IAEA
International Atomic Energy Agency

Virtual Expert Mission to Portugal on Radon Action Plan

Olga German, IAEA
6 – 9 October 2020
Virtual event

IAEA
International Atomic Energy Agency

Introduction

Scope and objective

- Provide expert advice on development and implementation of Radon Action Plan
- Requested by Portugal in frames of regional project RER9153
- Technical Officer: Olga German, IAEA
- Invited experts:
  - Tracy Gooding from UK
  - Luis Santiago Quindos Poncela from Spain
- Objectives:
  - to present international requirements and experiences from UK and Spain on the elements of national Radon Action Plan (RAP)
  - to present Portuguese experience and challenges in implementation of the requirements
  - to discuss possible ways forward, roles and responsibilities in development and implementation of RAP.

IAEA
International Atomic Energy Agency

1. Radon Action Plan

Content

- Why RAP?
- Structure and life-cycle
- Responsibilities and goals
- SMART Targets

Why RAP?

- Exposure of the population indoors is usually dominated by Rn-222.
- Government/national authority determine the extent of Rn-222 exposure:
  - National and regional surveys of Rn-222
  - Surveys of Rn-220 exposure (if relevant)
  - Surveys of gamma exposure from building materials may be useful in some circumstances
- If results indicate concern for public or occupational health:
  - Set national regulations
  - Assign roles, responsibilities and targets
  - Develop Radon Action Plan to **coordinate actions**!
- If results indicate low levels of exposure to Rn-222:
  - Government to inform about the results
  - Set national regulations
  - No need for RAP

Structure and life-cycle of RAP

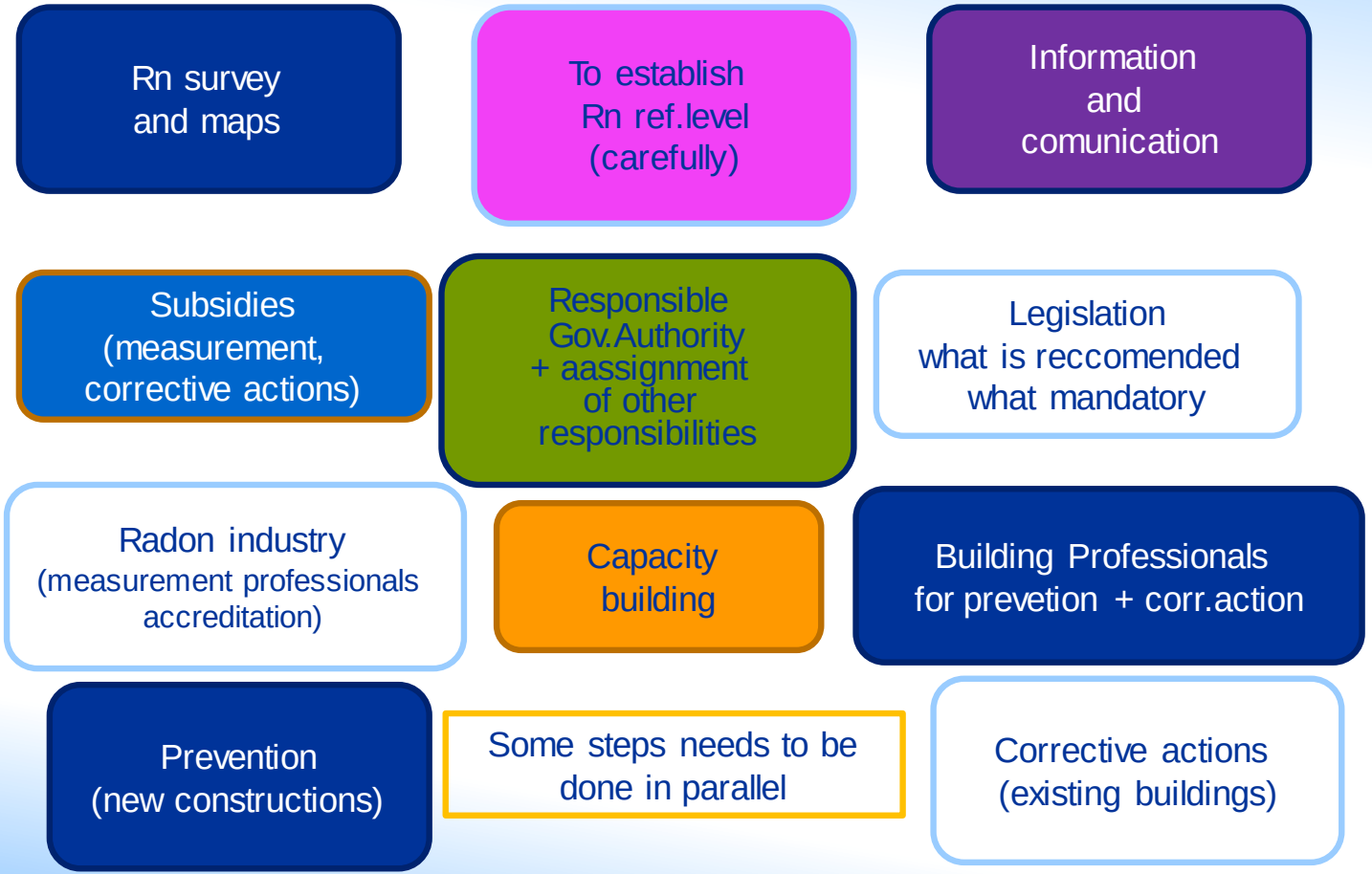
- Overall objective
- Targets SMART
- Means of achieving targets
- Means of verification of target achieving
- Responsibilities for targets
- Involved parties and coordination mechanisms
- Reporting means and period

