

# Evaluation of the National Radon Action Plan 2012-2020

## Executive Summary

### Initial Situation

Radon is a naturally occurring radioactive gas in the ground which can accumulate in the ambient air inside buildings and can cause lung cancer. Switzerland, due to its geological and climatic conditions, is particularly afflicted by the radon issue. Radon is the second most frequent cause, after smoking, for lung cancer and leads to 200 to 300 deaths each year. In order to protect the population from radon the specialist unit Radon of the Radiological Protection Division of the Federal Office of Public Health (FOPH), having regard to the Radiological Protection Ordinance (RPO), implemented the “National Radon Action Plan 2012-2020”. Key measures of the action plan are the revision of the RPO and the adoption of the World Health Organisation (WHO) recommended reference value of 300 Becquerel per cubic metre indoor air (Bq/m<sup>3</sup>). A first consequence of this was that not only the Alpine region and the Jura, but also the whole of Switzerland was classified as a potentially radon-exposed region. Pursuant to the RPO, the radon problem is enforced primarily by the cantons, whereas the National Radon Action Plan is implemented by the FOPH. The FOPH commissioned Interface Politikstudien Forschung Beratung to evaluate the National Radon Action Plan 2012-2020. Key themes of the evaluation were the status of the implementation, the achievement of the objectives as well as the future orientation of the FOPH radon strategy after 2020.

### Methodology

The evaluation design followed the “Critical Friend Approach”<sup>1</sup>. An evaluation according to this approach is an external evaluation; however, the evaluation process will place much emphasis on the integration of self-reflective elements and the participation of the persons responsible for the measures. In a first workshop with the FOPH staff responsible for radon, an impact model with output and outcome objectives was developed. A documentary analysis was then carried out by including data analyses from the specialist radon body. In addition, some twenty interviews were carried out with representatives of the FOPH, with stakeholders in two cantons - Neuchatel (representing smaller, highly radon-contaminated cantons) and Zurich (representing large, densely populated, less severely radon-exposed cantons) - and with national associations and institutes. Finally, online surveys were carried out with the cantonal units responsible for radon, and with the population. In a second workshop with the representatives of the FOPH and the Monitoring Group, the evaluation results were discussed and evaluated.

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<sup>1</sup> Balthasar, Andreas (2012): Fremd- und Selbstevaluation kombinieren: Der «Critical Friend Approach» als Option. Zeitschrift für Evaluation ZfEv, 11 (2), pp. 173–198.

## Results

The results of the evaluation make clear that the measures of the Radon Action Plan have achieved important objectives.

- Firstly, the *revision of the Radiological Protection Ordinance* was successfully concluded. The revised ordinance establishes the new radon reference value. Furthermore, it obliges the cantons to measure and remediate schools and kindergartens, and builders to provide systematic information in the context of the building permit procedure.
- Secondly, further important strategic *basic principles* have been developed for practically *all areas of activity*. These include in particular the implementation of standardised measurement procedures, the recognition of measurement bodies and of radon specialists, the establishment of radon in SIA Standard 180, the drafting of recommendations for new buildings, the development of a training concept for radon courses, the incorporation of radon issues in the basic training and further training in the building industry, the creation of a radon map and a practical handbook as well as first tests with short-time measurements.

These fundamental developments are important and necessary and have proved effective in terms of the evaluation. Whereas the *fundamental development work* has made very good progress, it is clear that the evaluation results show that the *widespread implementation* of the measures of the Radon Action Plan has made little progress. This is also true for those measures that have a significant impact on the solution of the radon problem in Switzerland, namely “measurements”, “remediations”, “building regulations” as well as “cooperation with other programs”. Accordingly, these measures are potentially particularly purposeful and effective.

- *Radon measurements* are a necessary condition for being able to determine radon-contaminated buildings. An analysis of the radon databank revealed that up to now radon measurements have been carried out in 6 per cent of all dwellings and public buildings (cantons in risk zones 11 per cent, 3 per cent in other zones). Given the provisions of the revised RPO and the planned measurement campaigns of the cantons, it can be assumed that the number of measurements in schools and kindergartens will be increased relatively quickly. However, greater efforts are required in order to be able to increase voluntary measurements in other buildings as well.
- *Radon remediation* is the only possibility available to resolve an existing radon problem in a building. However, shortcomings exist in the previous implementation and verification of radon remediation: The cantons estimate that today only about one quarter of the known buildings in which the threshold value, respectively the reference level, are exceeded, have been remediated. More accurate numbers are not available, as no systematic monitoring of remediation activities has been made. It is also unknown whether the remediations actually carried out were successful. It can be assumed that up to now post-remediation measurements have not been systematically carried out. Consequently, the necessary continuity in the measurement and remediation process is lacking.
- In order to find a long-term solution to the radon problem in Switzerland, it is imperative to construct radon-secure new builds. For this reason the RPO establishes in the context of the building permit procedure a duty to provide information to the building permit authorities; this comes into force on January 1, 2020. Previously, this was systematically required in only some cantons. Around half of the cantons are in fact

planning to inform in writing the building industry of the regulations as of 2020. Nevertheless, an effort is needed to ensure a uniform and systematic enforcement of the duty to provide information.

