



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Home Affairs FDHA
Federal Office of Public Health FOPH

Consumer Protection Directorate

Future of the radon program Switzerland

and....



Predictive radon mapping

in collaboration with



Prague, 22-24 September 2010
Martha Gruson, Division of Radiological Protection



New assessment of the risk

- Epidemiology

 - before: irradiated underground miners

 - now: population in dwellings

- ICRP: conversion factors 2009 (increase in the risk by a factor of 2):

 - before : $600 \text{ Bq/m}^3 = 10 \text{ mSv/year}$

 - now: $300 \text{ Bq/m}^3 = 10 \text{ mSv/year}$

- WHO: Radon handbook 2009 (reduction of the value by a factor of 3):

 - before: not higher than 1000 Bq/m^3

 - now: not higher than 300 Bq/m^3

- EU: BSS-Standards (final project 2010)

 - before: reference value for existing buildings 400 Bq/m^3

 - now : reference value for existing buildings 300 Bq/m^3

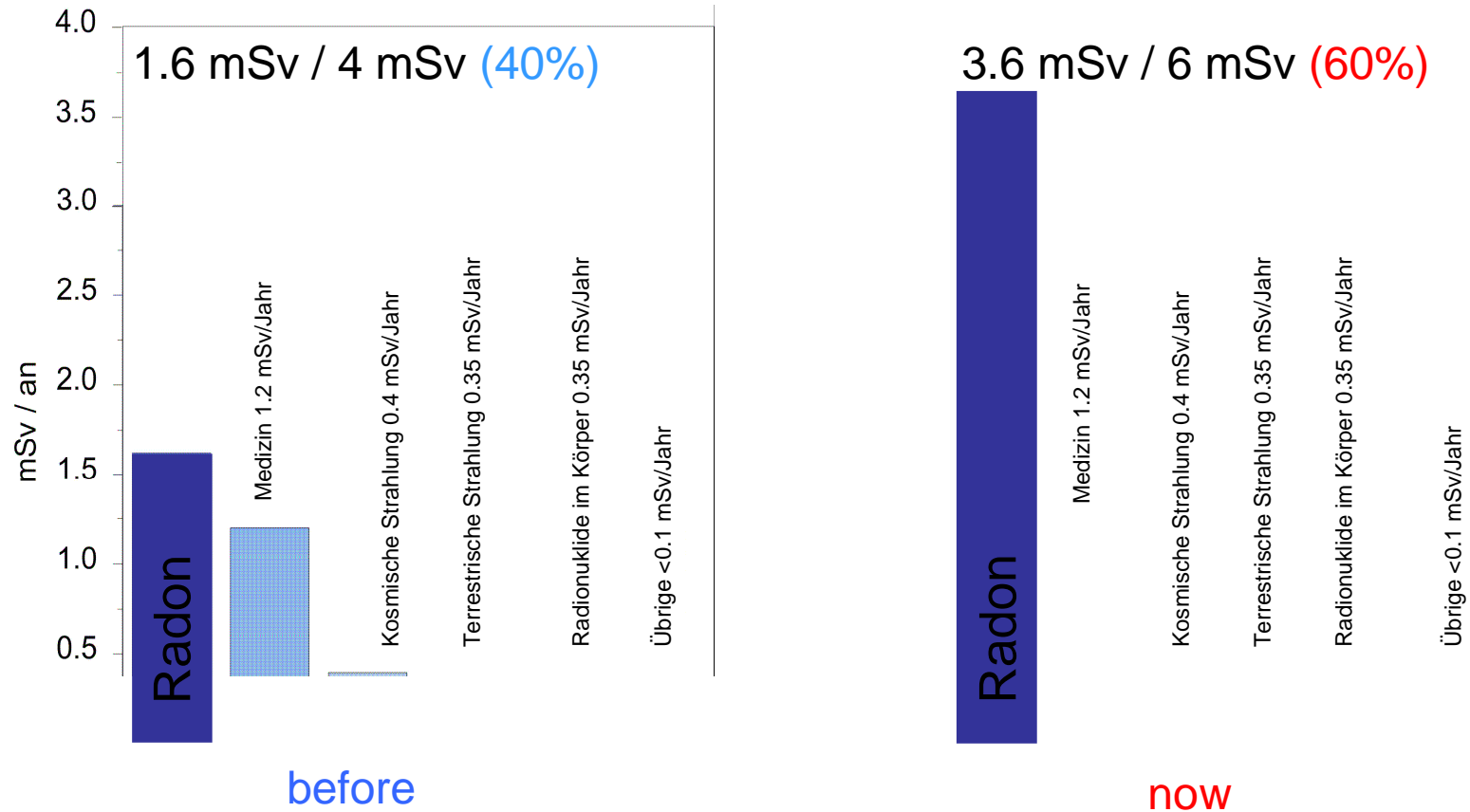
- Switzerland: Radiological Protection Ordinance (1994)