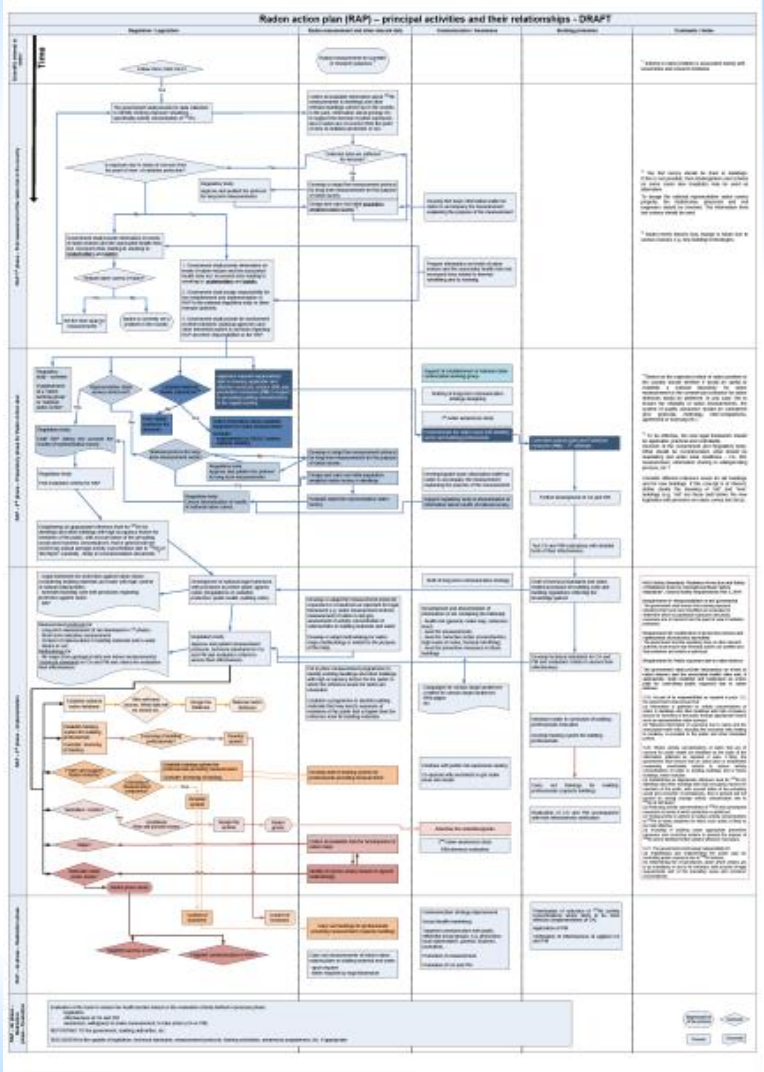
Can be coordinated with other national programmes

