



RADPAR

Radon Prevention and Remediation



Newsletter No. 6, May 2012

OUTLINE

Radon (^{222}Rn) is a naturally occurring radioactive gas. It constitutes the most important natural radiation exposure in many homes, schools, working places and contributes a great deal to the total natural ionizing radiation dose to world population. IARC (International Agency for Research on Cancer) classifies it as a Group 1 human carcinogen, while WHO (World Health Organization) considers it to be the second cause of lung cancer after cigarette smoking.

The RADPAR (Radon Prevention and Remediation) project is part of the Second Programme of Community Action in the Field of Health and within the aegis of the Executive Agency for Health and Consumers (EAHC), of Directorate General SANCO. It is focused on a number of issues related to indoor radon exposure as a public health problem within the framework of EU Member States (MS). This is the last RADPAR newsletter as the official end date of the project is the 7th of May 2012.

The last RADPAR Meeting took place in Brussels half a day before and half a day after the RADPAR Workshop (please see below) at the Federal Agency for Nuclear Control (FANC) building.

During the meeting it was agreed to prepare a COST Proposal to seek future funding for a sustainable European Network of radon experts, and focus on the compilation of an EU Radon Handbook. The 'main' focus should be on the technical side of radon prevention and remediation with regard to the Radon Handbook and its compilation and subsequent dissemination, possibly in close cooperation with WHO. Additionally, the RADPAR consortium members envisage participating

(and supporting) as "group of experts" to WHO, IAEA, EC, etc. to initiatives (projects, documents, etc.) of these organisations.

The aim is to prepare a proposal for the September 2012 COST application deadline.

Dissemination

The present Newsletter is the 6th and final Newsletter that the RADPAR Consortium has released. All previous newsletters are available in electronic form at the project's website (<http://web.jrc.ec.europa.eu/radpar>).

RADPAR Workshop: "Radon prevention and remediation"

The RADPAR Workshop with title "Radon Prevention and Remediation" took place at the Federal Agency for Nuclear Control (FANC) in Brussels on the 23rd of February 2012.

The objectives of this workshop were:

- To gain a better understanding of the health risk related to radon existing in the indoor environment and play a key role towards the radon prevention and remediation;
- To disseminate the results and the merits of methodology tools of the RADPAR project;
- To identify the opportunities for exploitation and dissemination, after the formal completion of the project, by policy makers, health professionals and relevant stakeholders, as well as to receive feedback from them.

This workshop had 65 participants from 16 countries and invited speakers from Japan, Germany, Luxembourg, Switzerland, Austria, Belgium and France. The participants were from National Radiation Protection Agencies, from the Academic Community, from Radon and Building Companies, and from National Authorities. During the workshop, presentations on the RADPAR Project were made by the members of the RADPAR

Consortium, while after that, presentations were made by distinguished invited speakers from Hirosaki University, Japan, the Federal Office for Radiation Protection of Germany, the DG ENER, the World Health Organization (WHO), the International Atomic Energy Agency (IAEA), the Federal Agency for Nuclear Control of Belgium and the Institute for Radiological Protection and Nuclear Safety of France. RADPAR flyers were distributed during the Workshop.

RADPAR TASKS AND ACTIVITIES

Recommendations on Radon Policies and Strategy

One of the RADPAR objective was to prepare recommendations on how to improve policies and strategies which could promote an effective radon prevention and remediation. These recommendations were prepared with a large cooperative work (see previous newsletter) and discussed in the RADPAR meeting held in Munich on 25 November 2011. The final result was a total of 66 specific recommendations on radon policies and strategy, covering 33 issues grouped in 11 arguments: 1) objective of radon policy; 2) overall strategy; 3) national action plan; 4) preventive measures; 5) reference levels for existing and future dwellings and other buildings; 6) surveys and radon concentration distribution; 7) national radon database; 8) use of radon maps; 9) radon prone areas and radon-prone buildings; 10) type of regulations; 11) promoting tools to increase the number of remedial actions.

