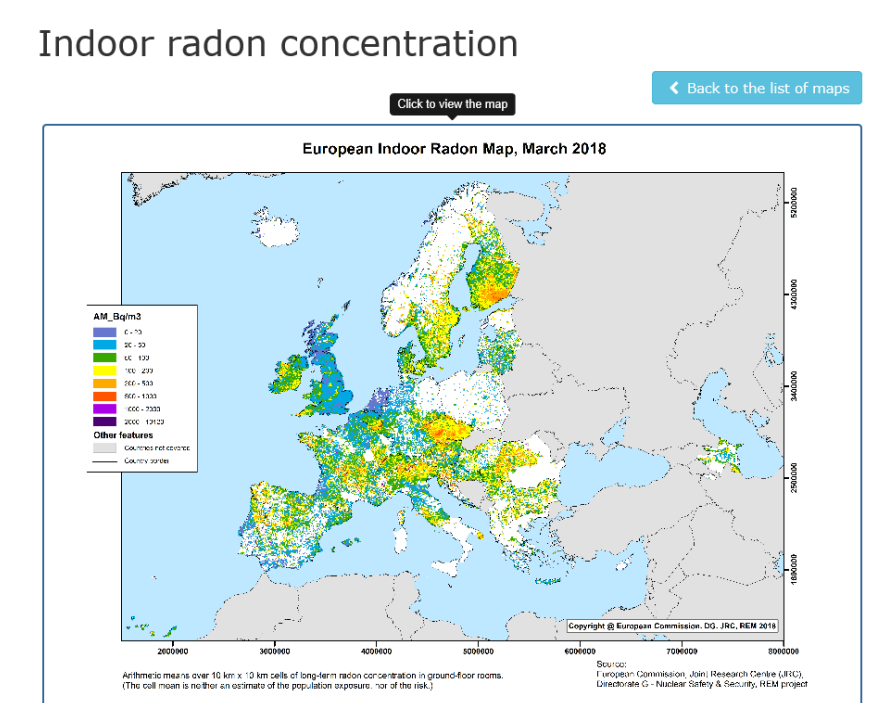


Evaluating radon websites from a stakeholder engagement perspective



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Abstract: Exposure to indoor radon in homes is one of the main causes of lung cancer worldwide. However, the levels of radon testing and subsequent home remediation remain lower than aimed for by radon National Action Plans in European countries. Recent studies suggest that public engagement may contribute to addressing this value-action gap. Given their role as common interaction points between citizens and public services, this research aimed at analyzing national and local authorities' radon websites from a stakeholder engagement perspective. Website evaluation metrics included indicators related to availability of radon information, accessibility, stakeholder interaction, dialogue, responsiveness, content and design, and transparency and openness. Results show that availability of radon information on the internet pages of radon prone areas is limited. Websites containing radon information should be improved with consistent information supported by engaging stories, provide for personalized features, allow for stakeholder feedback and dialogue, and include the use of social media. The analysis is concluded with a synthesis of good practices supporting stakeholder engagement in radon issues since this can improve public health.

Engagement factors	Identified good practices for stakeholder engagement in radon issues	
Availability of radon information on internet 	• Webpages of national and local authorities include radon related topics. • A special, dedicated radon internet page is developed at national level. • The internet page of a local community has a special radon sub-page. • Radon information is clearly identified and all information is collected on one sub-page. • The internet page includes outreach documents, such as brochures. • National and local radon webpages are cross-linked.	
Accessibility 	• The design of the webpage is adapted to different mobile applications and devices (e.g. computer, smartphone). • Personalized and customizable features are included on the webpage (e.g. GPS coordinates linked to radon prone areas, interactive radon map, radon concentrations included on the map).	
Stakeholder interaction 	• All links mentioned in the webpage are functional and tested regularly. • Feedback forms and satisfaction questionnaire are included in webpages. • Tools designed for collecting stakeholder questions and answers are on-line and open to all stakeholders, not only to residents. • A stakeholder can follow radon-related discussions by broadcastings and can participate in Webinars related to radon. • Information for direct personal communication about radon is available and inviting. • New social media are integrated and encourage enhanced stakeholder engagement in radon issues (e.g. Facebook, Twitter, YouTube).	
Dialogue 	• Chat areas and message boards are open to everybody and the content is visible to everybody. • A stakeholder can register for email updates, newsletters etc.	
Responsiveness 	• E-mail addresses published on-line are functional, and there is a person that responds to the stakeholders' questions. • Response to an email is given in a reasonable time, it contains factual information and addresses risk perception and empathy, if appropriate. • Response is taken as an opportunity to engage.	
Content for different stakeholders groups 	• The organizational structure of the webpage is clear and easy-to-use. • The webpage is user-oriented and user-friendly. • The webpage story is clearly structured around radon issues. • The content is personalized and includes greetings for radon stakeholders. • Different stakeholder groups have special sub-pages and designed content. • Webpage is easy to learn. • Basic radon information is easy to find: where to get self-radon test, how much the kit cost, where will results be published.	
Transparency and openness 	• The radon action plan is published online. • Radon subventions and applications are published online. • Tenders for radon mitigation activities are published online. • Financial documents related to the radon action plan are published online. • The new Basic Safety Standards Directive is published on the webpage. • National legislative documents directly or indirectly linked to radon issues are easy to find. • Radon mapping activities and plans are easy to find and follow. • Mitigation activities are regularly and transparently reported.	

Conclusions: This research showed that internet is insufficiently used to empower stakeholders to be involved in decision-making related to radon risks in radon prone areas, or to make informed decisions related to radon risk reduction. However, there are some good practices that authorities could follow.

