Follow-up of radon-prone areas in Finland

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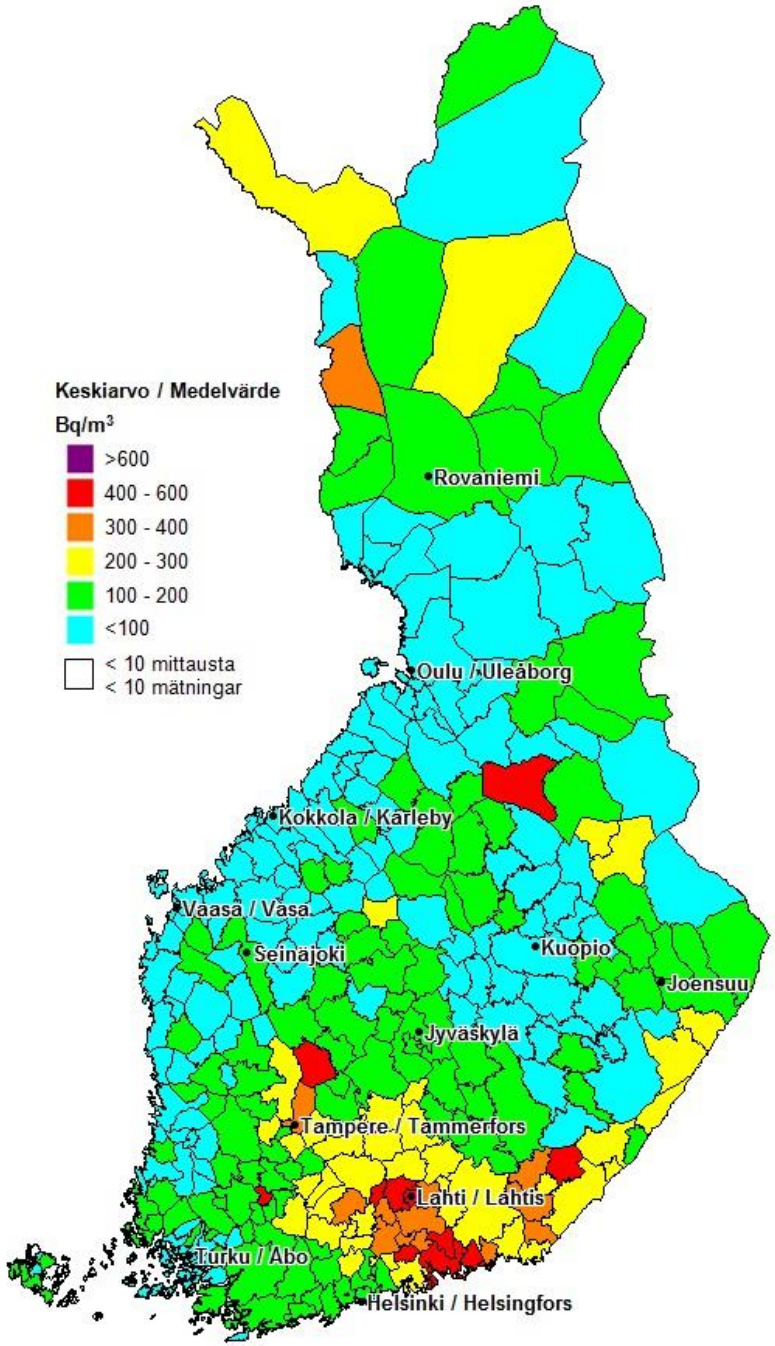