These recommendations take into account the previous experience and evaluation of action effectiveness of many countries and should be (hopefully) useful for all European countries, regardless their experience on radon. However, a further collaborating effort would be useful to provide all EU countries, especially those with a less extended experience, with specific guidelines and protocols to implement these recommendations.

These recommendations were included in the overall *RADPAR Recommendations* document, which contains recommendation covering all

the topics of the project, and sent to relevant authorities of all the EU countries, together with a request of feedback, organized with a graded (on 5 levels) evaluation for each recommendation, and free comments. The first analysis of the answers shows that the average feedback was quite positive.

Assessment of the significance of the health burden from radon to the EU population

An updated evaluation of the health burden from radon was produced, adding an evaluation of the combined effect of radon and smoking and a comparison with previous evaluations.

In particular, the annual fraction and number of lung cancers attributable to radon exposure were calculated for all the 27 EU Member States (and other three European countries) on the basis of the following data: i) representative average radon concentration in dwellings, as evaluated by an ad-hoc review of papers and information collected through questionnaires; ii) excess relative risk from radon evaluated by the European pooling of 13 case-control studies on lung cancer and residential radon; iii) total lung cancer rate data taken from WHO database; iv) smoking habits data taken from Eurostat database.

The combined effect of radon and smoking was evaluated by calculating attributable lung cancer rate separately for current smokers, former smokers, and never smokers. The attributable fraction ranges from 3% to 16% of all the lung cancers, but most of the lung cancers attributable to radon are expected to occur among current and former smokers, due to the combined effects of radon and smoking. This has to be taken into account by coordinating policies against radon and those against smoking.

All the results and details of the methods used for the health burden calculations are in the RADPAR Internal Report "Health burden from radon for EU Member States and some other European countries (including combined effects of radon and smoking and relevant databases)". A paper containing methods and results is under preparation.



Aspects of Radon Risk Communication

Another objective of the RADPAR project was primarily concerned with the development of recommendations aimed at improving radon risk communication strategies to help reduce radon exposure in EU Member States. These objectives were greatly assisted by the information gathered from stakeholders on current risk communication strategies and from public risk awareness surveys carried out by RADPAR partners in Belgium, Germany and Greece. The following is a summary of some of the important findings of this work:

Risk communication should be a two-way exchange of information between those communicating information on the risk and those that may be at risk. As the purpose of risk communication is to reduce the risk to those exposed the disseminated information should not only be informative but should wherever possible be prescriptive emphasising solutions and encouraging action. In keeping with other public health risk communication programmes it is important in communicating radon risk information to the general public (or to policy and decision makers) to have achievable and clear objectives. For the communication of these risks to the public and to decision makers to be effective it should be a cooperative effort involving both technical experts such as radiation scientists and epidemiologists and also communication experts like social scientists, psychologists, journalists etc.

There should in general be two main objectives in a radon risk communication programme:

- (a) to give accurate and comprehensible information in clear and simple messages on the potential harm to health from radon exposure.
- (b) to stimulate the target audiences to take action to measure radon in the home and where necessary to take action to reduce the indoor concentration of radon.

Interactive risk communication involving two-way communication pathways have been found to be generally more effective than one-way communication. Such two-way communication in the case of radon can be

achieved by the use of Roadshows, Radon Forums etc. Unlike the case of other environmental and radiation hazards there exists public apathy in accepting that exposure to radon can be a serious health hazard and that effective relatively low-cost technical solutions exist to reduce radon exposures. Indoor radon exposure is usually perceived as completely natural with no one to blame. It can be argued, however, that this perception of indoor radon exposures as being natural is erroneous. The source of radon ultimately is radium-226 in rocks and soils and as such is natural but indoor radon levels are artificial as they are the consequence of the human activities of building design, construction and usage.