RADON

Stakeholder engagement in case of the national radon program

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Case study introduction and data

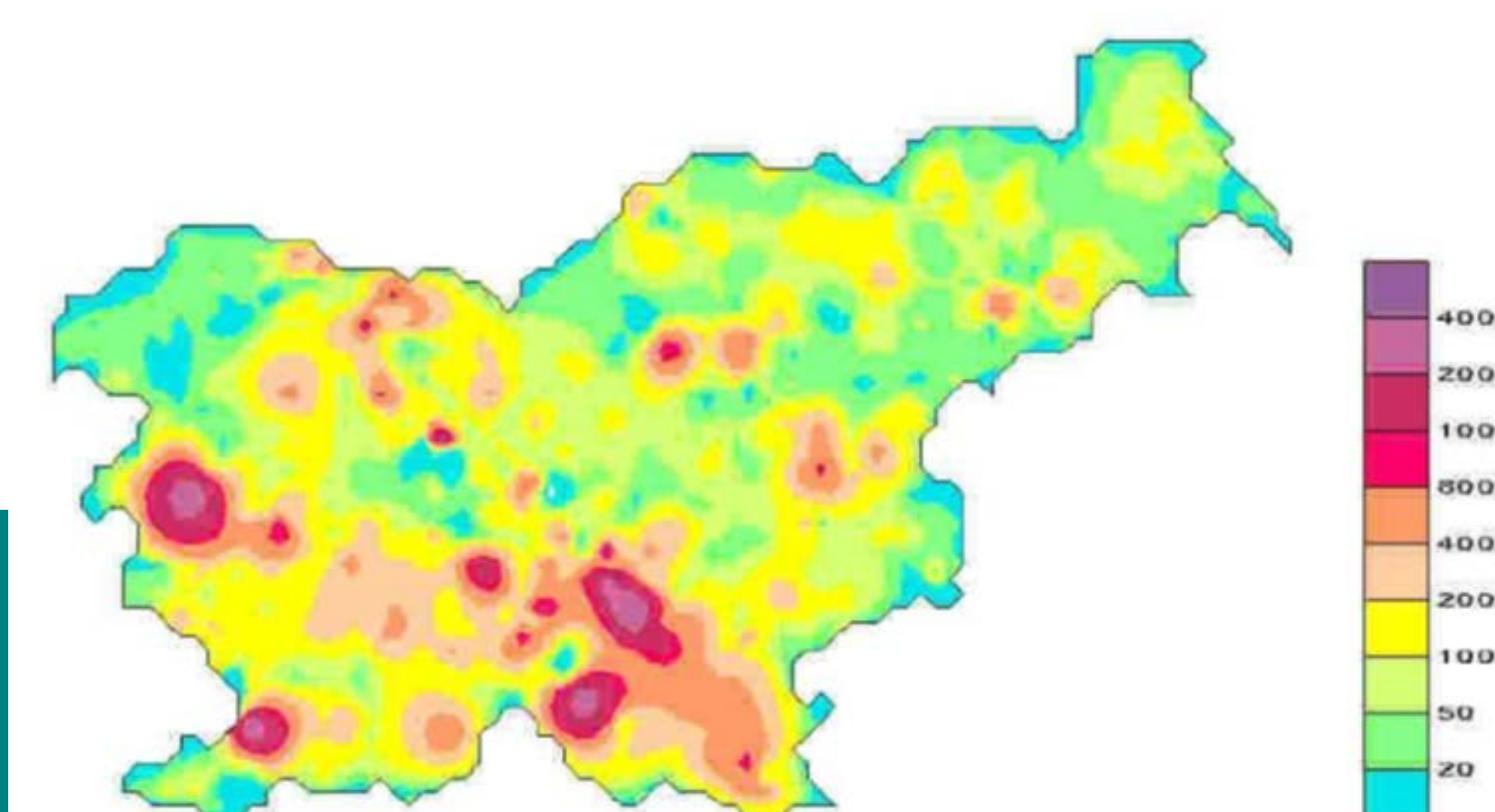
TOPIC: The case study focuses on the implementation in practice of the requirements of the national decree on a national radon program. It focuses specifically on the approaches to awareness and other communication practices with the target audiences. In 2018, the Slovene Government adopted through the national decree all related requirements from the BSS Directive in relation to a national radon program, and also defined the responsible stakeholders for its implementation.

OBJECTIVE: To identify the practices of stakeholder engagement, related to requirements from the decree, and what recommendations and/or lessons learned can be pointed out.

METHODOLOGY: Analyses included an investigation of the available information as presented in the relevant Slovenian legal framework, of information available on webpages and a review of relevant published documents. In addition, a series of interviews were performed with responsible staff and other relevant actors to obtain an understanding of the information and its interpretation. Interviews with responsible persons at the Slovene radiation protection administration (SRPA) and an authorised expert for measurement and assessments of doses to the public were conducted.

Findings and recommendations

- Legal requirements from the BSS directive are transposed to the Slovenian national legislation. The responsible authorities are lacking the resources, especially human, to effectively perform control and provide advices. The guidelines for new buildings are not yet adopted.
 - Gaps need to be addressed, and good approaches in other countries could be used to improve the presence in the public, and in particular to address the needs of more interested stakeholders (construction related companies, municipalities, responsible in schools and other public buildings, responsible in caves, ...).
 - The government should assess the needs for new staff in the responsible institution, in order to increase their presence in the public.
- The awareness of the public, and also of small municipalities, about the risk posed by radon is relatively low and advices from the authorities are not followed (such as regular ventilation of houses etc.).
 - It is recommended that authorities (SRPA, Ministry of Health, National institute for public health) start nationwide awareness campaigns based on the communication plan, through which the radon topic would be presented, and also to provide the most effective ways to reduce radon in buildings and elsewhere.
- The interest in radon measurements is especially high in public buildings. The available funds are limited. They are used by the principle of 'first come, first serve'. When the available money is spent, the requests are addressed in the next year.
 - It is recommended to develop not just legal regulation on a national radon program but also an action plan based on the evaluation of the current situation and feedback from the current implementation.
 - As small municipalities have a small budget, the reimbursement from the state for radon remediation should be changed and the costs should be paid in advance.
- Implementation of radon remediation is a challenge as the municipalities are not having sufficient knowledge, and there are also only few qualified contractors.
 - The government should also provide the means for regular trainings for involved experts (staff at municipalities, engineers, architects, implementers) to be able to perform their duties.
- At the governmental level the radon issue is not a priority, although the radon problem is the responsibility of several ministries: the ministry for health with the SRPA and the National institute for public health, the ministry for environment and spatial planning with construction regulation and inspections, the ministry for infrastructure responsible for energy efficiency in public buildings. Also municipalities have responsibility in all public buildings.
 - The government should establish a **coordinating** body where the radon topic would be effectively addressed for different stakeholders.