Radon Action Plan could include (GSR Part 3, SSG-32)

- **National radon policy**
  - Government to assign responsibilities
- **Provision of information – communication strategy!**
- **National survey of radon in dwellings and public buildings**
- ***Identification of radon prone areas (not always needed)***
- **Regulatory infrastructure for radon - setting a reference level**
  - For dwellings not to exceed an average annual concentration of 300 Bq/m^3
  - Building codes for new dwellings not to exceed an average annual concentration of 300 Bq/m^3
  - For workplaces not to exceed an average annual concentration of 1000 Bq/m^3
- **Control and reduction of exposure to radon**
  - Corrective actions for existing dwellings
  - Corrective actions to be mandatory or voluntary
- **Financial needs and subsidy mechanisms**
- **Evaluation of effectiveness**

Where to start? What do we have and what is missing?




Radon action plan (RAP) – principal activities and their relationships - DRAFT

Phases of Radon Action Plan

1. Development and approval
   - Assign responsibilities
   - A national reference level not exceeding 300 Bq/m^3
   - Develop legal framework
   - Identify effective preventive measures and corrective actions
   - Develop communication strategy
   - Develop educational system for professionals (building, measurement)
2. Implementation
   - Identify radon-prone areas and develop radon maps
   - Include appropriate preventive measures and corrective actions in building codes for new and existing buildings
   - Update and implement communication strategy
   - Educate, licence (?) professionals
   - Reduce radon levels in dwellings
3. Review

✓ Evaluate effectiveness of all actions

4. Improve RAP accordingly

Structure and life-cycle of RAP

- **Overall objective**
- **Targets SMART**
- Means of achieving targets
- Means of verification of target achieving
- Responsibilities for targets
- Involved parties and coordination mechanisms
- Reporting means and period

Can be coordinated with other national programmes

SMART targets of the radon action plan

- Overall OBJECTIVE: to decrease lung cancer in the country
  (such goal is in a distant future !!)
- In the meantime define more realistic (specific) targets such as:
  - Representative radon survey
  - Establishment and implementation of legal framework
  - Radon included in building code
  - Development of guidelines for professionals (building, measurement)
  - Communication of the topic with public – Radon awareness
- Radon Action Plan to cover:
  - Members of the public in their homes
  - Members of the public present in buildings with high occupational factor of the members of public
  - Workers at workplaces (other than those for which exposure due to radionuclides is controlled as planned exposure).

Duration of the radon programme vs RAP

- Radon programme is long-term activity 10-50 years
- Radon action plan (governmental document to implement radon programme) can be designed and implemented for shorter period of time – usually 5 to 10 years – and repeated
- Evaluation period in the middle of the project can be useful

Define target for the radon action plan - Example

Sweden http://www.miljomal.se/Environmental-Objectives-Portal/

- A Good-Built Environment was set as a part of national environmental quality objectives (adopted by the Parliament in 1999) to be met by 2020: “By 2020, buildings and their characteristics must not adversely affect health”.

- As part of this objective, a special interim target for the indoor environment was approved by the Parliament in 2002, which includes a specification for human exposure to radon in indoor air. It states: “radon concentrations should be lower than 200 Bq/m^3 in schools and pre-schools by the year 2010, and below 200 Bq/m^3 in homes by 2020”

Each national quality objective is assigned one or two authorities, depending of assigned regulatory responsibilities

Example RAP Sweden (I)