The actual radon risk communication strategy chosen for a country will depend on a number of factors such as the extent of the radon problem in that country (if it is known), the present state of public knowledge of radon, the available budget, the existence or otherwise of national radon reference levels and national building codes targeted at radon prevention. Having regard to the variability of these factors on a country by country basis it cannot be expected that a single radon risk communication strategy will be equally effective or applicable in all countries. Even in countries with well developed radon control strategies radon risk communication activities have often evolved in a heuristic fashion having been stimulated initially by the accidental discovery of high radon dwellings.

Apart from the general public (especially home owners) elected representatives (politicians) and other decision makers should be key target audiences.

A group that should be considered as a target audience for radon risk information are smokers. Due to the scientifically established strong synergism between radon exposure and smoking if smokers can be persuaded to reduce their residential radon exposure, even without a cessation or reduction in their smoking habits, a substantial reduction in their overall lung cancer risk might result. If possible radon information campaigns should be linked to other health or environmental



campaigns such as those aimed at reducing smoking and at improving indoor air quality. Within the context of a national radon strategy some or all of the following communication channels should be considered. For a basic information platform, websites and information brochures should be provided. Articles placed in health related magazines are considered an effective channel. The mailing of information brochures, advertising in newspapers and magazines, radon phone-in helplines, stands at public events and construction trade exhibitions, press releases, radio and TV popular science programmes etc. can also be recommended. Finally it should be mentioned that if possible radon risk awareness surveys should be carried out both before and after a radon risk communication campaign. The findings of the pre-campaign survey will assist in the design of the campaign and those of the post-campaign survey can be used both to assess the campaign effectiveness and to improve the design of future campaigns.

In the context of this topic it may be of interest to note that an invited paper on radon risk communication by James Mc Laughlin has recently been published entitled : "Risk Communication as a Strategic Tool to Raise Awareness of Radon Health Effects and to Reduce Exposures of the Public", Radiation Emergency Medicine. Vol 1, No 1-2, 2-6, March 2012.

Assessment on Radon Control Technologies

The RADPAR project had three objectives in order to contribute to the evaluation of radon control in buildings, to reduce potential conflicts between energy saving construction and radon reduction, and to form building professionals, These were :

1. Assessment of potential conflicts between energy conservation in buildings and radon exposure reduction.
2. Establishment of measurement protocols for radon control technologies.
3. Design of training courses for radon measurement, prevention, remediation, and cost effectiveness analysis.

To reach these objectives, the work undertaken had been at first to elaborate a specific questionnaire, sent to RADPAR partners and other European countries to state on current practices. Bibliography on each topic had also been realized associated with some specific studies. Analysis of all this material had been conducted. At the end, recommendations on each topic had been proposed.

Studies undertaken yielded three deliverables with different documents presented below:

- Deliverable 8: "Training course aimed at construction industry professionals". A document has been produced which includes the analysis of current practices in European countries involved in the RADPAR program and frames of courses for professionals.
- Deliverable 13: "Potential conflicts between energy conservation and radon control". The following seven documents referring to this topic have been produced:
 - D13/1. Assessment of current techniques used for reduction of indoor concentration in existing and new houses
 - D13/2. Energy saving construction (low energy / passive houses) and indoor radon exposure – Compilation and assessment
 - D13/3. Survey of Construction Technologies in Low Energy and Passive Houses in Europe
 - D13/4. Heating and Ventilation Systems in Low Energy and Passive Houses in Europe
 - D13/5. Measurement and Analysis of Radon in Selected Passive Houses in Austria
 - D13/6. Review of Low Energy Construction, Pressure Conditions and Indoor Radon in Finnish Residential Buildings
 - D13/7. Radon and Energy Efficient Construction: Assessment and Recommendations
- Deliverable 15: "Establishment of measurement procedures for radon control technologies". A document has been produced which includes the analysis of the requirements for standard



measurement protocols to characterize various building products used to control indoor radon such as membranes, sealing materials, sumps etc. It also proposes a protocol for the determination of the radon diffusion coefficient for membranes and sealants. This last protocol has been proposed to be an international standard and is now currently submitted at ISO level (ISO/WD 11665-10 standard).

