

Radon regulations in Europe

Examples of good practices

ERA working Group on radon regulations

Current contributors:

José – Luis Gutierrez, Wolfgang Ringer, Boris Dehandschutter, Bernard Collignan

HISTORY

- Since ICRP 50 (1987), radon regulations have started to develop in Europe

ICRP 60

Reference level
Protection of new buildings

90/143/Euratom

ICRP 65

Workplaces
radon prone areas

96/29/Euratom

ICRP 103

Regulatory frame!
Action Plans!
Limited Ref level!

2013/59/Euratom



Lessons learned / good practices

Examples of Good Practices

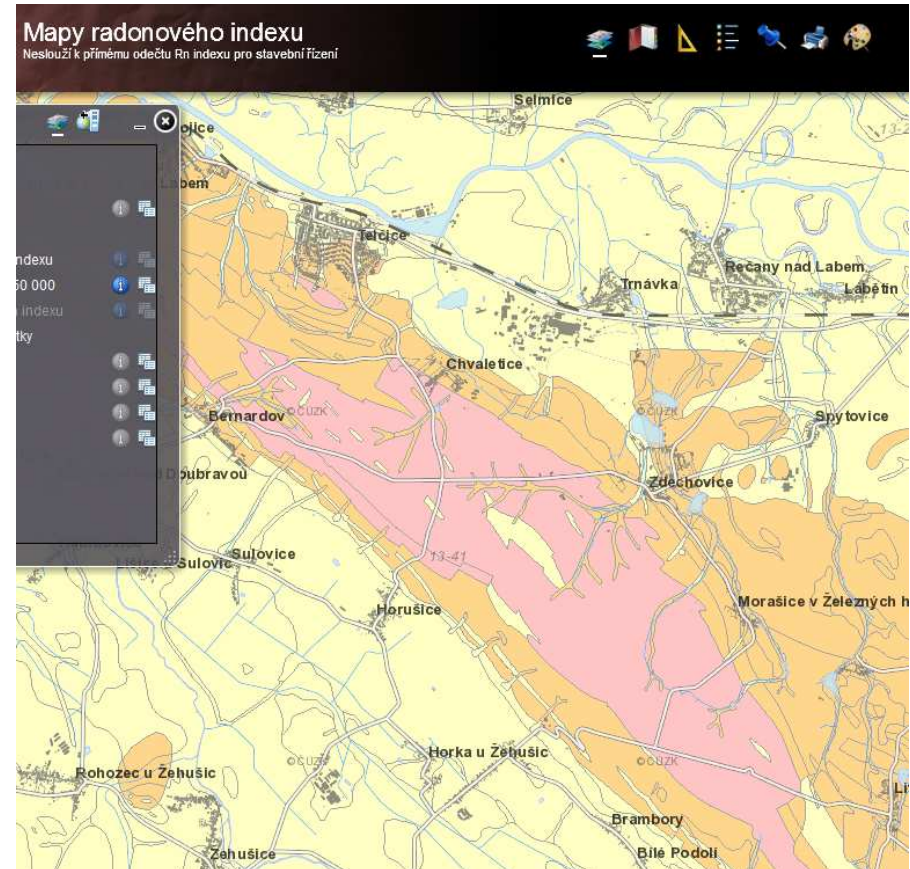
- Mapping
- Database
- Prevention
- Training and education
- House transactions
- Public Information
- National Radon Programmes
- *etc...*

Mapping

- Several countries have radon mapping defined in their regulations (CZ, AT, IE, BE, UK, ...)
- The approach to mapping is variable, depending on legacy and available technology
- All good approaches are based on indoor or soilgas radon data and information about the underlying rock