 - now : limit value 1000 Bq/m^3 , guideline value 400 Bq/m^3

 - future: ????



Annual exposition of the Swiss population

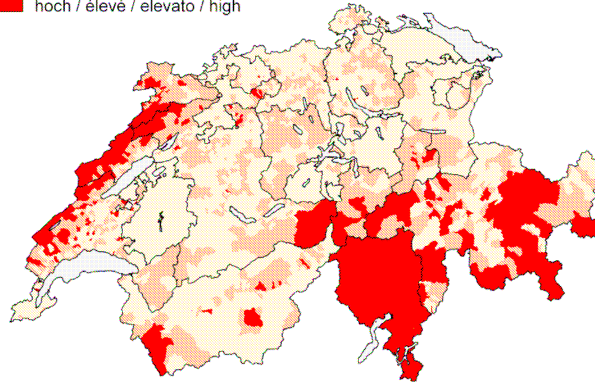




All Switzerland is a high risk area!

Map of the present situation

gering / léger / basso / low
mittel / moyen / medio / medium
hoch / élevé / elevato / high



Arithmetic mean:

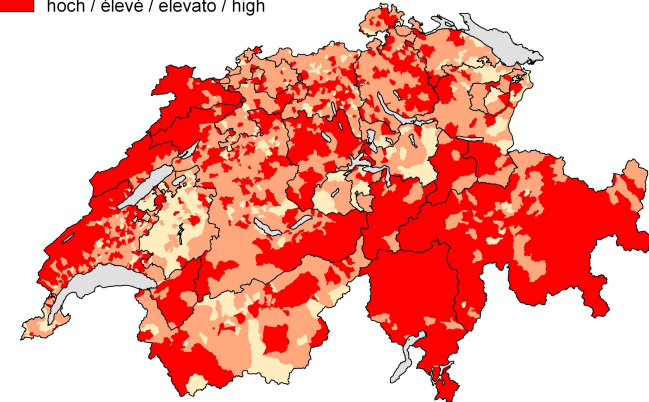
<100 Bq/m³

100-200 Bq/m³

>200 Bq/m³

Theoretical radon map

gering / léger / basso / low
mittel / moyen / medio / medium
hoch / élevé / elevato / high



Arithmetic mean:

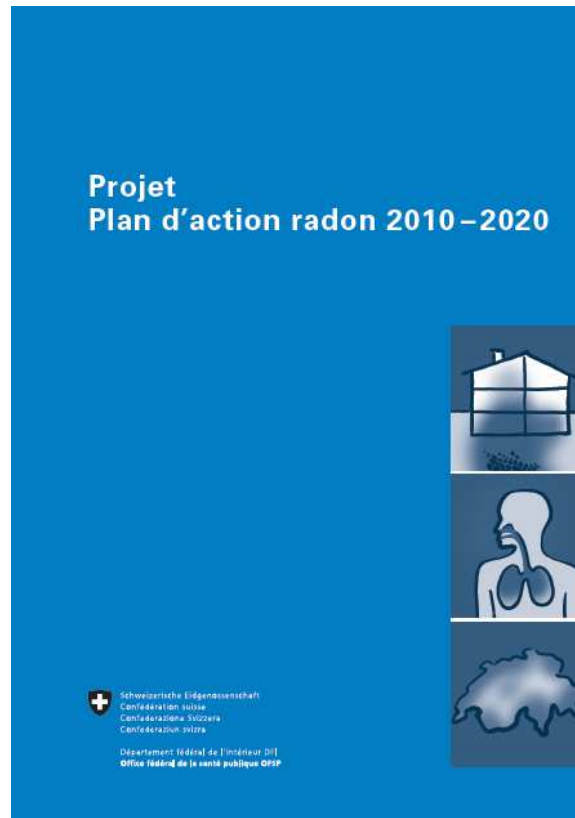
<50 Bq/m³

50-100 Bq/m³

>100 Bq/m³



National radon action plan



Soon available in English!

- From individual to collective approach
- Reduction of the limit from 1000 Bq/m³ to 300 Bq/m³ and optimization by mitigation
- Cost-effective solutions:
 - targeted measurements campaigns (dwellings, schools, public buildings...)
 - regulation for new buildings
 - synergy with energy mitigation
-
- Valorization of data (ex. geostatistic)



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New Project: Predictive radon mapping in collaboration with

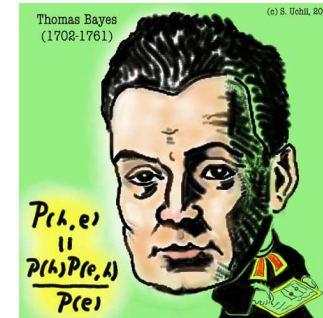


Statistic model (Bays' network)

Observed data (determinant factors)
and radon data set



Probability for non observed data



Software for radon mapping (kriging)



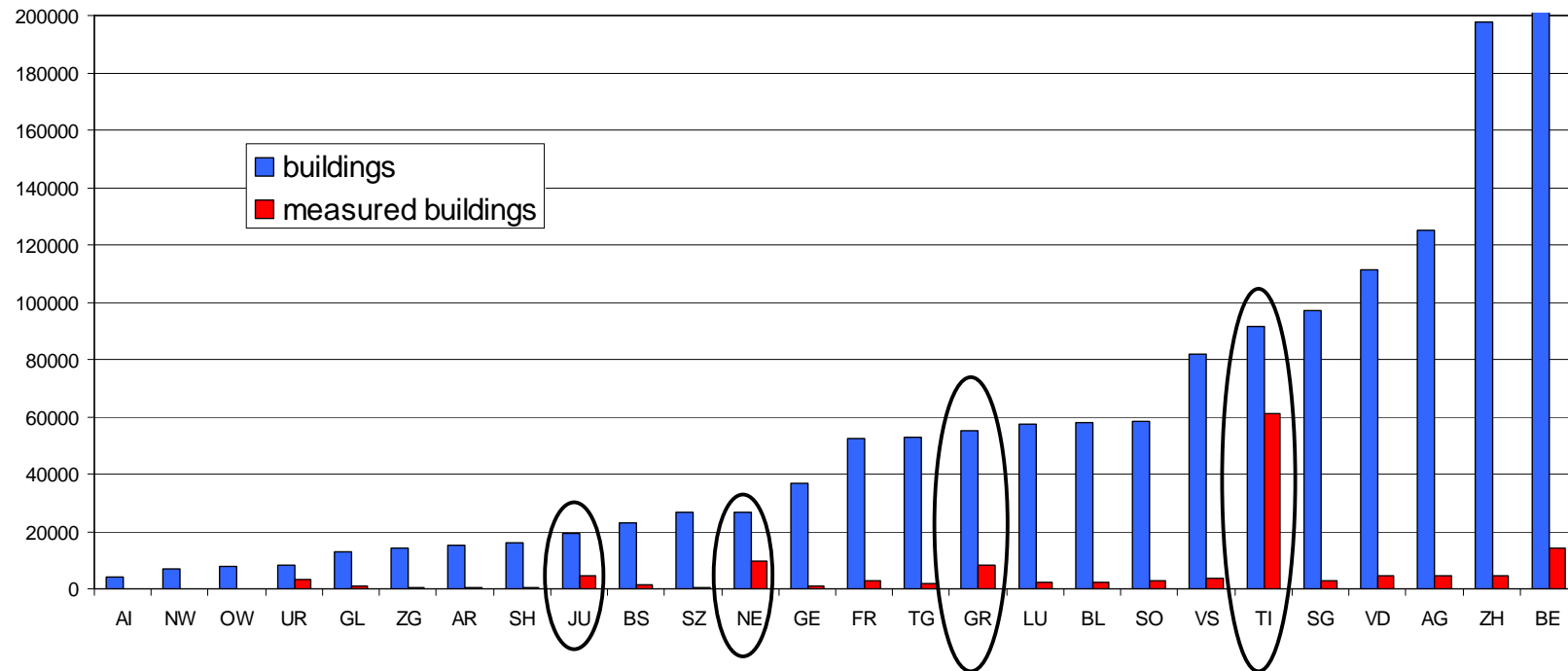
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Data set : indoor radon concentration