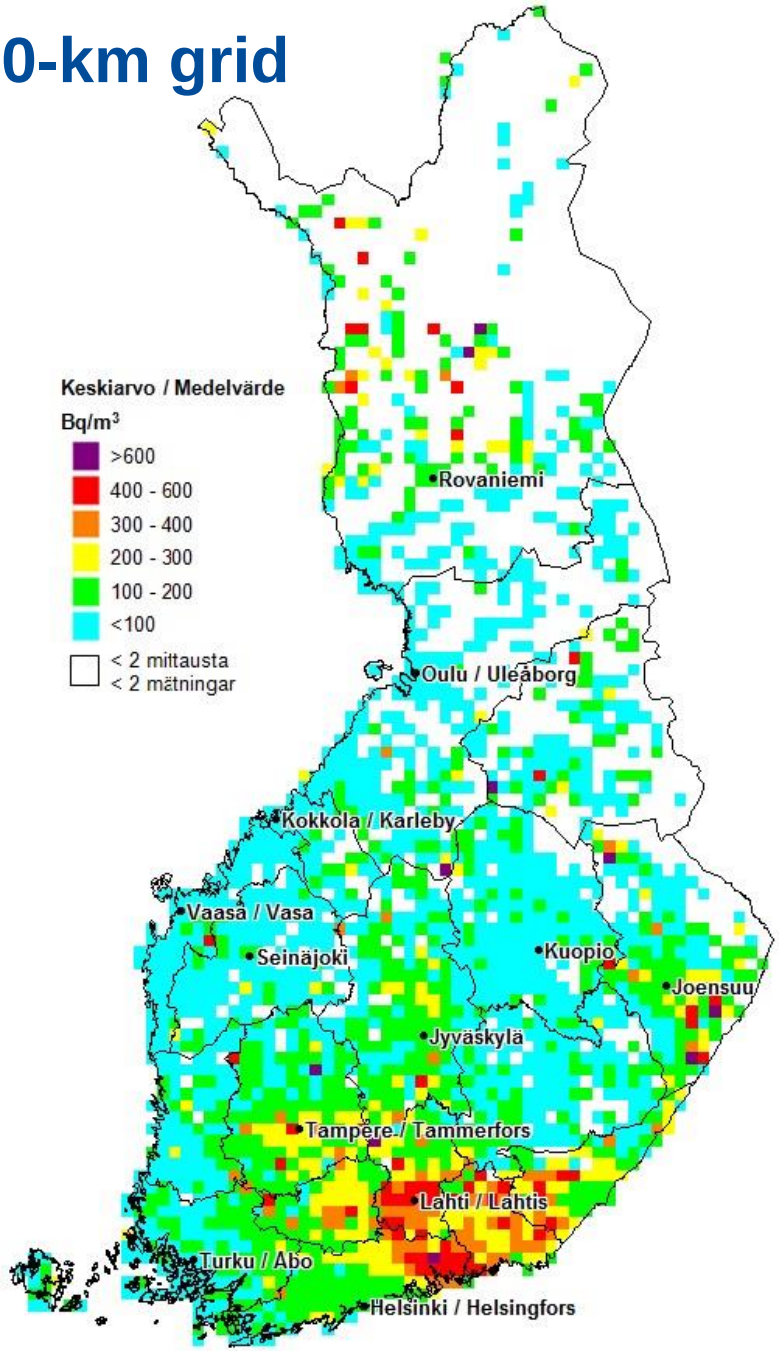
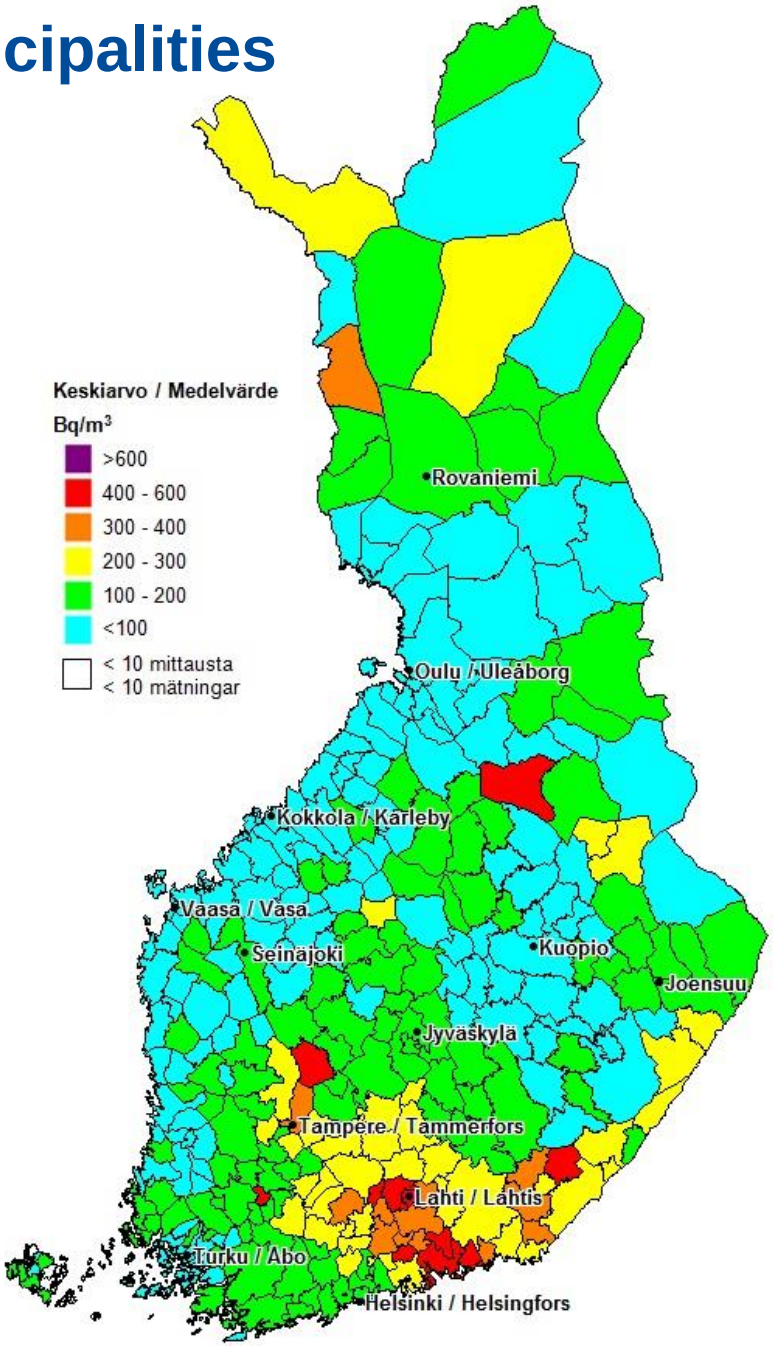