1. Introduction
    1. Task
    2. Whats is radon
    3. Background
2. Health effects
    1. Intorduction
    2. Choise of reference level
    3. Long-term target
    4. Health effects – summary of proposals
3. Organisations and result follow up
    1. Introduction
    2. Orgaisation
    3. Regional follow up
    4. Effective target and indicators
    5. Organisation and follow up – summary of proposals
4. Communication strategy
    1. Introduction
    2. Background
    3. Problem statement
    4. Target for communication activity
    5. Strategy
    6. Message
    7. Media strategy
    8. Resources and budget
    9. Organisation
    10. Measuring the results and follow up
    11. Communication – summary of proposals
5. Measurements
    1. Background
    2. Current status of measurements in dwellings and buildings
    3. Data management
    4. Geographic radon risk maps
    5. Method descriptions for radon measurements
    6. Measurements – summary of proposals
6. Radon remediation
    6. Background
    7. Strategy to facilitate radon remediation
    8. Economic support for radon remediation
    9. Information about methods
    10. Quality assurance strategy
    11. Radon remediation – summary of proposals
7. Radon in new buildings
    6. Background
    7. Radon in new buildings – summary of proposals
8. Radon in workplaces
    6. Background
    7. Occurance of radon in workplaces
    8. Measurments
    9. Identification of areas in workplaces
    10. Priority strategy for measurments in workplaces
    11. Radon in workplaces – summary of proposals
9. Radon in drinking water
    6. Introduction
    7. Current status
    8. Targets for radon in drinking water
    9. Radon reduction meathods for drinking water
    10. Radon in drinking water – summary of proposals

Structure and life-cycle of RAP

- Overall objective
- Targets SMART
- **Means of achieving targets**
- **Means of verification of target achieving**
- Responsibilities for targets
- Involved parties and coordination mechanisms
- Reporting means and period

Can be coordinated with other national programmes

Example RAP Sweden (II)

RAP Sweden is set for 5 years
Targets to be reported annually

Target 8 Radon in workplaces

- Inform and educate about radon in workplaces identified target audience.
- Identify areas with high risk of elevated radon concentration in workplaces based on combined data from soil information, company register and results of measurements in dwellings.
- Execute supervision of compliancewith the requirements of measurements based on priority areas identified.
- Execute supervision of compliance of workplaces with high radon concentration.
- Analyse and assess received registration applications from workplaces where radon concentration is above the reference level and use the results for next period priority setting.

8.6. Radon på arbetsplatser – sammanfattning av förslag

- Informera och utbilda om radon på arbetsplatser till identifierade målgrupper.
- Identifiera områden där stor risk föreligger för höga radonhalter på arbetsplatser baserat på en kombination av markinformation, företagsregister och resultat av mätningar i bostäder.
- Utöva tillsyn avseende radonmätning baserat på prioriterade områden enligt andra punkten.
- Utöva tillsyn av verksamheter som har förhöjd risk för höga radonhalter.
- Utvärdera och sammanställ inkomna anmälningar av verksamheter och arbetsställen med radonhalter över referensnivån som underlag för att revidera prioriteringar för kommande tillsyn.

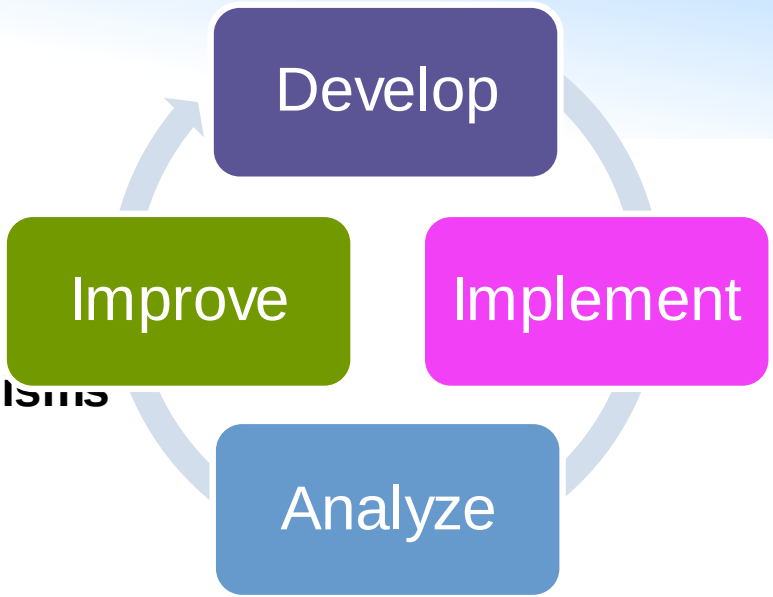
SMART targets

Questions at the beginning:

- What is the current status (legal framework, public perception, research, any survey results, are responsibilities clearly assigned)?
- What should be achieved?
- What should be done?
- What are the resources – human, technical (devices, laboratories), monetary?
- When to be achieved?
- How to verify that it was achieved?