- In order to be able to solve the radon problem in Switzerland within a reasonable period of time there needs to be systematic collaboration with coalition partners. *Collaboration with other programs* relating to radon has only occurred sporadically. In particular, it has not been possible to harness synergies with energy-efficient building remediation concepts. The exploitation of synergy effects is particularly important for a good cost-benefit ratio.

The following Table presents a summary of the evaluation results

**Summary of the evaluation results of the ten measures of the National Radon Action Plan 2012-2020**

<i>Measure</i>	<i>Implementation status and assessment of attained objectives</i>	<i>Optimisation potential from the point of view of those surveyed</i>
Revision RPO	<ul style="list-style-type: none"> <li>⊕ Revised RPO</li> <li>⊕ Leaflet legal provisions</li> <li>⊕ Radon Guidelines</li> </ul>	<ul style="list-style-type: none"> <li>- completed</li> </ul>
Measurements	<ul style="list-style-type: none"> <li>⊕ Planned measurements in all regions, in schools and kindergartens</li> <li>⊕ Radon measurement bodies are recognised</li> <li>⊕ Standardised radon measurement protocols are introduced</li> <li>⊖ A minority of the potentially contaminated buildings are measured</li> </ul>	<ul style="list-style-type: none"> <li>- Provide "Radon Check" (information tool)</li> <li>- Utilise periodic building inspections for measurements</li> <li>- Subsidise measurements</li> </ul>
Remediation	<ul style="list-style-type: none"> <li>⊖ Lack of overview of remediation activity</li> <li>⊖ A minority of contaminated buildings remediated</li> <li>⊖ No standardised review of remediation quality</li> <li>⊖ Absence of synergies with energy efficient remediations</li> </ul>	<ul style="list-style-type: none"> <li>- Monitor remediation activities and their quality</li> <li>- Continuity between measurement and remediation</li> <li>- Highlight remediation options and costs</li> <li>- Link radon with energy efficient remediations</li> </ul>
Building specifications	<ul style="list-style-type: none"> <li>⊕ Establish radon in SIA Standard 180; inconsistent application</li> <li>⊕ Duty of the building permit authorities to provide information</li> <li>⊖ Enforcement still open</li> </ul>	<ul style="list-style-type: none"> <li>- Recommendations for new builds and conversions; guidelines</li> <li>- Mandatory requirements for a Minergie-ECO Certificate</li> <li>- Information for building specialists/authorities</li> <li>- Radon as part of the acceptance of construction work</li> </ul>
Collaboration	<ul style="list-style-type: none"> <li>⊕ Co-operation in the context of the RPO revision and the guidelines</li> <li>⊖ Still poor "coalitions" with other federal programmes</li> <li>⊖ No co-operation with the building programme</li> </ul>	<ul style="list-style-type: none"> <li>- Indoor pollutants: collaboration in the context of measurement campaigns in schools</li> <li>- Energy counselling: ventilation/dampness issues in basements</li> <li>- Swiss Cancer League: European Code against Cancer</li> </ul>
Basic and further training	<ul style="list-style-type: none"> <li>⊕ Radon specialists: Training curriculum under revision</li> <li>⊕ Resources such as "Radon Handbook", Radon House, examples of "building sins"</li> <li>⊖ Building sector: initial specific issues</li> </ul>	<ul style="list-style-type: none"> <li>- Verification/publication of practical experience of radon specialists</li> <li>- Monitoring revision of training courses, systematically incorporate radon</li> <li>- Target groups are energy planners, architects, window manufacturers, ventilation technicians,</li> </ul>