Cost-effectiveness and health benefits of radon control strategies

The main objective of this part of the RADPAR project was to estimate the cost-effectiveness of existing and potential radon prevention and remediation strategies in the EU, and to improve radon control strategies through the design and use of training courses for radon measurement, prevention, remediation and cost-effectiveness analysis.

Alastair Gray, Oxford University who has led this work has liaised with other members of RADPAR to develop a spreadsheet-based model and training course. A training course event took place in Oxford, UK, in July 2011, and was attended by 16 participants from 9 countries: Czech Republic, Finland, France, Germany, Ireland, Italy, Norway, Spain and the UK. Day 1 was mainly devoted to familiarising the group with the cost-effectiveness model for existing homes, and Day 2 to discussing data sources, general options for evaluation, specific national policies, and timescales. It was generally agreed that it would be important to look at:

- 1) The cost-effectiveness of incorporating basic radon prevention measures in all new houses
- 2) The cost-effectiveness of incorporating basic radon prevention measures in new houses in targeted areas, for example defined by average radon levels.
- 3) The cost-effectiveness of remediation programmes in existing houses in targeted areas, for example defined by average radon levels.

Following the meeting, a detailed manual to accompany the spreadsheet-based model was developed, circulated for comment and redrafted, and is now available for use.

The workshop participants then began work on identifying data inputs relevant to their own countries, and inputting these to the model. By October 2011 initial results were available from Finland, Ireland, Norway and the UK, matching the RADPAR Quantity Indicator which stated that the spreadsheet based model should be used by a relevant institution in at least three countries, in addition to the UK, by the end of the project.

These results were presented at a RADPAR meeting in November 2011, and following discussion amongst participating countries some revisions were made to ensure the results were as comparable as possible. In addition, estimates were subsequently produced for the Czech Republic.

The detailed results will be reported in the RADPAR final report and in a scientific manuscript. Broadly, the results suggest that the installation of basic radon prevention measures in new homes is justified down to moderately low levels of radon. For remediation of existing homes, the results demonstrated that cost-effectiveness is often highly dependent on the willingness of households to respond to invitations to test their homes, and to remediate them when found above the relevant reference level. This underlines the importance of effective communication strategies and methods.

Alastair Gray is now working closely with participating countries to collate the results for the final RADPAR report, and to prepare a manuscript.

GENERAL RADON NEWS

- Radon Conference: The radon international conference "Radon in the geospheres" will take place in Świeradów- Zdrój Spa Resort between 17-22 June 2012. The last day of the conference will include intercomparison measurements of ^{222}Rn activity concentration in ground water. More information is available on the official conference website:

<http://www.radonconference.pwr.wroc.pl/>



- ICRP Draft report on “Radiological Protection against Radon Exposure: The ICRP (International Commission on Radiological Protection) has recently published its draft report on “Radiological Protection against Radon Exposure”. This is a document which, as in the case of previous ICRP publications, may reasonably be expected to have a strong influence on those parts of the European Basic Standards dealing with radon exposure. Due to the level of interest in this document it will be available for consultation for an extended period. Comments must be submitted through the ICRP website no later than June 8, 2012. We would strongly encourage all radon stakeholders to download the draft document, read it and submit comments to ICRP (www.icrp.org/page.asp?id=148).