Structure and life-cycle of RAP

- Overall objective
- Targets SMART
- Means of achieving targets
- Means of verification of target achieving
- **Responsibilities for targets**
- **Involved parties and coordination mechanisms**
- **Reporting means and period**

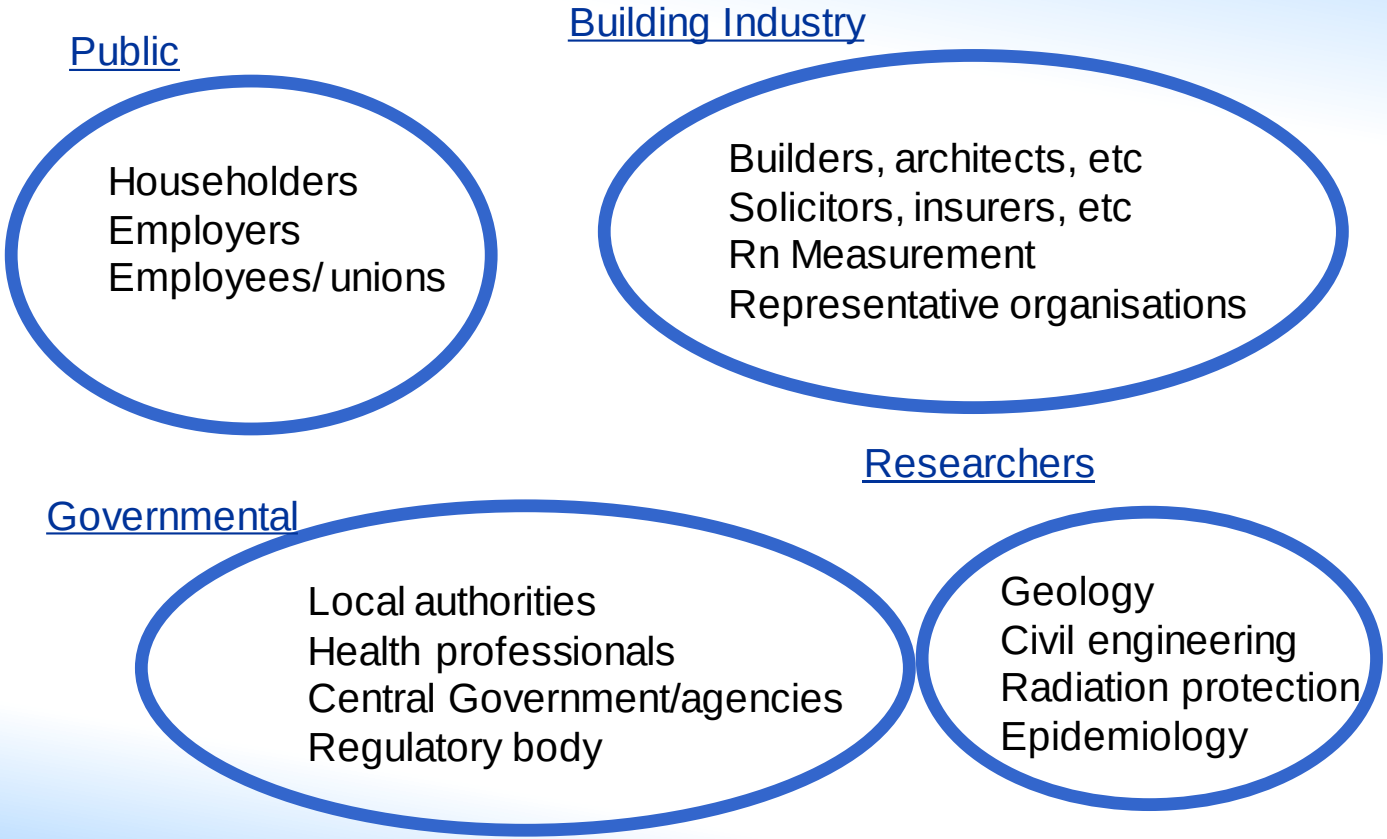


Can be coordinated with other national programmes

Defining the role of key players

- Government, ministries, authorities, organisations, individuals etc.
- Who will be responsible for what?
- Who should be involved in which action?
- Budget allocation and for what?
- Co-operation and meetings
- Reporting way and period
- If needed – set radon working group (advisory group)
  - Define the objectives of the group – advisors or decision makers!
- Establishment of discussion with / cooperation with:
  - Chamber of Architects
  - Technical universities
  - Research institutes – Geology, Radiation protection, Civil engineering
  - Private sector providing measurement and builders and civil engineers

Identification of interested parties



Examples of entities to cooperate with

Ireland

- ✓ Department of Communications,
- ✓ Climate Action and Environment (Chair),
- ✓ Department of Health,
- ✓ Department of Housing,
- ✓ Planning, Community and Local Government,
- ✓ Department of Education and Skills,
- ✓ Department of Jobs, Enterprise and Innovation,
- ✓ Environmental Protection Agency,
- ✓ Health Service Executive,
- ✓ Health and Safety Authority,
- ✓ Geological Survey of Ireland,