About 200'000 measurements in 140'000 houses, but:

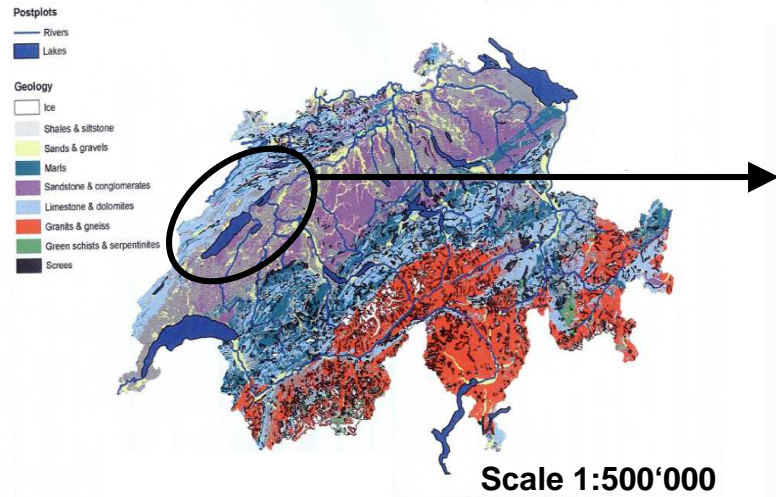
- 10% invalid geoposition
- winter/summer correction



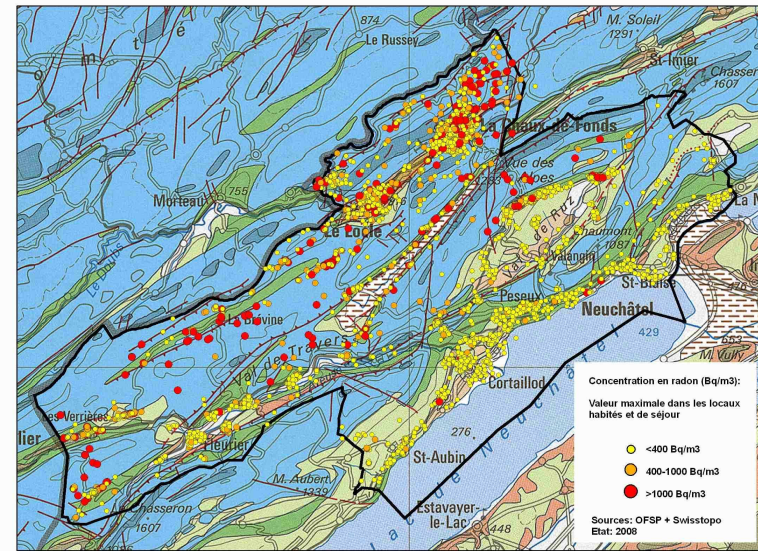
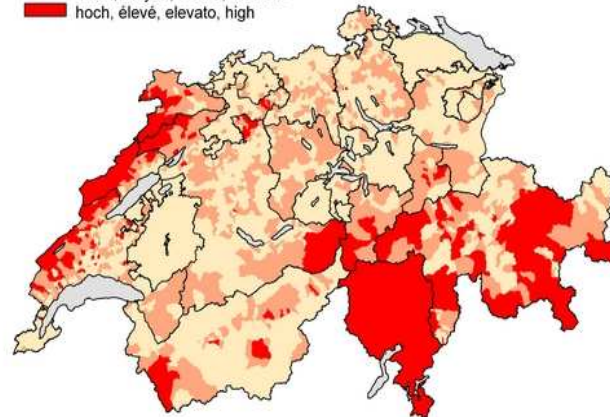
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Determinant factor : geology

