The EU-RAP study: “Review and evaluation of national radon action plans established in EU Member States according to the requirements in Council Directive 2013/59/Euratom – the BSS Directive – focusing on the practical implementation of the actions defined in these action plans” receives support by EC, DG Energy. Ref. Ares (2020)2496502
Exposure to indoor radon constitutes an important part of the overall exposure to ionising radiation of workers, particularly in certain geographical areas or specific types of workplaces.

EC established a uniform basic safety standards to protect health of workers against dangers arising from radon, recognising the importance of occupational radiation protection as a priority objective.

Legal background: Council Directive 96/29/Euratom [EU1996] already included general requirements on the identification of work activities where workers could be exposed to thoron or radon, explicitly mentioning spas, caves, mines, underground workplaces and aboveground workplaces in identified areas.

Council Directive 2013/59/Euratom confirms the required high level of protection of the previous Directive, extending its scope to coherently and consistently cover the protection of workers in workplaces with enhanced natural radiation, e.g. workers exposed to radon in workplaces, workers in industries processing naturally-occurring radioactive materials (NORM), as well as aircrew and space crew.
By May 2022:

- RAP approved in 23 countries
- ‘Draft document’ in 3 countries (ES, IT, PT)
- No dedicated RAP in 2 countries (but radon actions are taken) (LI, LT)
BSS Directive Article 54 Radon in workplaces – MS shall:

- establish national reference levels for indoor radon concentrations in workplaces
- require that radon measurements are carried out in workplaces within the identified areas
- require that radon measurements are carried out in specific types of workplaces
- require notification of situations where the radon concentrations continues to exceed the reference level despite of optimized measures applied
Task 1. Collection of RAPs, authorities’ identification and relationship

- Document analysis
- Internet search
- Snowball technique
- Email
- Phone calls
- Participation in radon-related events

Task 2. Analysis of national RAPs

- On-line survey
- Group interviews

Task 3. Comparative horizontal analysis

- Comparative analysis
- 4 regional workshops

Task 4. Final workshop

- Participatory workshop

Accession countries*

Review and evaluation of national RAP established in EU MS and the UK according to the requirements in the BSS Directive – focusing on the practical implementation of the actions defined in these action plans

EU-RAP Reference Group

Management and quality control


Reduce lung cancer risk
Reference level

• Reference level workplaces
  • 100 Bq/m³ Netherlands, Denmark
  • 200 Bq/m³ Sweden
  • 300 Bq/m³ the rest
  • 400 Bq/m³ Latvia
  • 600 Bq/m³ Spain

• Reference level public buildings, schools and kindergartens
  • Mostly the same reference level value as for workplaces
  • 200 Bq/m³ Estonia, Ireland
  • 300 Bq/m³ Spain

• Basis for the reference level is most often the prevailing geological situation and the upper level of radon concentration recommended by the EU BSS.
Effective dose calculation

- ICRP 137 implemented in several MS
  - Spain to be implemented this year
- ICRP 65
  - UK, Germany, Latvia, Slovenia, Portugal (ICRP137 under discussion)
- ICRP 115+126
  - Sweden

- Pending task for decision – France, the Netherlands, Portugal
- Dose conversion factors not implemented in the legislation
  - Croatia, Slovakia, Poland
  - Malta, Cyprus (no need, low radon conc.)

- Some MS also use time integral of radon activity concentration for comparison if the effective dose or reference level is exceeded (e.g. Sweden)
Types of workplaces

- All workplaces to be measured
  - With priority given to those located on priority areas - Sweden, UK, Portugal
  - Employer is responsible for assessment of the health risks for employees incl. radon – France, Denmark
- Specific workplaces
  - To be measured regardless their location
  - Most MS consider water treatment facilities and underground workplaces (mines, caves)
  - but also spas, jails, wineries are considered as workplaces to be measured
  - Several MS consider buildings of public interest and school and preschool facilities
  - or geology defined locations – all territory with well permeable gravel or sandy soil (Finland)
- Workplaces on priority areas
  - Connected with delineation of priority areas, located in basement and on ground floor in these areas
  - Some MS have not finished delineation of priority areas - measurement is on voluntary basis
  - Some MS define using additional criteria, e.g. buildings built before implementation of legal framework considering radon (Czech Republic, Slovakia)
- Exemption from notification
  - time spent at workplace – 10-100 h per year
National measurement protocol for indoor radon

- In most of the MS measurement protocols are developed
- Poland has published good practices
- Cyprus and Malta have decided not to develop measurement protocol due to prevailing low radon concentration on the territory

- Passive integral detectors are widely used, measurement duration ranges from 1 up to 12 months
- Continuous monitors are used as well, but not quite often
Licensing of measurement providers

• Some MS define national criteria which should be fulfilled by the measurement body (laboratory, company), e.g. Czech Republic, Sweden
• Some MS require accreditation according to ISO/IEC 17025
• In few MS the licensing/accreditation/registration of measurement provides is foreseen in near future, e.g. Greece, Hungary

• Compare: Licensing/accreditation of providers of mitigations is often ‘decided not to establish’ or ‘providers listed after undertaking a training course’. 
Builders, architects and engineers recognized as important counterpart in reducing radon levels indoors.

Status of development and extent of mitigation guides is influenced by the importance given to radon in past 20 years.

Guidelines comprise the description of good practices up to technical standard and implementation of radon related requirements in building code.

Few MS requests considering radon during renovation of buildings (e.g. Finland)

Subsidies if available for mitigation directed to households and public buildings, only France reported possible financial support for employers.
Actions if elevated radon levels found

• Standard procedure:
  • the employer is required to take corrective action to reduce radon concentration below the reference level;
  • if after implementation of the corrective action the concentration remains above the RL, the employer should follow the notification procedure;
  • annual effective dose is <=6 mSv, the employer is responsible to follow procedures for monitoring employee and informing the regulator;
  • annual effective dose >6 mSv shall be treated as planned exposure situations.

• MS differ in:
  • the extent of support provided to the employer
    • e.g. Lithuania or Hungary with the case by case support provided by the regulator and the UK or Sweden with established regulatory system and system of guidelines and private companies providing measurement and mitigations);
  • the extent of measurement if the reference level is exceeded
    • e.g. Slovenia recommend to carry out measurement of radon progenies and gamma dose rate of building material;
  • the obligation to the employer to carry out measurement after implementing remedial measure
    • e.g. Croatia with no obligatory measurement and the Czech Republic where the confirmation of reduction is carried out as an annual measurement and dose calculation.
• Most of the MS do not take special actions regarding working from home.
• Some countries sensitised this potential exposure through mass media during Covid-19 lock-down (e.g. Belgium)
• UK: work with radiation (according to legislation): it does not matter where your work is.
Dealing with radon risk on workplaces

- There is a legal basis established to protect workers from radon.
- Measurement at workplaces are/will be implemented in MS.
- Many specific workplaces are still to be measured regardless of the location defined in all of the MS.
- Workplaces located in priority areas are/will be defined as well; measurement on voluntary basis where priority areas not delineated yet.
- Funding mostly not provided to private companies; in few MS provided to school facilities and/or public buildings.
- Measurement protocols are/will be developed for workplaces in most of the MS.
- There is a lack of education & training related to protection from radon risk for employers and employees in most of the EU MS.
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