- ✓ Sustainable Energy Authority of Ireland
- ✓ County and City Managers' Association.

Source:
http://www.epa.ie/radon/getinformed/nationalradoncontrolstrategy/

Norway

- ✓ The Norwegian Labour Inspection Authority
- ✓ The Norwegian Directorate of Health
- ✓ The Norwegian State Housing Bank
- ✓ The Norwegian Institute of Public Health
- ✓ Geological Survey of Norway
- ✓ National Institute of Occupational Health
- ✓ National Office of Building Technology and Administration
- ✓ County Governors
- ✓ Local authorities
- ✓ NRPA

Source: Strategy for the exposure for the reduction of radon exposure in Norway, Norwegian Ministries, 2010

Example RAP Germany (I)

Table of contents

Example RAP Germany (II)

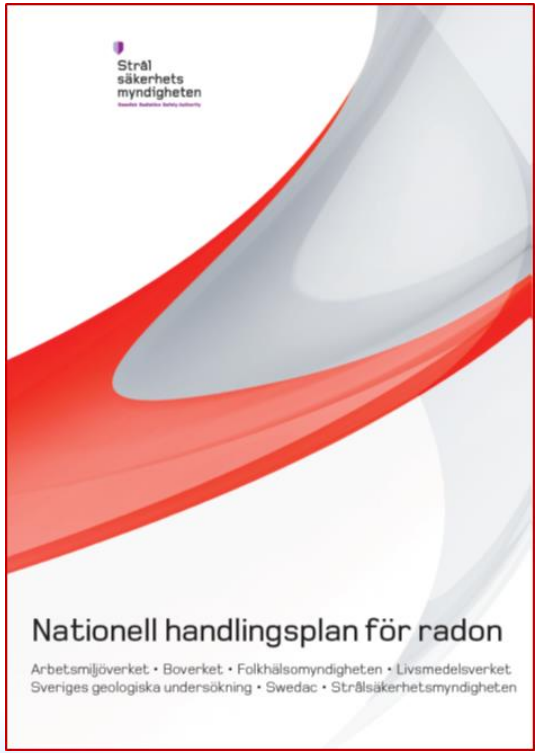
- **II Radon Protection measures**
- II.3 Measures to prevent or significantly impede radon ingress into habitable rooms in new buildings
  - *Measure 3.1:* Make more in-depth information available on measures to reduce radon ingress into habitable rooms in new buildings
  - *Measure 3.2:* Analyse effectiveness of construction measures to protect against radon in habitable rooms in new buildings
  - *Measure 3.3:* Develop and implement a nationally coordinated concept for education, further education and training courses on radon protection for experts
  - *Measure 3.4:* Formulate concepts to assess the quality of execution of radon protection measures in new buildings
  - *Measure 3.5:* Integrate radon protection into existing quality certificates for buildings