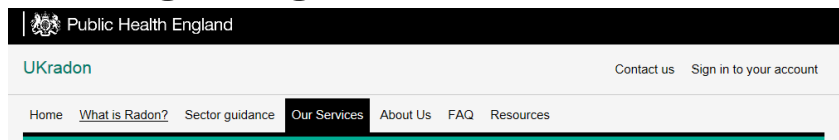
Radon Mapping in the Czech Republic

- 1990: the first governmental resolution about radon (No. 150, May 1990)
the first proposal of the uniform method for radon risk classification of foundation soils radon maps in scale 1:200 000
- Mapping the *radon index (1-4)* based on the radon potential $(Rn_{SG}-1)/(-\log_K-10)$ over local geological units for every 1:50k map (214 for the whole country)
- *Very good correlation with indoor data*



Radon Mapping in the UK

- Since 2005: mapping the radon potential (% above action level based on GM and GSD of indoor data) in grid squares (1x1 km) over defined (grouped) geological units, allowing variations between and within geological units.



Order a radon address search

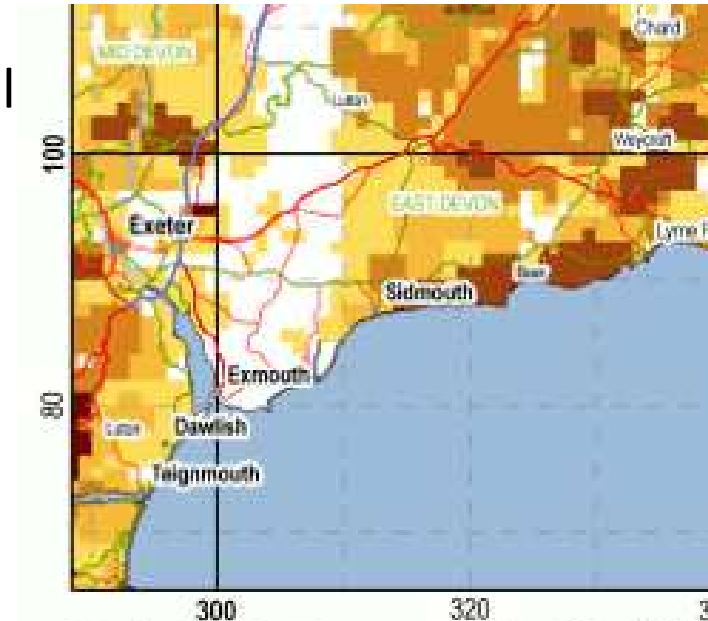
Radon Risk Report for addresses in England and Wales

Issued by Public Health England and the British Geological Survey using Address-Point® and Royal Mail PAF®.
Fee paid £ 3.25 + VAT. Email receipt issued by Secure Trading Ltd.

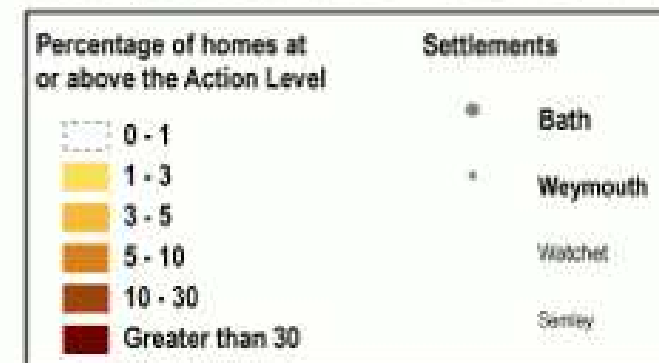
Address searched	49 Bryant Road, Town, County, TY15 7BT
Numerical grid reference for this address:	487297 East 278926 North
Date of report	11 September 2014

Guidance for existing properties

Is this property in a Radon Affected Area? - [YES](#)



The colours show the maximum percentage band within each 1-km coloured-square can be obtained for a small charge from www.ukra