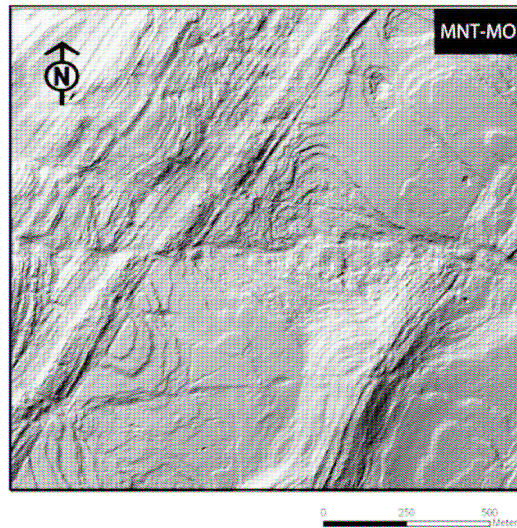


■ gering, léger, basso, low
■ mittel, moyen, medio, medium
■ hoch, élevé, elevato, high

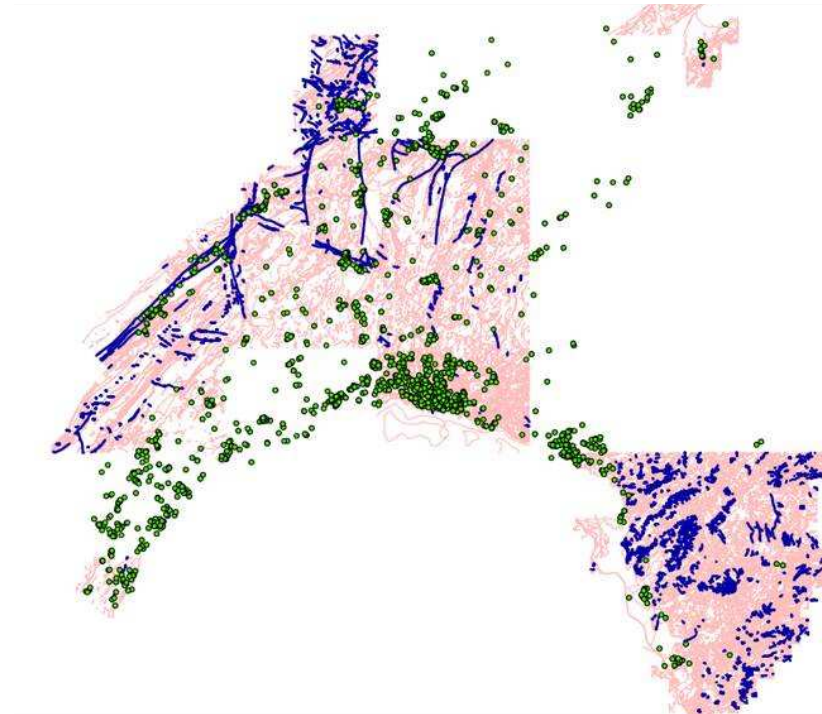




Determinant factor : distance to geological faults



Digital Terrain Model
(precision 2 meter)