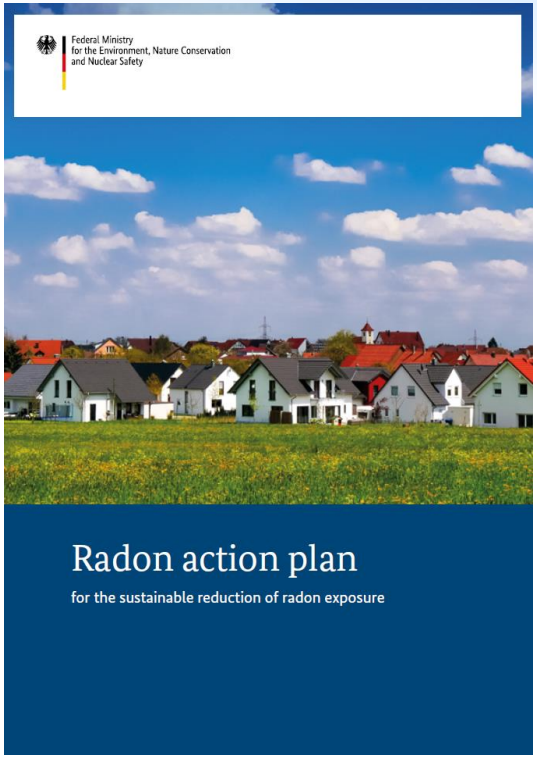
Example RAP Germany (III)

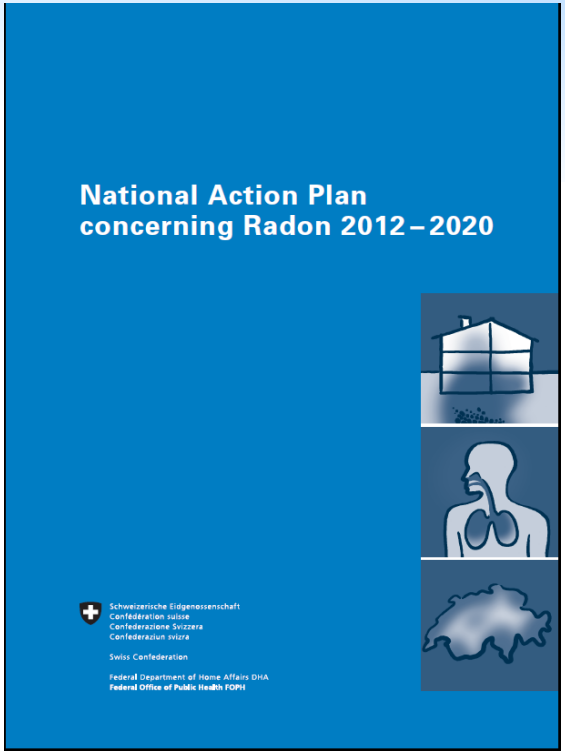
Measure 3.1	Make more in-depth information available on measures to reduce radon ingress into habitable rooms in new buildings
Description	Practical recommendations for preventative radon protection in new buildings shall be drawn up to facilitate the implementation of legal provisions. Recommendations of the German Institute for Standardisation DIN joint working group NABau/NHRS Radon geschütztes Bauen and other expert bodies shall be taken into consideration. Information on this topic, together with further information on radon, shall be published in a new edition of the German Radon Handbook (Radonhandbuch Deutschland). Different target groups are to be adequately taken into account.
Expected result	More in-depth information and recommendations on radon protection in new buildings
Coordination	BMU
Implementation	Radon protection experts from federal government and federal states and experts from the fields of moisture protection, ventilation and construction
Envisaged implementation by/in the period	2019 to 2020, update if necessary

Measure 3.5	Integrate radon protection into existing quality certificates for buildings
Description	It shall be reviewed whether quality criteria for radon protection can be developed and integrated into existing quality certificates in other areas. The aim shall be to achieve such integration. The period of time for which the certificates are valid shall also be reviewed if necessary.
Expected result	Concept for quality certificates for buildings with habitable rooms or workplaces that are protected against radon
Coordination	BMU
Implementation	BMU, BfS, competent authorities of federal states
Envisaged implementation by/in the period	2019 to 2028

Examples RAP







IAEA
International Atomic Energy Agency

3.Radon at workplaces

GSR Part 3 Requirement 52 (Existing exposure situations)

Requirement 52: Exposure in workplaces

The regulatory body shall establish and enforce requirements for the protection of workers in existing exposure situations.