10-km grid



Municipalities



Radon risk area communication

Å**www.radon.fi**

- ÅMunicipal statistics and maps
- ÅPost code area statistics
- Å5x5 and 10x10 km grid maps
- based on 120 000 measured dwellings

ÅNo official radon risk areas in Finland for dwellings

ÅRadon prevention in new building:

- Municipal authorities decide if preventive measures have to be carried out

ÅRadon mitigation in existing building

- Local radon campaigns, information to general public

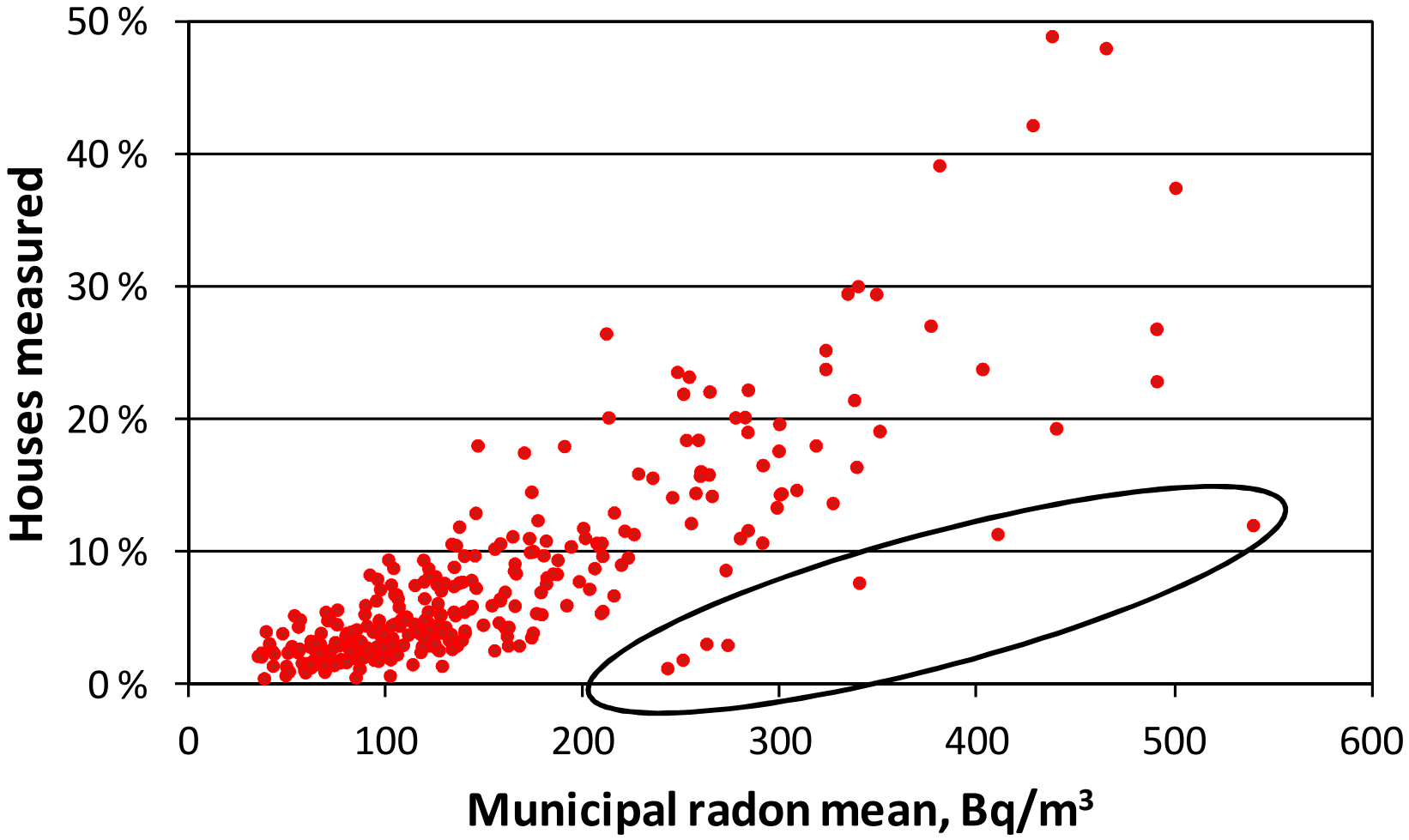
Actions needed in radon risk areas

i) houses should be measured extensively
ii) houses found to have elevated values should be mitigated
iii) radon prevention should be required in new building

Cost-efficiency is the better the more precisely actions are targeted to high-radon areas