RADON

Stakeholders in radon risk management and prevention in Italy

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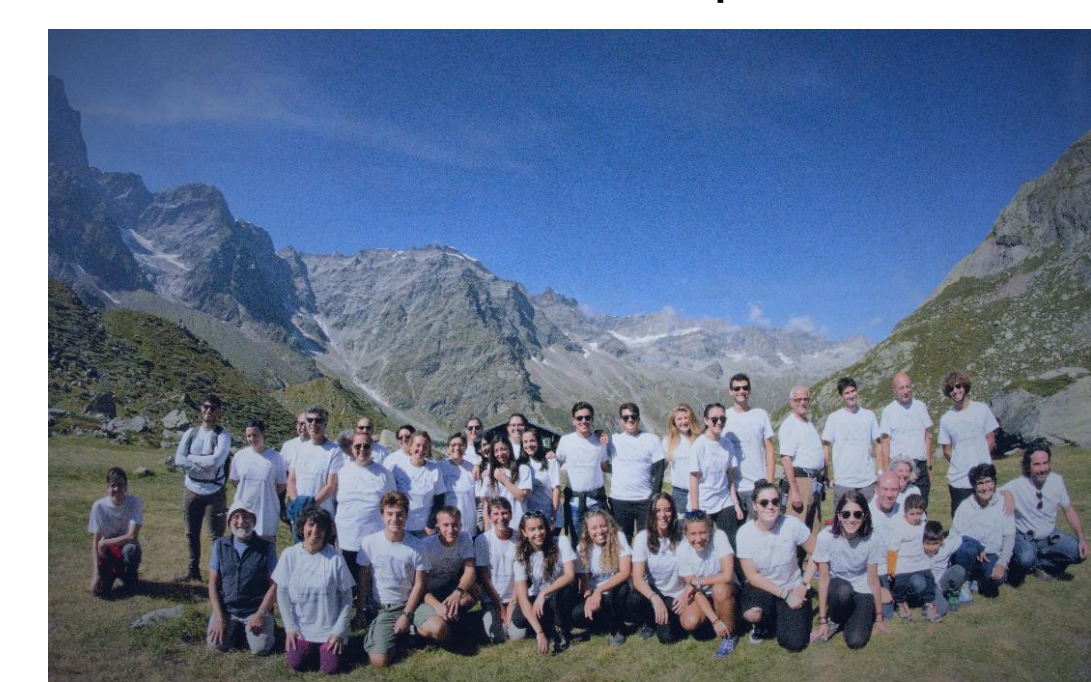
Case study introduction and data

TOPIC: In Italy the regulation regarding the protection from radon exposure refers to the 2000 decree with attention to workplaces, including schools. The Ministry of Health prepared the National Radon Plan (PNR) in 2002. The plan was launched in 2005 through the project 'Start-up of the Radon National Plan for the reduction of lung cancer risk in Italy' coordinated by the National Institute of Health, in cooperation with the National Institute for Occupational Safety and Prevention and the Italian Institute for Environmental Protection and Research. A second phase of the project was launched in 2012. The instrument of technical guidelines, the information documents addressed to the public and other means of communication on radon risk, at national and regional level, contribute to providing basic information and open opportunities for the involvement of stakeholders.

OBJECTIVES: to analyze which stakeholders are actively involved in radon risk information and prevention with attention to indoor exposure, their different levels of involvement and possible exchanges of views and experiences, and to evidence the relation with enhancement of RP.

METHODOLOGY: The analysis is based on documents and on interviews conducted with professional experts in radiological protection with longstanding experience regarding radon. The interviewed experts work in academia (on education, training and research related to radon), and in the Regional Agency of Environmental Protection.

RadioLab Summer School, Macugnaga, Monte Rosa, Sept. 2018

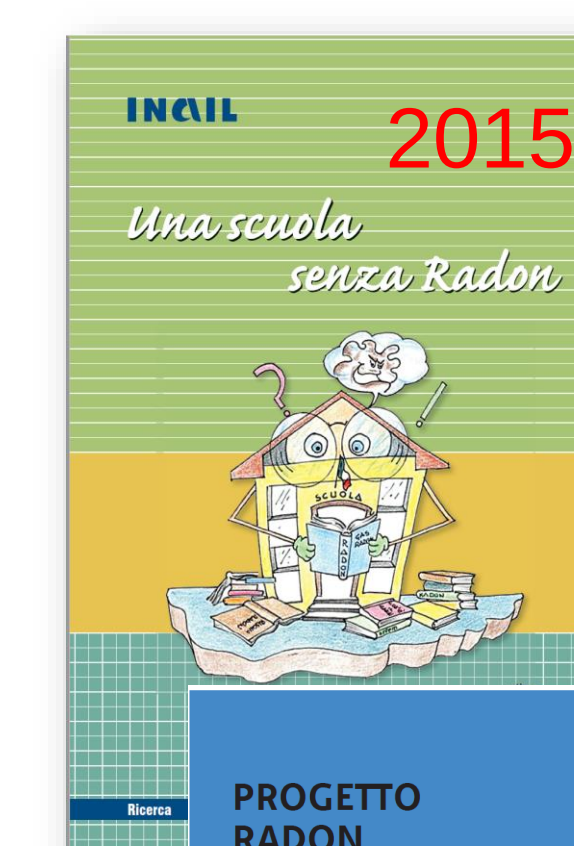


INFN — National Institute for Nuclear Physics - Activity of Public engagement.
<https://web.infn.it/RadioLab/>

To bring students closer to the Radon thematic through on site measurements carried out by the participants.



Schools are susceptible target, and scientific research on radon levels is performed in different Regions with attention to daily exposure of students, teachers, and administrative staff. Some studies indicated risk of exposure to high radon concentration in Italian schools.



To Insert interdisciplinary training paths to promote the culture of health and safety at work.



To inform the public in a simple, complete and objective way about the problem represented by radon in homes, while providing indications for intervention.

Findings

- To make the involvement of stakeholders 'effective', collaboration is needed with local institutional partners, like municipalities, and the public.
- Awareness awakens sporadically, often in relation to journal articles and communication, and sometimes in relation only to specific alarmism and without dedicating time to have a clearer view on different situations and related possible actions.
- There is increasing attention, regarding radon risk, to information and training of young people, and professionals in training. It is recognized important to direct attention towards students in communication - 'Involvement is becoming'.
- In public institutions, radon awareness is more present, but there are difficulties in putting radon at a certain level of priority, as there are other problems that require attention and resources.
- In the case of private homes, radon risk management is essentially motivated at a personal level; quite often people do not want to face this problem, e.g. because they do not consider a 'natural element' dangerous enough to take action, or the financial cost of remediation hinders action.