Map 3 Dorset, Somerset, Wiltshire and the Bristol (

Databases

A centralized database containing information about

- measurements (different types)
- Mitigations
- Follow-up

Allows and is indispensable for the good evaluation of the Radon action plans

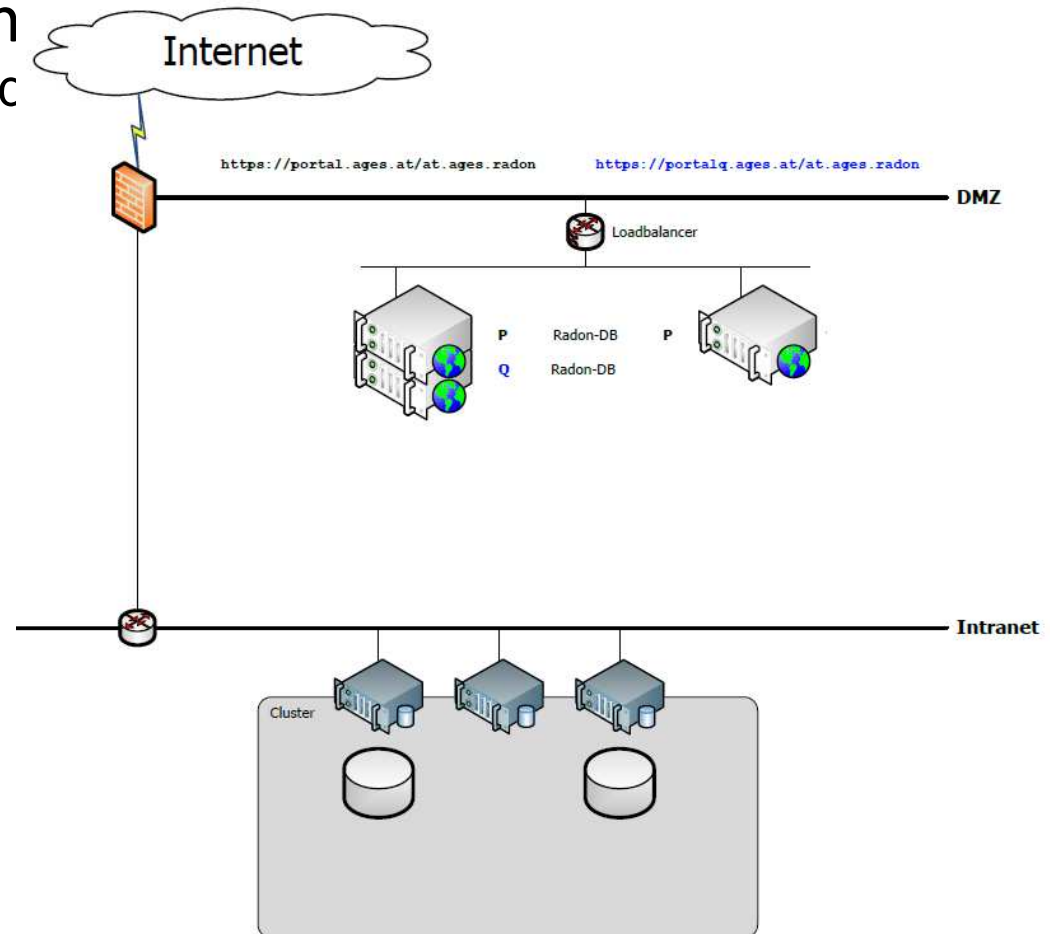
Exists in a few countries only:

- Austria
- Switzerland
- UK
- ...?

- Documentation of all data:
 - measurement data
 - info on mitigation/prevention
 - building data
 - personal data
- Basis for:
 - Austrian Radon Potential Map
 - knowledge transfer
 - support for projects, measurement
 - effectiveness monitoring of radon programmes

Radon Database in Austria

- Web-based application
→ access for authorities and measurement labs through web portal
- Technical data:
 - Oracle RDBMS
 - x Sun X6270 Blades
 - Sun Solaris 10
- Special:
 - „legacy data“ range
 - two-part DB-ID
 - PAC- data connection



• Data export and search:

- export to XML or CSV:
 - o personal data
 - o building data
 - o data about prevention, remediation
 - o measurement data
- search:
 - o adress data