Houses measured vs. mean radon

by municipality

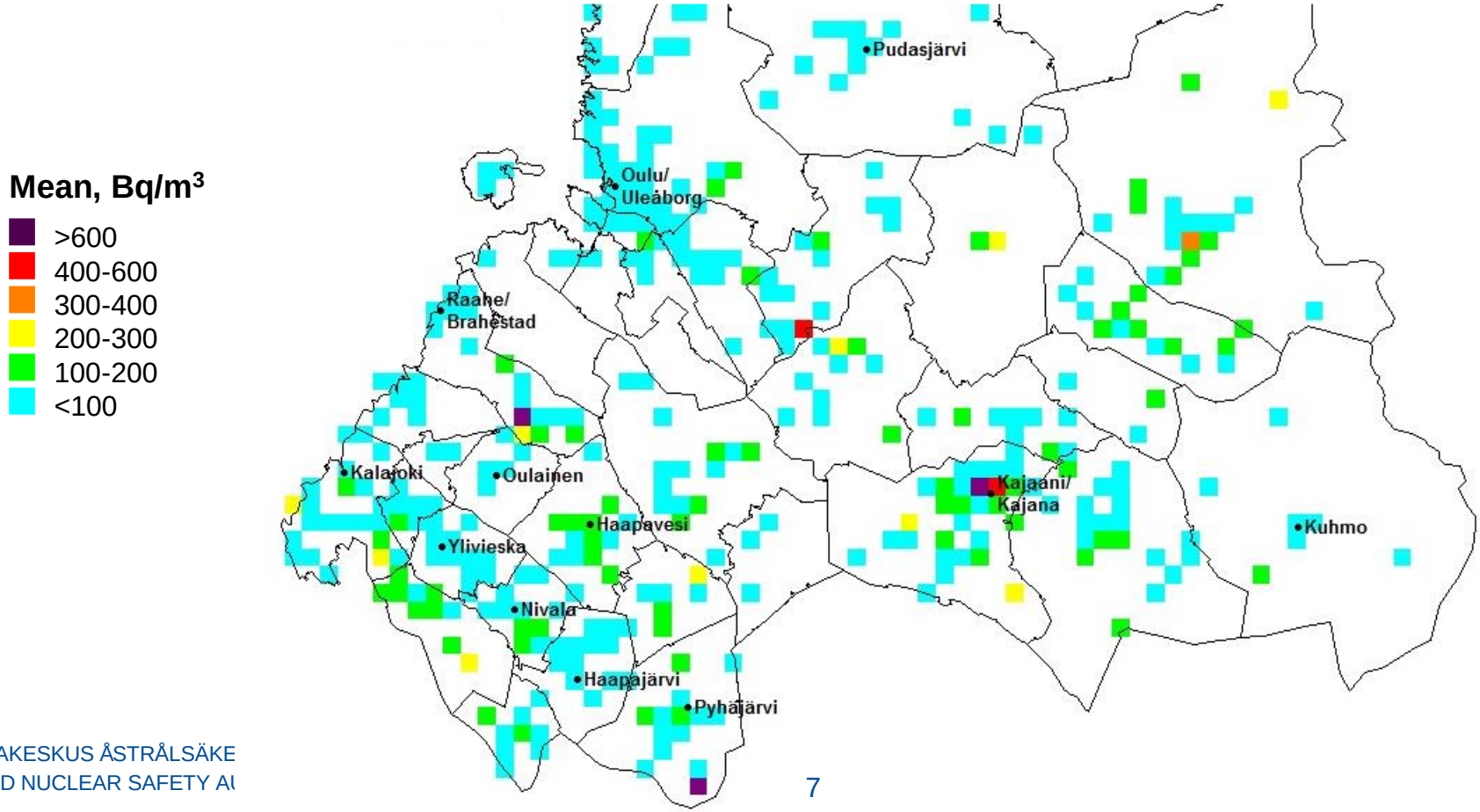


Measurement activity vs. municipal / 1-km^2 cell mean radon

Municipal mean, Bq/m^3	1-km^2 cell mean, Bq/m^3	Number of cells	Number of houses	Measured houses
Above 300	Above 300	1333	54607	31 %
Above 300	Below 300	2098	54377	20 %
Above 300	Unknown	3333	9468	0 %
Below 300	Above 300	2375	71695	19 %
Below 300	Below 300	20337	897683	8 %
Below 300	Unknown	73349	314626	0 %
Total		102825	1402456	8 %