Conclusions

- Radon is a matter of health inside buildings and its dangers are closely related to the quality of buildings. The debate on who is responsible in case of high radon risk exposure seems still ongoing: institutions for health care, or environmental institutions?
- There is a need for individual involvement as things imposed from above are seldom put into practice, but raising awareness of individuals through the regional structures -which are opening more doors to connect with the public- is currently at a good point in practice.
- Young people should be informed, trained and sensitized irrespective of their professional futures, as they will in many cases be future stakeholders, and thus need knowledge of the various aspects of radon risk.

Communication and Management of intervention in case of high radon exposure level. Case study : Wallonia - Belgium

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Introduction

This research pursues two objectives. The first one is to highlight the dynamics of local actors when a sensitive public infrastructure, a primary public school, is exposed to radon. The second objective is to analyse the interactions and communication patterns between professional experts and with the local authority and local inhabitants.

The case study of a local event of radon exposure in a primary school in 2017 was favoured and was treated inductively and qualitatively.

It is based on a literature review, on the analysis of the legal framework about radon control public policy and on a field research including stakeholders.

Local actors involved in the event of radon exposure were interviewed: mayor, administrative director of the municipality, civil servants, and a remediation expert. In addition, two radon experts from province services (in charge of indoor pollution) and federal authority were interviewed.

Findings

Plural Authority Management

Distribution of responsibilities in the federal Belgium is complex : four vertical levels of power are involved in the issue of radon for risk analysis and risk management: the federal, the region, the provinces, and the municipalities.

- FANC, the federal authority for nuclear control is responsible for risk assessment.
- The regional service for environment and health is situated in an ambiguous position under the control of 3 ministries. This makes an integrated approach difficult to implement.
- The provincial authority is the expert for radon risk management. It tends to act as a "brokers" between the FANC and the local authorities.
- Municipalities have legal obligations in radon measurement and remediation in public buildings. They are also in charge of the « political crisis » management when a high radon exposure level is revealed.

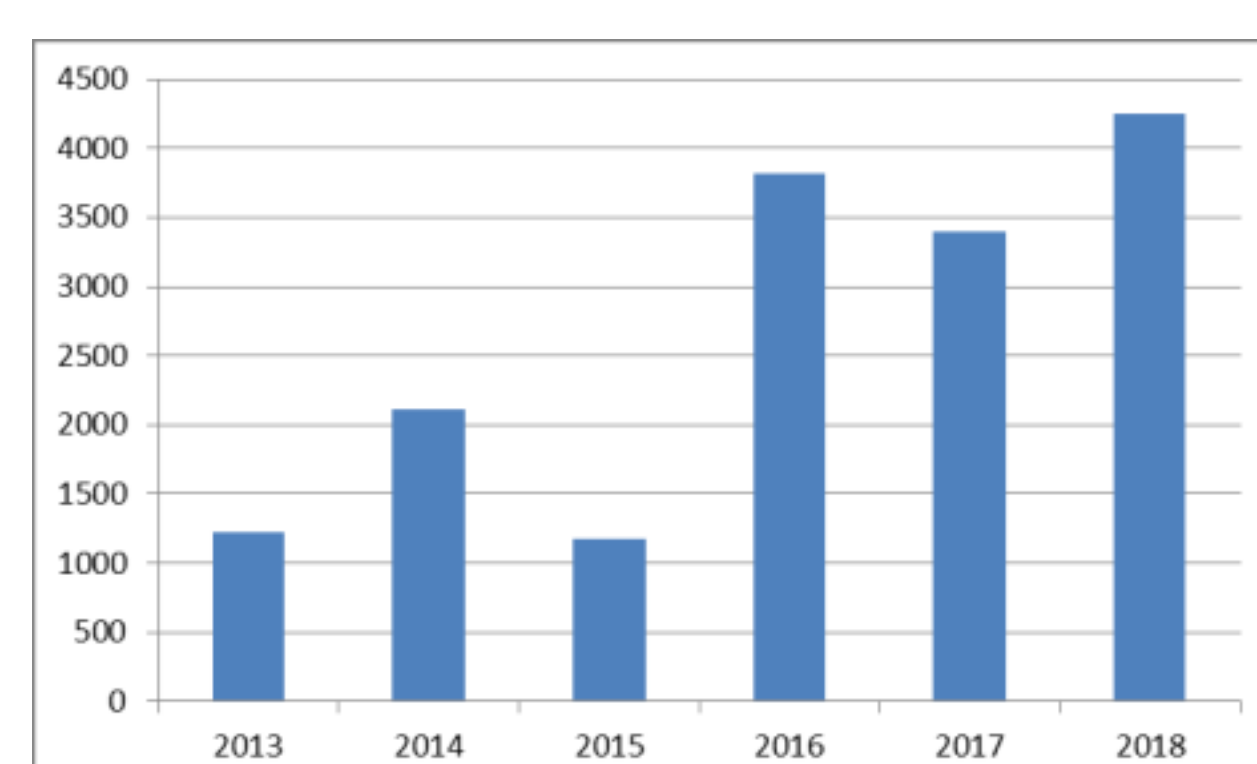
Distribution of responsibilities and tasks between the different authorities were not always very clear and the strategy for global communication is haphazard. The whole system suffers from the absence of investment of the regional level and the absence of consistent and global communication patterns about the risk assessment.

Level of awareness & Communication strategy

The level of awareness about radon is considered by field experts as too low, in the population at large but also among professionals.

Depending on the location, there are disparities of knowledge on the topic of radon: higher levels of awareness in very high risk areas.

Another divergence exists between the participation for radon measurement (on the increase) and the percentage of homes asking for support for remediation (still too low).



Evolution over time of the number of detectors ordered (FANC)

Adjustments in communication strategy about radon campaign have been made. The most relevant means highlighted are: a web platform to order a radon detector online at any time of the year, information through social networks, free large scale newspapers but also through a unaddressed post delivery to all houses in the municipality with the support of the local authorities.

