurement procedures vary between the Nordic countries.
 - the seasonal correction factor varies between 0.75 and 1 (no correction).
 - the reference level in some countries refer to an average of measurements in the dwelling, in other it refers to each single room.

Summary 3

- The reference level for existing dwellings and premises where the public have access varies between 100 and 300 Bq/m³
- Limit/reference values in new buildings varies between 100 and 200 Bq/m³.

Summary 4

- Denmark, Finland and Sweden all have reference levels and/or limit values for workplaces stated in national regulations.
- In Norway the workplace is regulated in general terms in the regulations and reference values are given in guidance material.

Other topics in the report

- Preventive measures in new buildings
- National grants and tax deductions for radon remediation in dwellings
- National quality recommendations, target values and requirements for drinking water
- National gamma radiation reference levels

Thank you!

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and Nuclear Safety Authority