A 4-km^2 hot-spot in Kajaani

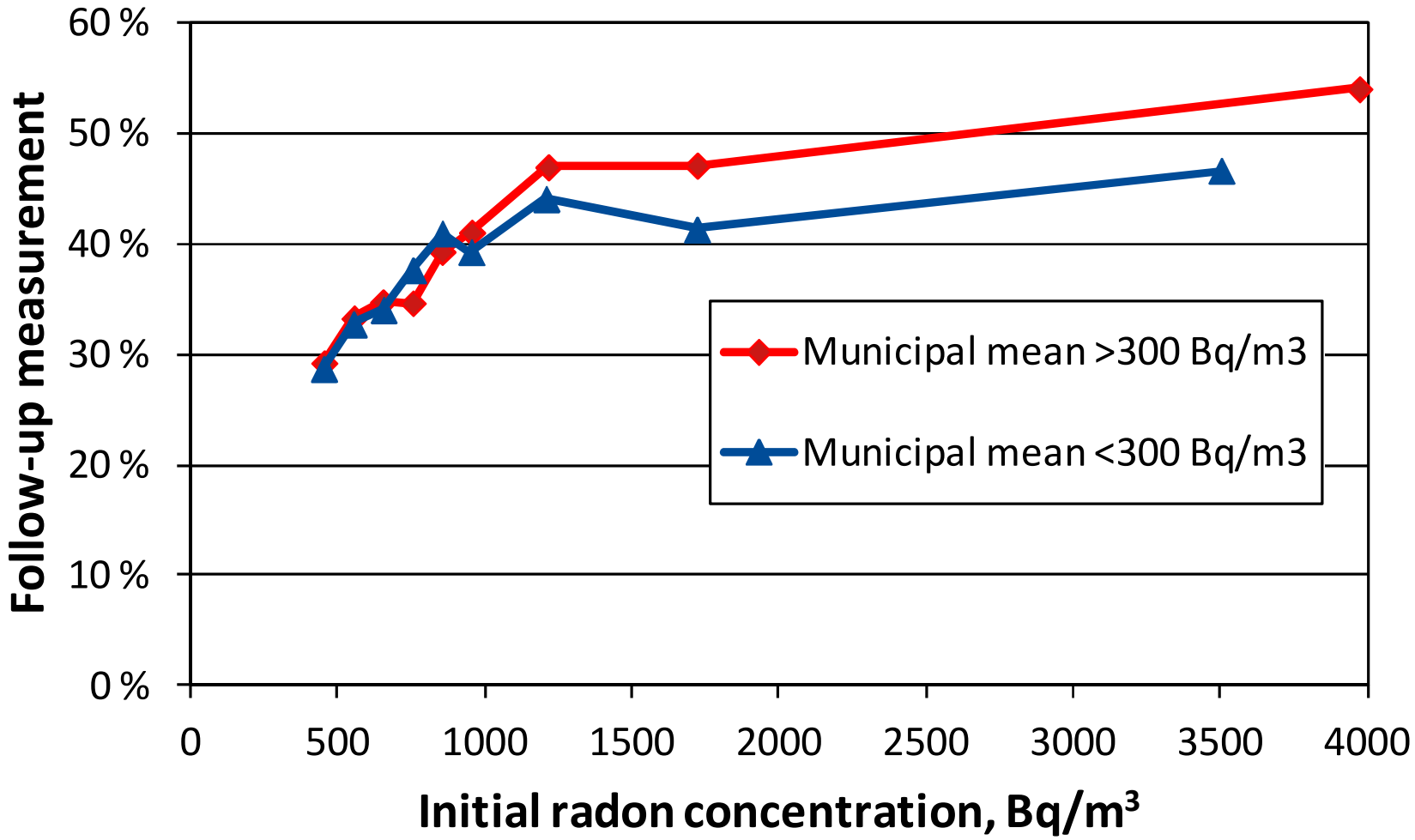
Å 4-km^2 local hot spot, mean 857 Bq/m^3 (municipal mean 143 Bq/m^3)
Å Elevated values were recorded in the 1990s
=> comprehensive measurements and radon mitigations,
82 % of the 422 houses have been measured.