Lack of knowledge and engagement in professionals

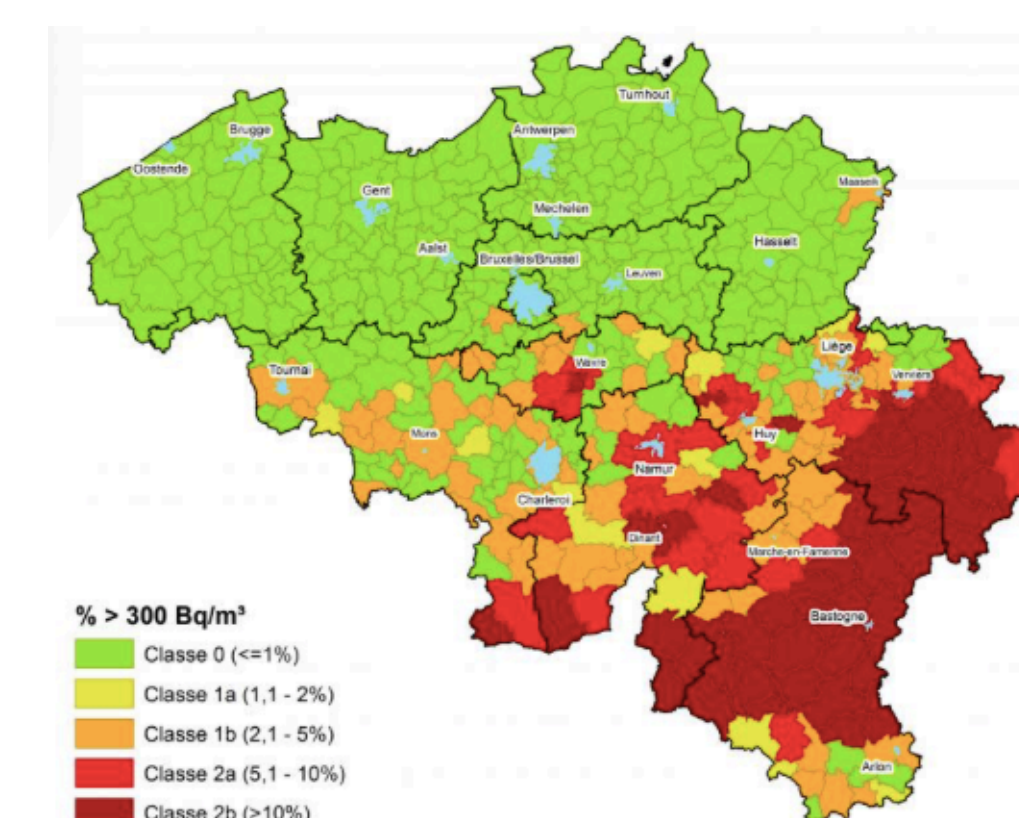
A lack of commitment from three types of professionals involved in radon has been highlighted.

- Local urban planning services in high-risk zones could inform the promoters about the practice to place a plastic membrane anti-radon. This information is not systematically given and there is no request for specific risk analysis by the local service.
- Medical doctors seem to be more mobilized on "indoor pollution" in general and less so on radon as there are not associated to the measurement campaigns.
- Architects & building professionals have the opportunity to follow training but the participation rate is very low. The regional law imposes for the construction of a new building :*"to prevent or minimize the risk with regard to the zones defined by the FANC » (CODT 2017 – Annex 4)*

If the responsibility is on architects, the scale of the map is too large scale to define the risk accurately. This position is also shared by the Belgian Superior Health Council which supports the importance of not restricting the actions to radon prone areas and to adapt building techniques all over the country, if the objective is to impact the lung cancer incidence rate (SHC - 2017)

Mapping risk zones: a tool dangerously reassuring ?

The definition of risk zones for radon is a European obligation. In Belgium, the communication is taking the form of a interactive map which is produced by the federal authority.



It is supposed to be a very useful tool for raising awareness by showing where the risk is above average. However, this map has been criticized by the provincial actors for two reasons:

- The map contributes to demobilize the local authorities which are not in the red, although there can be very hot spots in a low-risk zone.
- The map is misleading ; it conveys the idea that radon measurement is somehow uniform in a local zone, while experience shows the contrary.

This strengthens the position of SHC which proposes a public health perspective in risk assessment and integrates the options of risk management in the analysis and recommendations to public managers.

Conclusions

Radon is at the same time a public health, an environmental, an economic and an urbanism issue. The adoption of an integrated approach of environment-health issues together with urban planning and energy saving policies would favour the involvement of citizens and the adoption of protective measures.

Given that the top down approach has not been effective for private houses, the utility of risk assessment can be increased by clearly linking it to context sensitive risk-management options, in order to inform the decisions of those in charge of risk mitigation about the available options.

Action oriented research (e.g. citizen science) with case studies is necessary to better understand the interactions between stakeholders engaged in different policy issues and / or at different levels of responsibility in a web of multiple frames and constraints.

RADON

Multidisciplinary approach to manage the radon risk in the Bourgogne – Franche-Comté area