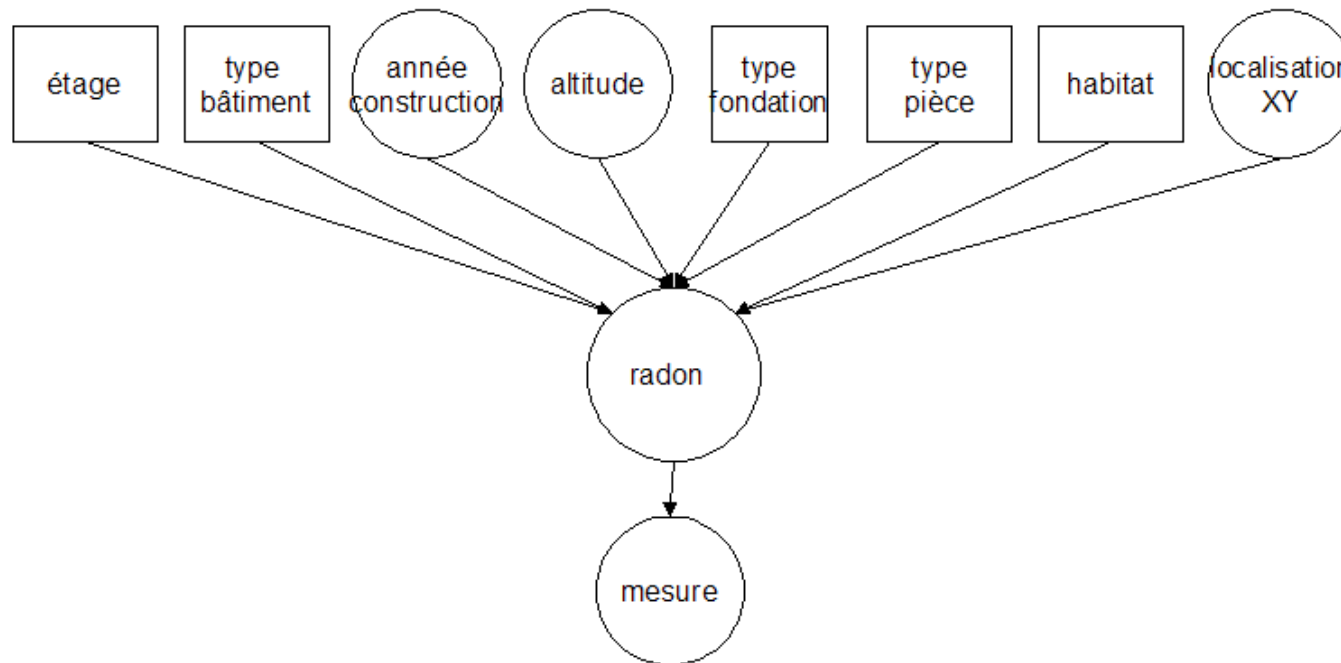
Source : IRA

- Indoor radon measurement
- Geological fault



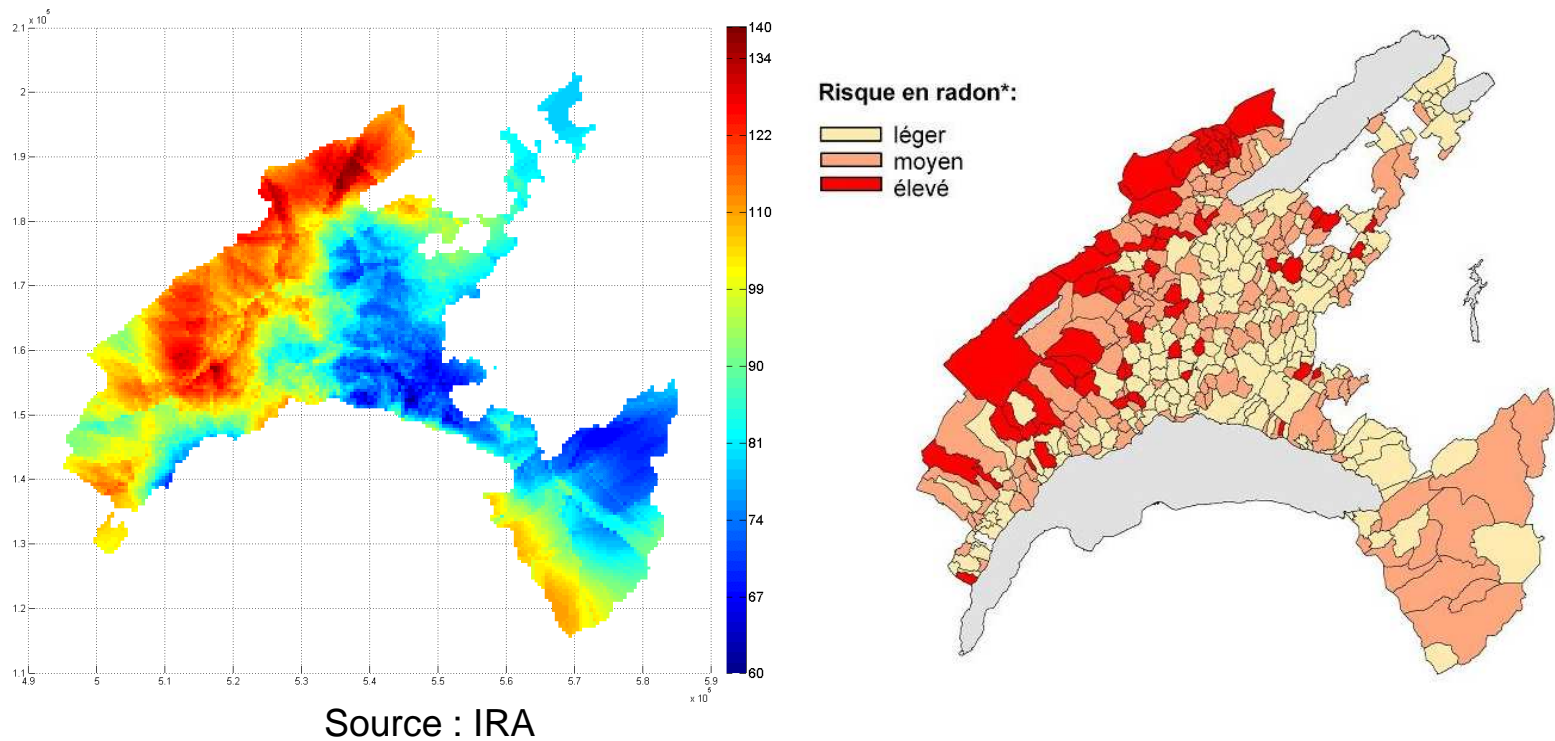
Determinant factor : characteristic of houses

-1	école	naturel	chambre	
0	maison ind.	bétonné	cuisine	habité
...	...	plaque	...	non-habité
3	bât. indus	autres	toilettes	





Radon mapping (example in canton Vaud)



More results in 2014!



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Energie and Radon

~7.5 Mio. Euro/year

Das Gebäudeprogramm
2010-2020

Sanieren und profitieren.

Kurzanleitung zum Gebäudeprogramm

2000 WATT GESELLSCHAFT

Reduction of the limit value to 300 Bq/m³:
50'000-100'000 buildings to mitigate!

Prague, 22-24 September 2010
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National radon action plan

- Information to the regional health directors
- Coordination with energy mitigation program

Next steps....

- Decision of the federal council (~ March 2011)
- Revision of the Radiological Protection Ordinance (2011-2014)

Today election!



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Thank you for your attention