Percentage measured again, if initially >400 Bq/m³

Indicates mitigation activity

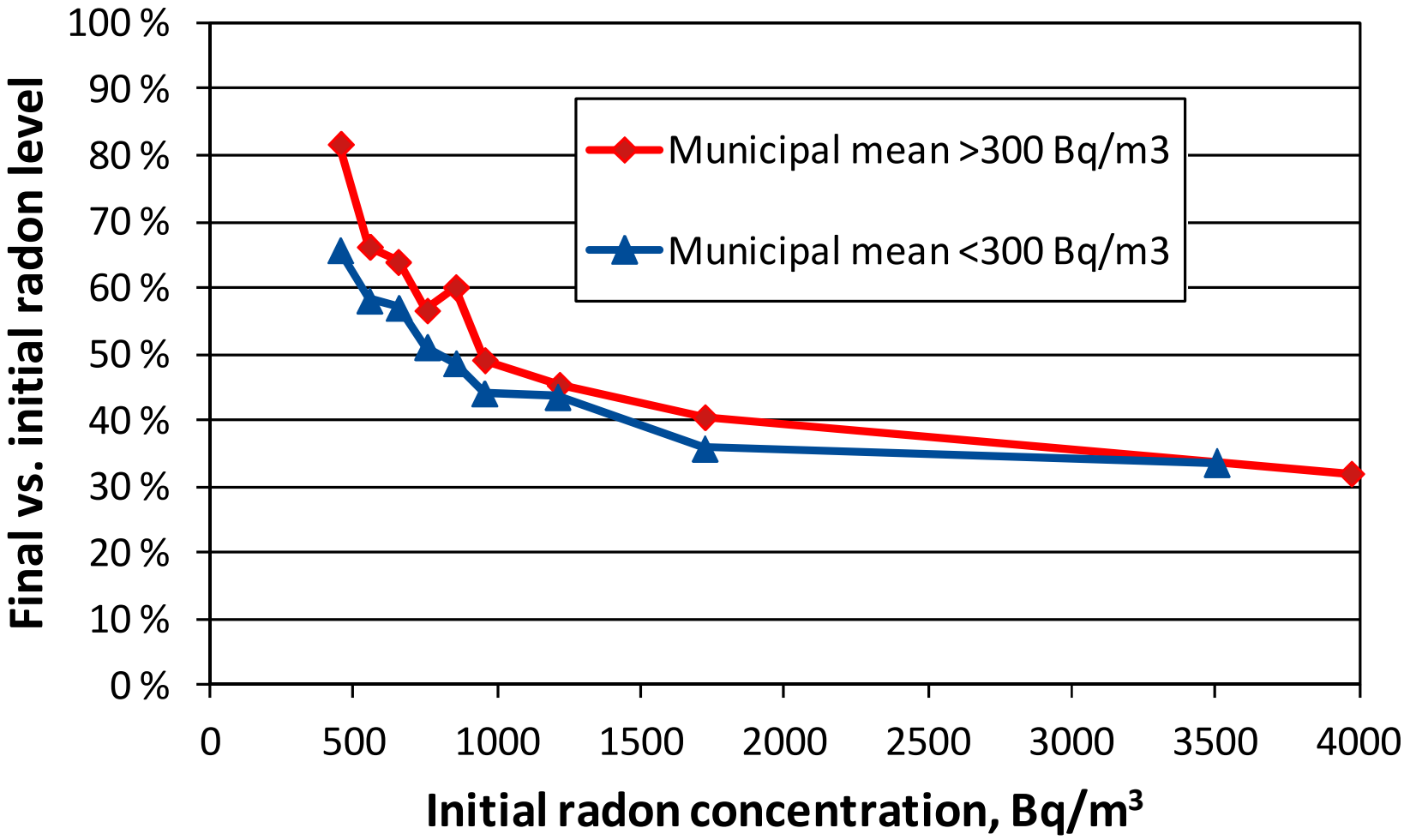
depends on the radon level of the house in question, but not on the municipal radon situation



Radon mitigation efficiency

Depends on the initial radon level of the house in question,

but not on the municipal radon situation



Radon prevention vs. municipal mean

Municipal mean, Bq/m^3	N (survey participants only)	Radon piping installed (survey participants only)
0 ï 100	183	23 %
100 ï 200	241	71 %
200 ï 300	125	91 %
300 ï	55	100 %

Proportion of houses having radon piping installed (slab-on-ground, no basement, single-family houses with building permit 2006).
The municipal mean radon concentration is based on all the houses measured.