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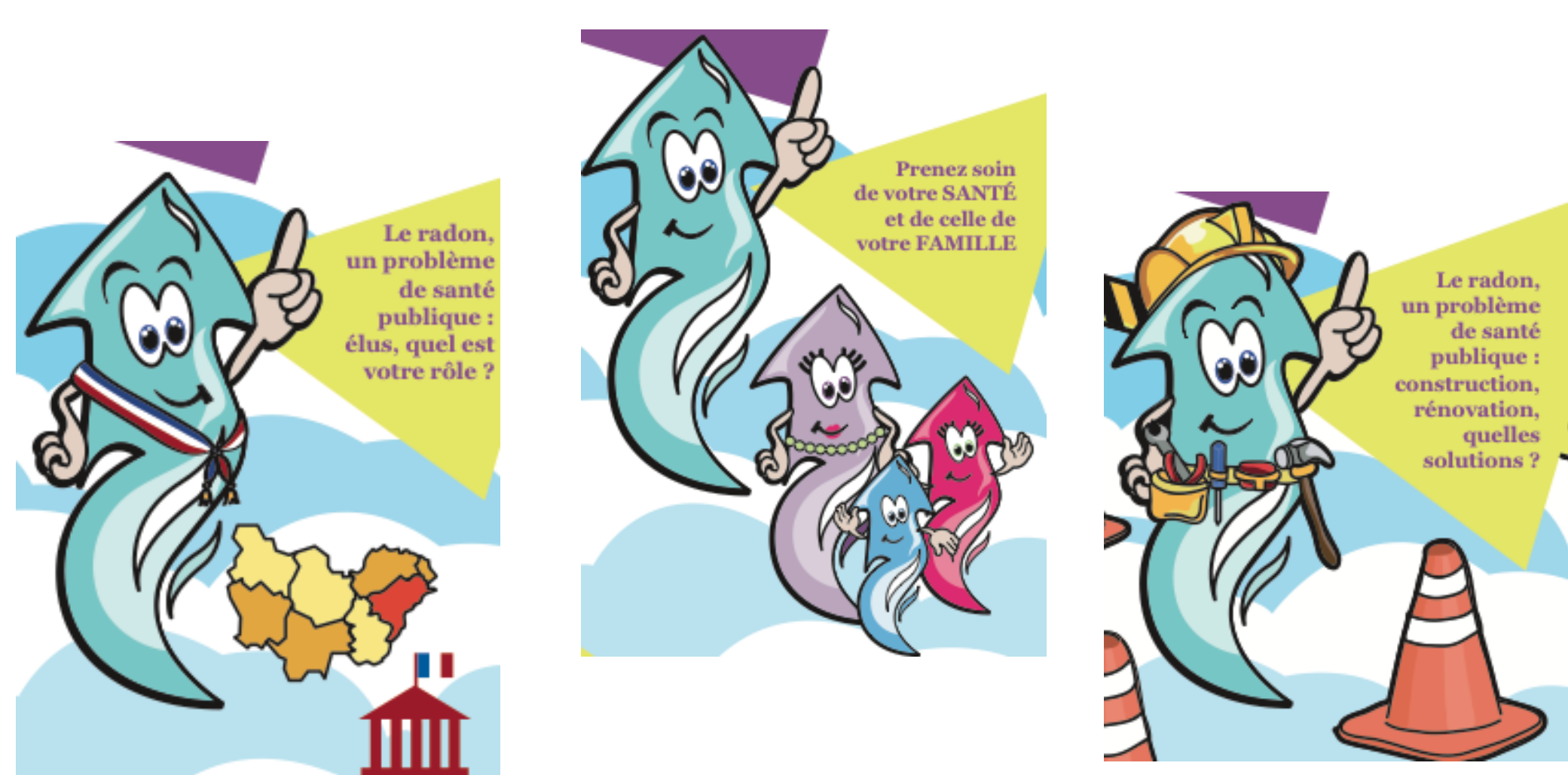
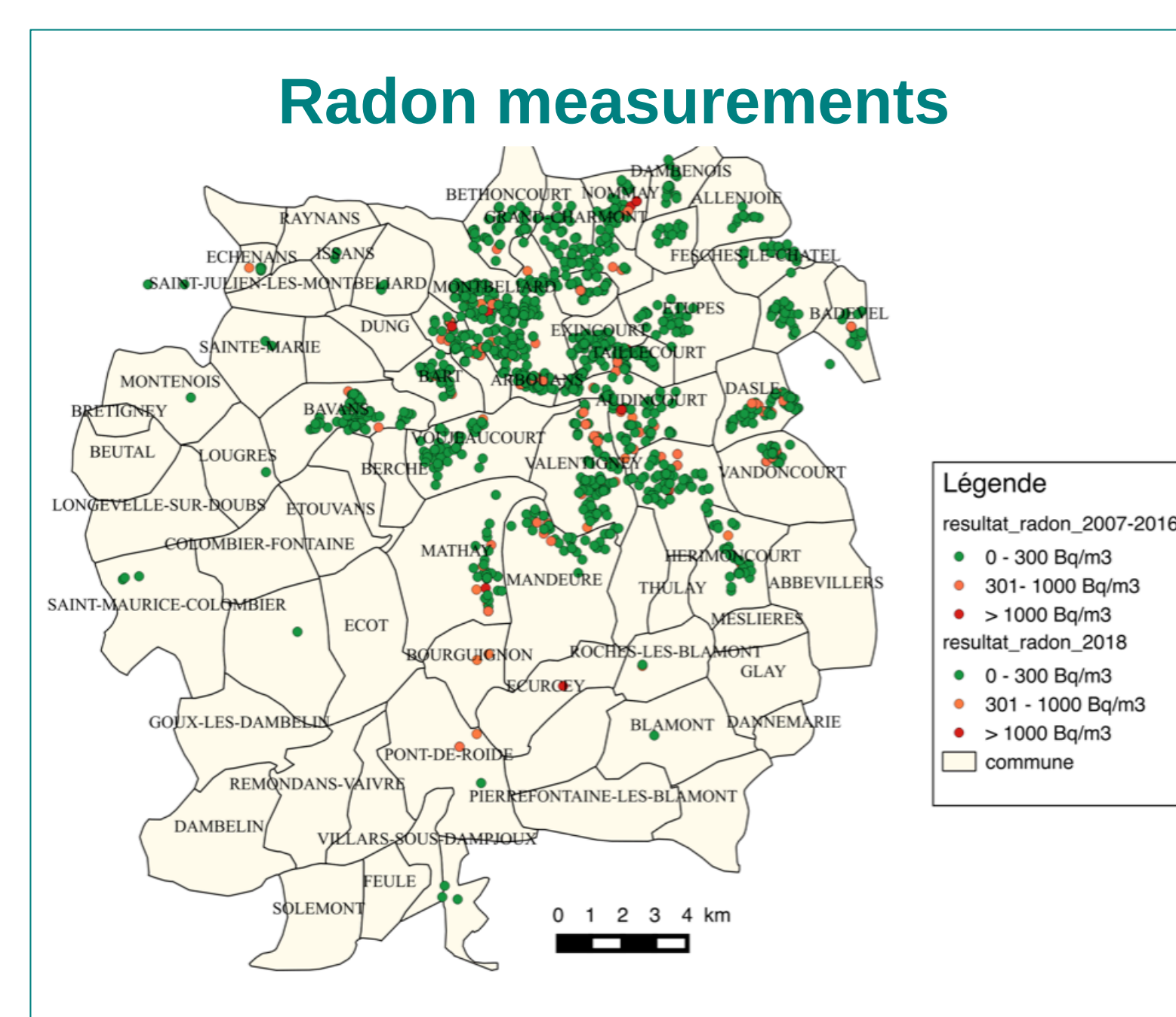
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Case study introduction and data

- **Initiators:** Institute for Radiological Protection and Nuclear Safety (IRSN), the Montbéliard Urban Public Authority (PMA), the Regional Agency for Air Quality Monitoring (ATMO), the Health Regional Agency (ARS) and the Nuclear Protection Evaluation Centre (CEPN).
- **Target Stakeholders:** General public, local elected representatives / local communities, building professionals, national and local authorities (regulation, health, environment)
- **Aims:** Develop radon risk awareness to foster the implementation of:
 - Local initiatives for radon management
 - Measurement campaigns
 - Remediation actions and preventive actions for new buildings
- **RP culture dissemination actions drawing on the development of various tools**
 - Leaflets,
 - Training courses,
 - Awareness session,
 - Website...