- The 13th International Congress of the International Radiation Protection Association (IRPA 13) Glasgow May 13-18 2012: With more than 800 participants this will be the largest congress in the world this year dealing with radiation protection. It will focus on the most up-to-date practices and experiences in radiation protection. Special sessions will be devoted to the Fukushima reactor disasters and the strategies that have been adopted to protect the public from the consequent radiation exposures. It should be noted that a special session devoted to radon topics will take place on Thursday May 17th. Two members of the RADPAR consortium will participate in this session. Hannu Arvela (STUK) will give a presentation entitled “A Nationwide Radon Survey in Finland - Prevention in new Construction” and James Mc Laughlin (UOWM/UCD) will be Chair of this radon session. Further information on IRPA 13 is to be found at: www.irpa13.glasgow

- NRE IX: The 9th Natural Radiation Environment Symposium: For the past half century NRE Series of Symposia have been held in various parts of the world. For example NRE VII was held in Greece (Rhodes) in 2002 and NRE VIII was held in Rio de Janeiro (Buzios) in 2007. In the case of

the latter it is with regret we note the passing last year of Prof. Anselmo Paschoa the main local organiser of NRE VIII. Anselmo was well known as a radon expert and greatly respected by his peers.

We note that NRE IX the ninth in the NRE series was to have been held this year in Nagoya, Japan but was cancelled. While a decision is not yet finalised it now appears likely that NRE IX will probably be held in 2013 in Hirosaki, Japan. This strong possibility is due to the initiative of Prof. Shinji Tokonami, Hirosaki University. It should be noted that Prof. Tokonami, who is a foremost radon and thoron researcher in east Asia, gave a presentation of his research at the RADPAR Workshop in Brussels recently (February 2012). A website giving details on NRE IX is not yet constructed but can be anticipated to appear when a decision on holding NRE IX is finalised. Keep a lookout for it!

- New information materials for Designers and Engineers published in the Czech Republic: Martin Jiranek from the Faculty of civil engineering, CTU, in Prague with the financial support of State office for Nuclear Safety developed new comprehensive review of technologies for radon mitigation in houses and for preventive measures in new houses built in radon prone areas. The brochures cover the most important fields of radon mitigation – Insulation membranes, Subsoil Ventilation, Ventilators, piping and regulation, Design of proper anti-radon measures (see attached Figures).

These brochures are available only in Czech language and are free for distribution among the engineers. The file format of the brochures allows to be easily updated just by replacing the old sheet or whole brochure by the new one.

- Information for Designers on the Building Fairs in Brno (Czech Republic): Ales Fronka from NRPI (SURO) was invited to join the Building Fairs traditionally held in Brno. Building Fairs, the only international building fair organized in Middle and East Europe, has a long tradition. In cooperation with Czech



Chamber of Authorized Engineers and Technicians Engaged in Construction Dr. Fronka took part in the Advisory Centre. The discussions with the Fair visitors were focused mainly on new construction technologies which may influence radon ingress to houses.

- Information for Designers and Engineers in Jihlava (Czech Republic): Martin Jiranek (FCE CTU in Prague) and Ladislav Moucka (SURO) were invited to take part in the Annual Meeting of Czech Chamber of Authorized Engineers and Technicians Engaged in Construction. The state of art in radon mitigation and radon diagnostic measurement were introduced to audience. Representatives of the Chamber expressed their interest in future collaboration in the field of education of building designers and engineers.

THE RADPAR PARTNERSHIP

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2. Bundesamt fur Strahlenschutz, Germany
3. University of Bremen, Germany
4. University of Oxford, UK
5. Centre Scientifique et Technique du Batiment, France
6. Institute Superiore di Sanita, Italy
7. Austrian Agency for Health and Food Safety, Austria
8. Norwegian Radiation Protection Authority, Norway
9. Radiation and Nuclear Safety Authority, Finland
10. International Bureau for Environmental Studies, Belgium
11. National Radiation Protection Institute, Czech Republic
12. World Health Organization, Switzerland
13. Federal Office of Public Health, Switzerland
14. Health Protection Agency, UK
15. Technical University of Helsinki, Finland
16. University of Cantabria, Spain
17. University of Porto, Portugal
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