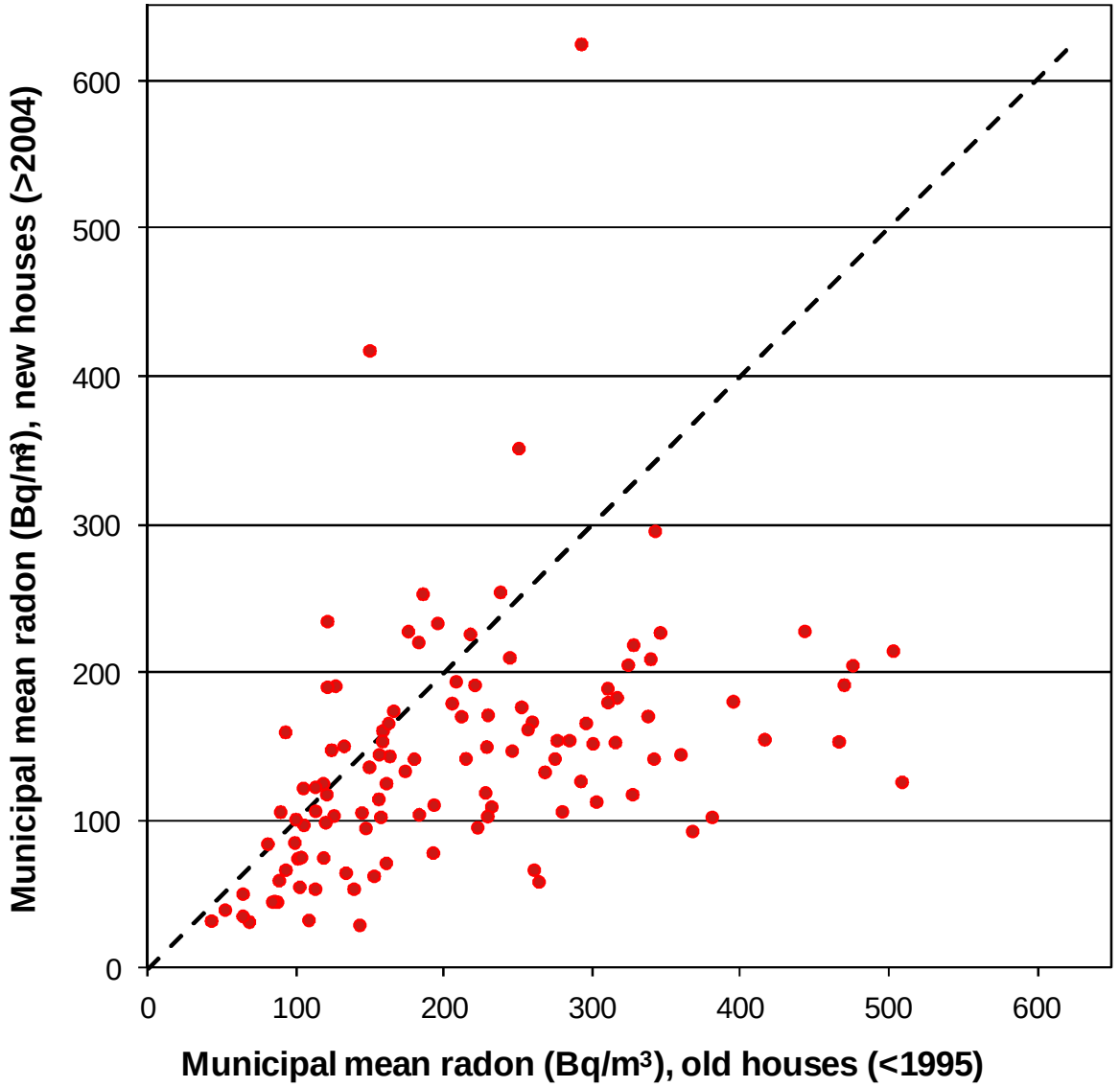
Future: Radon prevention in energy-efficient buildings?

Radon prevention vs. 1-km^2 cell mean

1-km^2 cell mean, Bq/m^3	N (survey participants only)	Radon piping installed (survey participants only)
0 ï 100	257	45 %
100 ï 200	211	74 %
200 ï 300	69	91 %
300 ï	42	90 %

Proportion of houses having radon piping installed (slab-on-ground, no basement, single-family houses with building permit 2006).
The 1-km^2 mean radon concentration is based on all the houses measured.

Radon in new vs. old houses



Cost-efficiency (RADPAR project WP 7)

ÅRadon preventive measures in new building

Costs (health service not included):

Radon prevention	1000 ú

0,016 lung cancer cases averted (high-radon areas)

0,010 lung cancer cases averted (Finland)

ÅRadon measurement campaign + mitigation, high-radon areas

Costs (health service not included):

Invitation (195)	58 ú
Measurement (8)	257 ú
Mitigation (1) (55% of those >400 Bq/m^3)	2921 ú (discounted)
Total	3236 ú

0,036 lung cancer cases averted (high-radon areas)

Conclusions

- Radon preventive measures in new building and radon measurements are clearly more common in high-radon municipalities.

- Finding and recognising local hot spots within otherwise low-radon areas require more attention