Findings

- Starting point for all stakeholders: need to have radon considered as a health risk - “radon increases the risk of lung cancer”
- Need to develop specific information and/or training & education adapted to the target stakeholders and to the role they have to play in radon management
- Need to involve representatives of the target stakeholders together with RP experts, universities, experts in scientific vulgarisation,... for the elaboration of the tools and information media
- Integrate radon into a general perspective of Indoor Air Quality and energy efficiency
- For the general public:
 - Need to process step by step
 - Raise awareness about radon risk, provide measurement device, provide feed-back and advice after measurement campaigns
- For building professionals:
 - Processes to develop RP culture and associated technical knowledge to implement actions are linked to education and training:
 - Need to integrate radon issue into initial education and to develop training materials and opportunities for continuous education



Awareness meeting for inhabitants

Conclusions

- The management of radon risk and the dissemination of radon RP culture require the development of an adaptive structure and multidisciplinary expert group
- The initiation of the actions by territorial actors is a key factor of success
- The collaboration with national actors and the integration within the framework of the national radon action plan are however important to give legitimacy to the actions
- Need to involve experts who are recognized by each type of stakeholders to disseminate information and knowledge
- Importance to be close to the public to answer to their questions, explain the risk and give advices for measurements and mitigation actions

RADON

Development of radiation protection culture for different categories of stakeholders at local level

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Case study introduction and data

EEAE coordinates the implementation of the Greek Radon Action Plan (GRAP). In this framework, it performs indoor radon measurements countrywide to: a) estimate the distribution of indoor radon concentrations in dwellings, b) complete the national radon map and c) identify areas with increased radon concentration in indoor air.

Preliminary results showed elevated radon concentrations in dwellings in a region at the northeast part of Greece. EEAE initiated a survey based on large scale measurements in the region together with actions to evaluate and increase the awareness of the local stakeholders about the radon issue.

Findings

- An initial effort to qualitatively evaluate the stakeholders' radiation protection culture indicated a lack of awareness about ionizing radiation.
- It is difficult to change stakeholders' beliefs and perceptions about ionising radiation and ensure their effective participation in necessary actions.
- Continuous and systematic efforts are needed to increase the awareness of the involved stakeholders about radon.



Conclusions

- Need for further actions to increase the stakeholders' awareness about the radon issue.
- Professionals involved in the construction of dwellings and public buildings should be provided with appropriate education & training on radiation protection.
- The cooperation of the competent authorities with the local authorities and the professional and scientific societies is necessary in order to deal effectively with the radon issue.

RADON

Swiss National Radon Action Plan 2012-2020

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Introduction

In Switzerland a national radon action plan is in effect since 2012. In its framework different measures are implemented in order to improve the radon situation in the country. Switzerland is strongly affected by the radon problem, which is tackled on several levels.

The 7 measures of the radon action plan

1. Revision of the legal regulations
2. Extending our knowledge of radon exposure in dwellings
3. Promotion of protective measures against radon in buildings
4. Planning an efficient strategy for remediation
5. Including radon in the training of construction experts
6. Improving public awareness to health problems caused by radon
7. Developing the tools and methods



Current Implementation

1. Revision of the legal regulations: new ordinance (StSV) 2018

- one legal value: reference value 300 Bq/m³
- **except:** radon exposed work places: threshold 1000 Bq/m³
- building owner is responsible for remediation measures
- **except:** schools/kindergartens have to be remediated
- no obligation to measure radon
- **except:** schools/kindergartens and radon exposed work places

	StSV of 1994	StSV of 2018		
Dwellings	Limit 1000 Bq/m ³ (aa) Guide value 400 Bq/m ³ (aa)	Reference value 300 Bq/m ³ (aa)		
Working places	Limit 3000 Bq/m ³ (averaged over monthly working time)	Reference value 300 Bq/m ³ (aa)	Threshold 1000 Bq/m ³ (aa)	Annual doses > 10 mSv/year → Planned exposure
radon exposed Working places		No reference value	Threshold 1000 Bq/m ³ (aa)	Annual doses > 10 mSv/year → Planned exposure