Prevention

Country	Target level (Bq/m ³)	Number of dwellings***	
		In total	With prevention
Austria	200	3 700 000	15 (<0.001 %)
Belgium	200	5 040 000	
Czech Republic	200	3 900 000	210 000 (5.5 %)
Finland	200	2 450 000	60 000 (2.4 %)
Greece	200	5 630 000	
Ireland	200	1 900 000	699 000 (36 %)*
UK	200	23 000 000	Not known **
Portugal	400		a few
Switzerland	400	4 000 000	5 000 (0.1 %)
Germany	100	39 900 000	1 000 (0.003 %)
Norway	100	2 270 000	
France	-	32 800 000	
Italy	-	22 000 000	

* This is the number of dwellings built since 1998 when the law was enacted

** UK: guidelines for radon prevention since 1991

*** In low rise residential and apartment buildings

Data as of 2009

Source: RADPAR

New guide for radon prevention in 2003

- **Use of a strip of bitumen felt for sealing**
- **Installation of radon piping (as already in the previous 1996 guide)**

New building code for foundations in 2004

- **In the design and construction work, radon risks at the construction site shall be taken into account**
- **Radon-technical design documents are required**

Results

- **Preventive measures were taken**
 - in **92 %** of houses in six provinces with highest radon concentration (Area 1)
 - in **38 %** of houses elsewhere in the country (Area 2)
 - in **54 %** of houses, whole country

- **Average radon concentration 95 Bq/m³, median 58 Bq/m³**

- **Percentage exceeding 200 Bq/m³**

- 200 Bq/m ³	10.6%, previous nationwide survey	15.8%
- 400 Bq/m ³	2.1%	3.8%

Study on effectiveness of preventive measures (2012)

Since 1998 new buildings in high radon areas have to have a radon barrier.

Radon measurements in 189 social homes prior to 1998 and 149 after 1998 (high radon areas in county Cork).

Build year	1999-07	1969-98
No of homes	149	189
Geometric mean (Bq/m ³)	78	129
Arithmetic mean (Bq/m ³)	120	272
Maximum (Bq/m ³)	743	2133
No of homes > 200 Bq/m ³	19 (13%)	62 (33%)

Prevention – Example Ireland

Installation of external sump

A Typical External Sump

- Vent cowl
- Pipework cranked around eaves
- Pipework fixed back to brickwork

No of homes	125
Initial radon measurements	200 – 3,300 Bq/m ³ ap
Final radon measurements	<10 – 389 Bq/m ³
Remediation efficiency	61 – 99 %
Mean remediation efficiency $\pm 1 \sigma$	91.9 \pm 7.5 %

Sealant

Source:

Long S., Fenton D. (2012) *The effectiveness fo radon preventive and remedial measures in Irish Social Housing*. IRPA 13 Congress, Glasgow (Scotland), 13.-18. Mai 2012.

The cornerstones of a radon prevention strategy are:

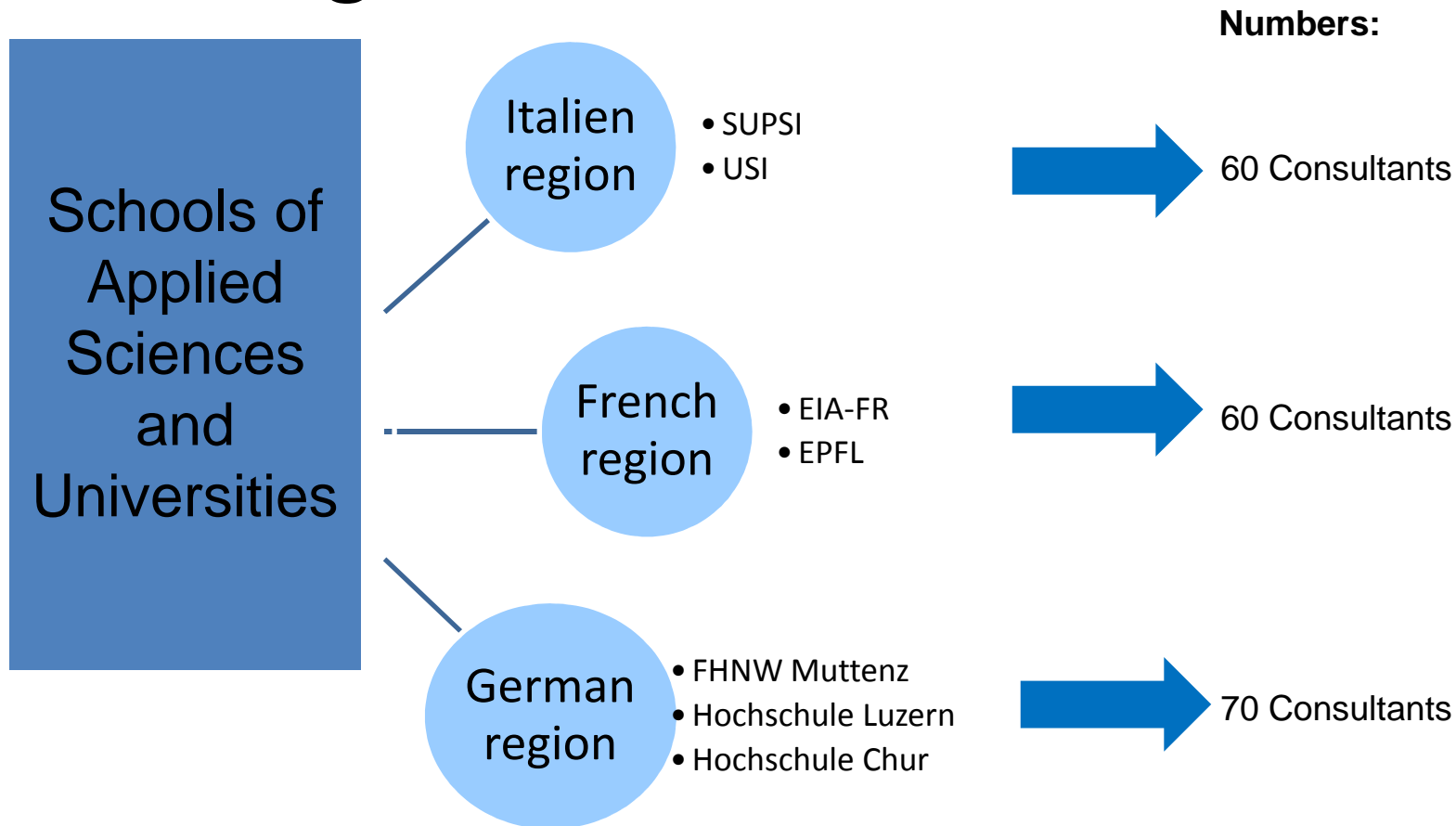
- Have legislative basis (building codes, radiation protection act)
- Provide technical document on preventive measures for building professionals
- Inform concerned parties (federal state, municipalities, building professionals, builder, owner)
- Assure implementation of radon preventive measures through building permit process (information, requirement)
- Verify
 - implementation of preventive measures
 - effectiveness of preventive measures (e.g. by free measurements)

*long and
hard going
process*

Training and education

- An important treat to the success of a radon action plan is the level of knowledge of the stake-holder (especially building professionals, physicians, local authorities,...)
- A training and education programme can help to limit this risk
- A good example can be found in Switzerland

Training for « radon consultants »



From BAG, ROOMS meeting 2011 in Freiburg

Their role:

- To organise basic and advanced training courses
- To organise an e-learning course
- To organises a CAS (Certified Advanced Study) on indoor air quality including radon
- The trained consultants introduce their remediation work in the federal database

Conclusions

- In Europe, a broad and diverse approach to radon management exists
- Gives a great opportunity for REX, and for the distillation of Good Practices, and even Best Practices
- The working group on radon regulations aims at collecting and publishing this information, for the benefit of the european radon stakeholders