Measure	Implementation status and assessment of attained objectives	Optimisation potential from the point of view of those surveyed
		real estate sector, notaries, municipalities
Real estate market	<ul style="list-style-type: none"> <li>⊕ Radon is slowly becoming an issue</li> <li>⊖ Up to now low awareness in the real estate sector</li> </ul>	<ul style="list-style-type: none"> <li>- Campaign with the Notaries' Association, real estate sector</li> <li>- Integration in the life-cycle analysis of the building</li> <li>- Lending by banks, property valuation</li> </ul>
Information	<ul style="list-style-type: none"> <li>⊖ Materials rather outdated, few target groups/ not action orientated</li> <li>⊖ Population's knowledge rather low</li> </ul>	<ul style="list-style-type: none"> <li>- Co-operation with Associations and Leagues</li> <li>- Specific action-oriented messages (Radon-Check/Information tool)</li> </ul>
Measurement methods	<ul style="list-style-type: none"> <li>⊕ Standardised radon measurement protocols</li> <li>⊕ Tests with short-time measurements, but not yet recognised</li> </ul>	<ul style="list-style-type: none"> <li>- Recognised short-time, simple measurements</li> <li>- Radon measurement protocols for dynamic use</li> </ul>
Risk assessment	<ul style="list-style-type: none"> <li>⊕ Radon map, but without specific parameters</li> </ul>	<ul style="list-style-type: none"> <li>- Extension to the Radon-Check (Information-Tool)</li> </ul>

Key: green = objectives mainly achieved, light green = objectives somewhat achieved, light red = objectives not always achieved, red = objectives mainly unachieved, grey = measures with high potential to solve radon issues, according to the estimation of the members of workshop II.

Source: Presentation by Interface, based on the evaluation results.

### Recommendations

In order to make substantial progress, despite resource constraints, in the implementation of the created legislative and strategic foundations and thereby to achieve a broad-based attack on the radon problem, we propose a clearly focussed strategy:

- *Focussing on the central activities:* Although the evaluation has identified the optimisation potential for all ten measures of the current Radon Action Plan, the evaluation team feels that the future strategy should be focussed on the following main activities: measurements and remediation, so as to solve existing radon problems, as well as the systematic application of building regulations in order to avoid the emergence of new radon problems.
- *Focussing on the relevant key stakeholders:* For these main activities key stakeholders can be identified who specify the (qualitatively good) implementation of the activities: building owners and builders, who decide on measurements and remediation to be carried out as well as on radon-secure constructions; service providers of radon-relevant services; and authorities who ensure the enforcement of the building regulations.
- *Focussing on the collaboration with important partners and representatives of interest groups:* Due to the limited resources and the size of the task, there should be systematic collaboration with partners and representatives of interest groups in order to reach the key stakeholders as efficiently as possible.
- *Focussing on simple processes* in order to ensure the continuous implementation of the activities to the end.

In light of the above and on the basis of the abovementioned key stakeholders, we have formulated four recommendations for the attention of the FOPH and its partners to guide the future radon strategy.

**Recommendation 1: Effectively inform building owners and builders**

It is left to the discretion of the building owner whether a radon measurement is carried out in an existing building. If a reference value is exceeded then, according to the RPO, the owners are obliged to carry out remediation - under their own responsibility (with the exception of schools and kindergartens), however. In addition, it is the responsibility of the builders to demand from the building contractors that their buildings be radon-secure. In order to ensure that owners or builders can reach a decision in favour of a radon-secure building, it is imperative that the necessary bases for a decision are available to them in good time. We recommend the following two measures to the FOPH:

**I Development of an information tool**

A user-friendly and web-based information tool should be developed based on the existing fundamentals such as the radon map and the Radon Guidelines. The tool should illustrate the overall process of radon-secure construction, including radon measurements, radon remediation and subsequent follow-up measurements, and contain information on the following aspects:

- Information on the *health risks* of radon with descriptive examples and if need be provided by involving lung specialists.
- A rapid assessment of the *need for action* in relation to radon exposure or to enable radon-secure construction (in terms of a radon check).
- Provide information on *carrying out a recognised (short-time) measurement and remediation*. This includes *inter alia* the addresses of radon specialists/radon measurement offices in the region.
- Information on *ensuring radon-secure construction*, including the provision of a standard contract between builders and planners.
- Information on considering radon in the *life cycle analysis* of buildings so as to optimally co-ordinate radon remediation with additional renovation projects.
- Information on the *approximate expected costs* of a radon measurement and of a possible remediation as well as for radon-secure construction.

The information tool is developed step by step:

- In a first step, the tool will be developed specifically for *radon*; in close collaboration with the cantons, the real estate sector and other relevant stakeholders.
- In a second step, it will be examined whether the radon tool can be extended to a *“healthy indoor air”* tool. For this purpose collaboration should be sought with the specialist department “Indoor Pollutants” of the FOPH, indoor air specialists, the Lungenliga Schweiz and if need be lung specialists (also with regard to possible lung cancer screening).
- In a third step the tool can be integrated into a higher-level tool *“Healthy construction and Living”*, in collaboration with partners from the relevant sectors.

