Radon in Norway

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Content

- International risk estimates
- Radon in the present Norwegian housing stock
- Radon sources
- Outdoor radon concentrations in some areas
- National radon working group
- Development of a new strategy

International risk estimates

Recent studies have confirmed that radon, also at low levels, poses a risk for lung cancer

The dose-response relation seems to be linear with no evidence of a treshold, and a significant risk remain even when the measured radon concentrations are below the present action level in Norway (200 Bq/m^3)

Pooled analyses from 13 European case-control studies,
Darby et al. 2005.
7148 cases and 14208 controls

7 North American case-control studies,
Krewski et al.2005.
3662 cases and 4966 controls

International risk estimates

Darby et al. 2005

Estimated that radon is the cause of

- 2% of all fatal cancer incidents in Europa
- 9% of all fatal lung cancer incidents in Europa

Based on a mean radon concentration in European dwellings of 59 Bq/m^3 .

International risk estimates

Estimation:
About 280 fatal lung cancers in Norway yearly.

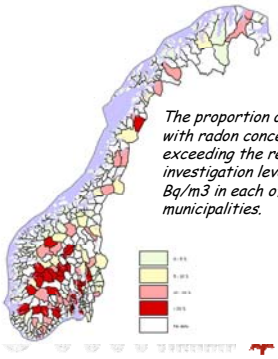
Average number of deaths yearly for some causes in the 1996-2005 period (*Statistics Norway*) is given in the table

Natural disasters (avalaches etc.)	33
Fire	58
Drowning	74
Car accidents	329

Radon
in the present Norwegian housing stock

Norway is divided into 19 counties and 431 municipalities.

Nearly 200 municipalities have carried out radon surveys.



The proportion of dwellings with radon concentration exceeding the recommended investigation level of 200 Bq/m3 in each of 188 municipalities.

7

Radon in the present Norwegian housing stock

- The populations weighted annual mean radon concentration is estimated to 88 Bq/m3.
- It has been estimated that 9% of the housing stock (175.000 dwellings) has an annual mean radon concentration exceeding 200 Bq/m^3 and that 3.3% of the housing stock has an annual mean radon concentration exceeding 400 Bq/m^3.
- 8.000 out of the expected 175.000 dwellings with radon concentration above 200 Bq/m^3 have been identified so far.

8

Radon sources

The indoor radon concentrations in Norway are among the highest in Europe because:

- High occurrences of radium rich soil and bedrock,
- High occurrences of highly permeable unconsolidated sediments,
- Household water from borehole wells
- Construction of buildings
- Climate

9

Radon sources

•Areas with large occurrence of alum shale.

•Potentially high concentrations of radon

10

Radon sources

Large occurrences of highly permeable unconsolidated sediments

Examples of dwellings exceeding 10 000 Bq/m3 (maximum 56 000Bq/m^3), and outdoor concentrations exceeding 200 Bq/m^3 (Sundal et al 2007)

11

Radon sources

- In Norway about 12 % of the dwelling are supplied with water from private borehole wells
- For about 10 % of the wells the recommended action level of 500 Bq/l is exceeded
- Rule of thumb: 1000 Bq/l in household water is causing 100 Bq/m^3 in the indoor air radon concentration (shower, dish washer, washing machine)

12

Radon sources

Building construction highly permeable clay aggregates blocks in the foundation construction

13

Outdoor radon consentrations

- In 1996-1997 an indoor radon concentration measuring project was carried out in the Ullensvang municipal.
- In a particular area in the municipality, 90 % of the dwellings had radon consentrations exceeding 200 Bq/m3.
- Mitigation measures did not have the expected effect in all cases.
- Some outdoor measurements were carried out.
- The finding of radon concentrations exceeding 200 Bq/m3 were leading to more measurements in some well known radon affected areas and some reference areas.