2. Extending our knowledge of radon exposure in dwellings

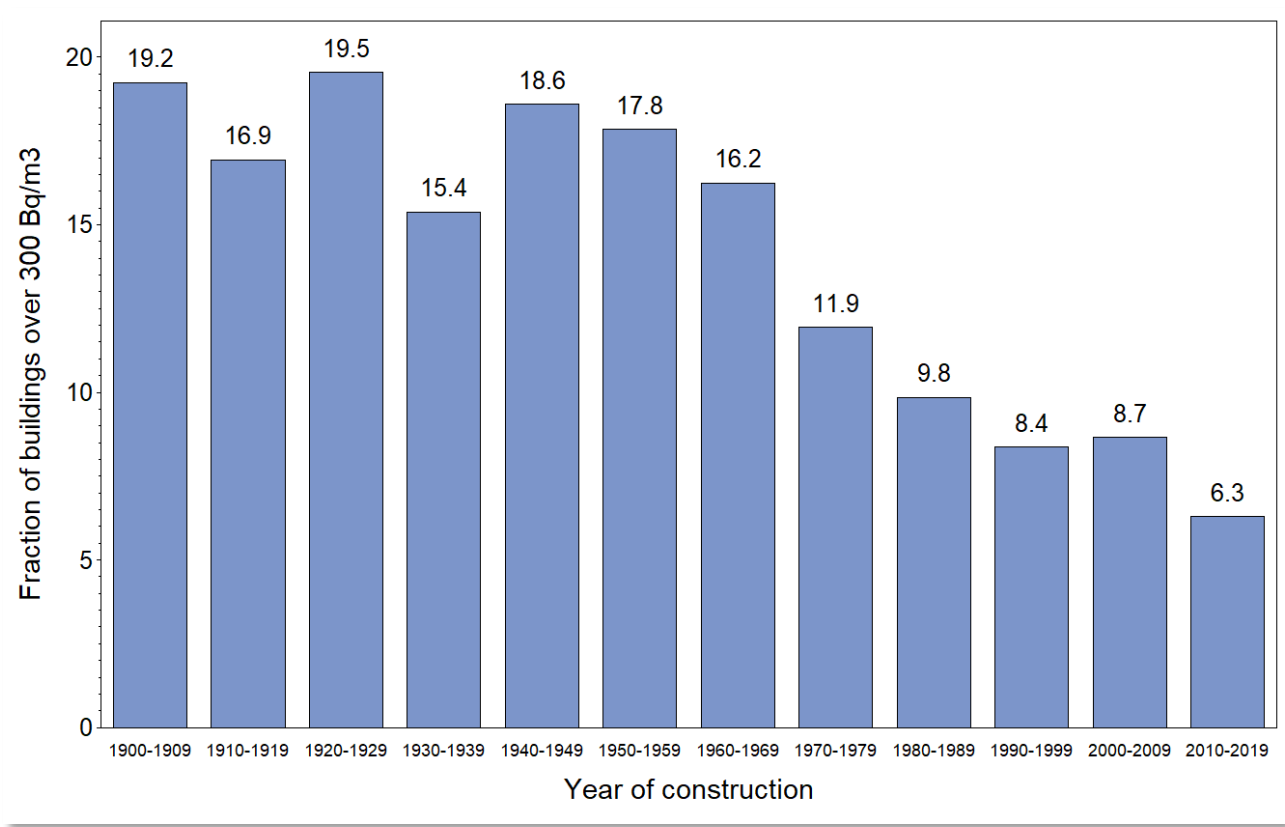
Increasing the fraction of measurements in specific buildings

2012-2016:

- larger cities: 0.3% → 5%
- schools/kindergartens: 3.5% → 13%
- new buildings: 3.5% → 20%

3. Promotion of protective measures against radon in buildings

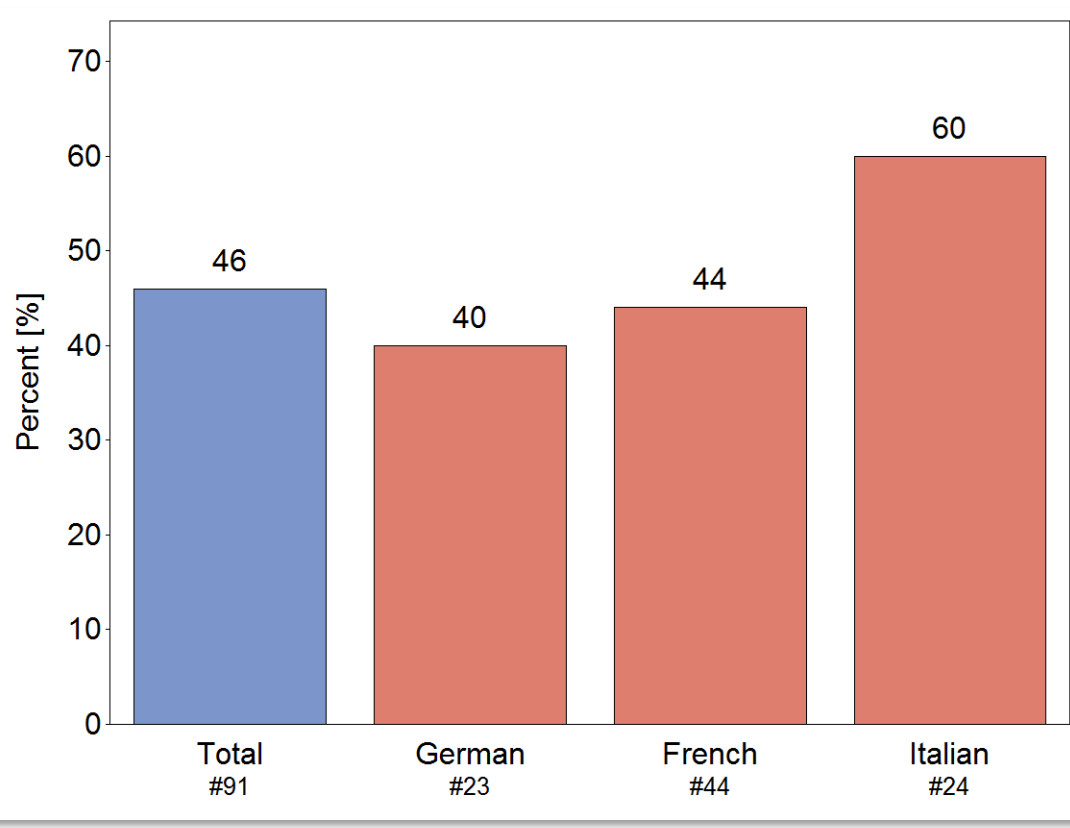
newer buildings are more radon save



4. Planning an efficient strategy for remediation

- Motivating radon mitigations
- Increasing the remediation Rate

Rate



5. Planning an efficient strategy for remediation

Many architects and construction experts are not aware of the radon problem.

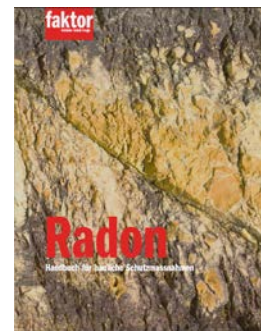
The FOPH has appointed three radon delegates based at three universities of applied sciences, who work on including the radon issue in the basic education of building experts.

Improve the knowledge of radon at the level of apprenticeship and professional training, cooperation with professional unions.

6. Improving public awareness to health problems caused by radon



publications



virtual radon house

radon hotline &
www.ch-radon.ch

7. Developing the tools and methods

New measuring protocols for different building types:

- Dwellings
- Schools and kindergartens
- Work places
- Radon exposed work places

Conclusions

There are in particular three areas, which have to be improved in a future action plan:

Increased risk awareness of the public, monitoring of the remediation activities, synergies with indoor air quality