**I Disseminate the information tool through coalition partners**

The information tool should be disseminated through specific information channels. They include coalition partners such as:

- Umbrella organisation of non-profit housing construction companies “Swiss social housing co-operative”,
- Association of Swiss Real Estate Industry “SVIT Schweiz”,

- Swiss Homeowner Association “HEV Schweiz”,
- Association of Towns and Municipalities (Municipalities as the owners of school buildings),
- Swiss Tenants’ Association,
- Health Leagues and Lung Specialists.

It should also be explored whether the tool can be disseminated by persons who periodically carry out building inspections, such as for example real estate valuers or creditors such as banks and insurance companies.

### **Recommendation 2: Promote integrated services from a single-source**

For radon remediation to be carried out successfully and comprehensively, there needs to be firstly a systematic interlinking of measurement and planning, and secondly that radon is taken into account in the context of general or energy efficient remediation measures.

#### **I** Link measurements, planning and remediation:

In order to prevent decisions being taken not to carry out remediation in spite of the reference value being exceeded or that a remediation is completed without a follow-up inspection, we encourage the FOPH to ensure that radon advisory services, radon measurements and radon remediation are offered from one source, thereby avoiding unnecessary interfaces between multiple service providers. To this end, the following measures should be considered:

- Radon specialists should also be certified as measurement bodies, and employees of the measurement bodies should be motivated to complete the recognised radon-specialist training. This would ensure that building owners and builders have a single contact person, who also has an interest in continuing and completing the process. This should enable the previous practice of a strict separation between measurement, remediation and follow-up inspection to be avoided and if need be an adaptation of the Ordinance could be envisaged.
- Follow-up inspections after remediation or for new constructions should be subsidised and systematically entered into the radon databank.
- Publish ratings of suppliers with successful remediation experience together with examples of successful remediations.
- Recommendations for radon-secure new constructions and conversions should be drafted and disseminated.
- Short-time measurements should be recognised, such that the need for action can be rapidly assessed. This also includes investigating digital measures in the field of remediation and prevention (intelligent house).

#### **I** Integrating radon

We recommend to the FOPH to systematically link radon remediations with other remediation activities – in particular with energy efficient remediations. The following measures should be investigated:

- Train more energy planners, who plan and coordinate energy efficient remediations, to become radon specialists.
- Incorporate radon into the basic and continued training of this occupational group by collaborating with the State Secretariat for Education, Research and Innovation (SE-

RI), the competent sectorial and occupational training associations as well as with technical and other universities.

- Together with the Federal Office of Energy (SFOE) identify and communicate common messages (healthy indoor air thanks to ventilation) and to check that radon is firmly embedded in the CO<sub>2</sub> Act.
- Reinforce the links to radon and indoor air quality, i.e. emphasise preventative measures in regard to radon pollutants in schools and check the integration of radon in the Chemicals Act.
- Finally, mandatory integration of radon specifications in the Minergie certificate.

### **Recommendation 3: Promote the inclusion of radon in the building permit procedures**

Incorporating the subject of radon into building permit procedures results in a legal framework that enables building contractors to be systematically made aware of radon issues. However, depending on the canton, the building permit procedures are organised at the cantonal or municipal level. Consequently, canton-specific implementation guides are needed.

#### **I Develop implementation guides**

We recommend the FOPH to develop cantonal implementation guides by working together with the Swiss Conference of Directors of Public Works, Planning and Environmental Protection (DPPE), the Swiss Conference of Municipal Clerks (SKSG) and including the SIA. This includes three points:

- We recommend that building contractors have to confirm to the building permit authorities by means of a form that states they have taken due note of the information relating to radon issues.
- Checks should be made in a further step whether a radon protection concept should be compulsory – analogously to fire protection issues - in particularly affected areas.
- Finally, in collaboration with the Swiss Homeowners' Association (HEV), recommendations should be formulated and disseminated by the various partners for use in a standard contract between builders and building contractors for new constructions. In the standard contract radon is to be explicitly mentioned and follow-up measurements stipulated within the guarantee period.

#### **I Building authorities are informed and given further training**

We also recommend that the FOPH, together with the abovementioned partners, inform and train the building authorities (including the cantonal building valuers) according to the particularities of each canton. Although the actual enforcement is indeed the responsibility of the cantons, nevertheless we consider it expedient for the FOPH to support the cantons in order to ensure the best possible conditions for an effective enforcement.

### **Recommendation 4: Promote interaction between stakeholders**

Finally, we recommend the FOPH to actively promote interaction between stakeholders by means of the following measures:

- Organisation of workshops of selected topics so as to promote an exchange of experience between the partners and other relevant stakeholders, and to specifically inform and train them. This includes, for example, the canton-specific implementation of measurement campaigns in schools and kindergartens.

- In collaboration with the partners, the preparation and dissemination of good examples of implementation.