Strålevern report 2006:20

14

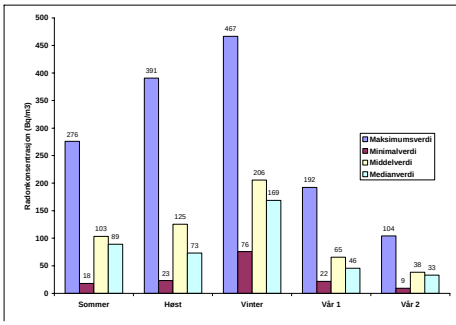
Outdoor radon

WHO:

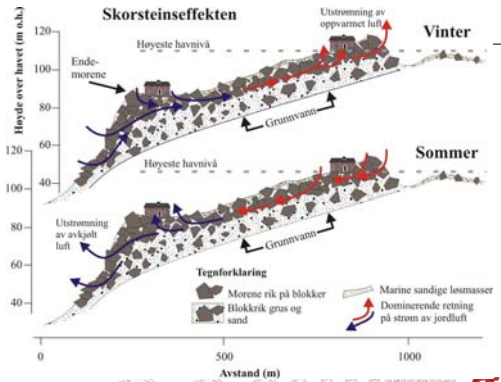
The outdoor radon concentration varies normally between 5 and 15 Bq/m3.

15

Outdoor radon concentrations - Ullensvang

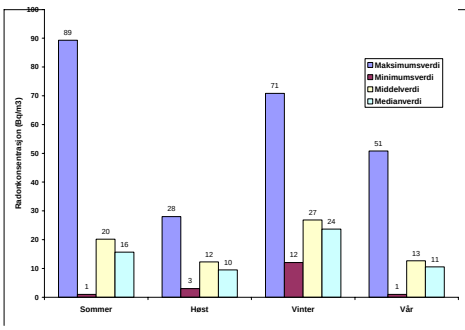


16



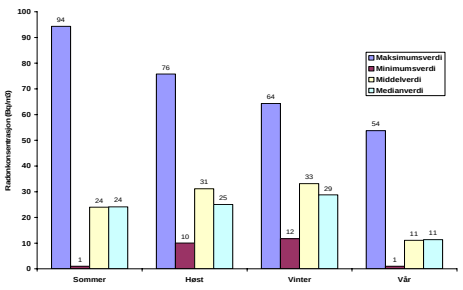
17

Outdoor radon concentrations - Fredrikstad



18

Outdoor measurements – Røyken



19

National radon working group

Recognizing there is a need to be more aware of radon risks within the relevant Norwegian authorities, and

Recognizing there is a need to coordinate the radon work between the different ministries and directorates

the Ministry of Healt and Care Services appointed a working group autumn 2007

20

National radon working group

- Ministry of Health and Care Services
- Ministry of Labor and Social Inclution
- Ministry of Local Government and Regional Developement
- Ministry of the Environment
- Norwegian Institute of Public Health
- The National Office of Building Technology and Administrations
- The Norwegian Labor Inspection Authority
- The Norwegian State Housing Bank
- Norwegian Radiation Protection Authority

21

Radon working group

The mandate is very wide:

- ·Health risk
- ·Land planning
- ·Building constructions
- ·Schools
- ·Kindergartens
- ·Workplaces (ordinary and underground)
- ·Household water

·Information and risk communication

·State contribution to mitigation of dwellings

22

Radon working group

Main focus on regulations (study and proposals on changes and amendments)

The report will be finished autumn 2008.

- Nordic recommendations will be published soon
- The report from the WHO International Radon Project is also expected soon

23

Radon in Norway development of a new strategy

Norwegian Radiation Protection Authority is focusing on the principle of ALARA (As Low As Reasonable Achievable)

Because:

- No threshold
- Majority of the lung cancer cases are caused by exposure to radon concentrations below 200 Bq/m3

24

Radon in Norway development of a new strategy

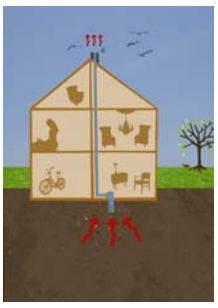
How:

·All new building should be buildt radontight and preferably also with systemes for depressuration of the ground.

·measures taken during building construction can significantly reduce radon

·Radon – a subject when buying and selling homes.

·Information and education



25

Radon in Norway
state and strategy

Radon safe area!