- The requirements in respect of public exposure shall be applied for protection and safety for workers in existing exposure situations, other than:
- Remediation of areas with residual radioactive material - exposure of workers is planned exposure situation,
- **Exposure due to radon in workplaces -** reference level for ^{222}Rn - 1000 Bq/m^3 , account taken of the prevailing social and economic circumstances. If, remains above the reference level – requirements of planned exposure situations shall apply.
- Exposure of aircrew and space crew due to cosmic radiation - reference level of dose and a methodology for the assessment, recording of doses, information to employees. Specific requirements for occupational exposure in planned exposure situations are to apply, particularly for pregnant aircrew if reference levels are exceeded.

GSR Part 3 Requirement 52 (Existing exposure situations)

Exposure due to radon in workplaces

…

Employers shall ensure that activity concentrations of 222Rn in workplaces are as low as reasonably achievable below the reference level established in accordance with para. 5.27, and shall ensure that protection is optimized.

If, despite all reasonable efforts by the employer to reduce activity concentrations of radon, the activity concentration of 222Rn in workplaces remains above the reference level established in accordance with para. 5.27, the relevant requirements for occupational exposure in planned exposure situations as stated in Section 3 shall apply.

GSR Part 3 Requirement 21 (Planned exposure situations)

Requirement 21: Responsibilities of employers, registrants and licensees for the protection of workers

Employers, registrants and licensees shall be responsible for the protection of workers against occupational exposure. Employers, registrants and licensees shall ensure that protection and safety is optimized and that the dose limits for occupational exposure are not exceeded.

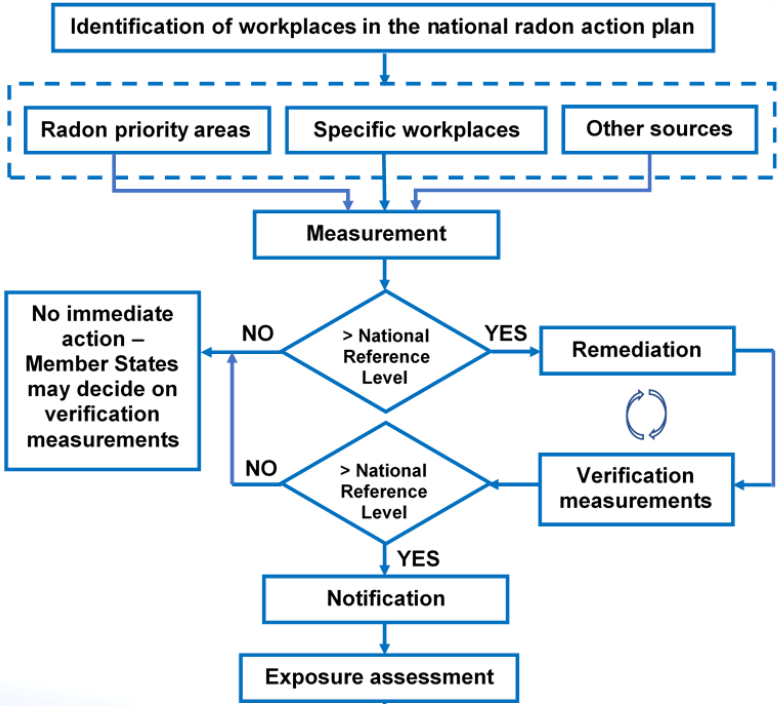
Employers, registrants and licensees shall be responsible for:

- Protection of workers against occupational exposure;
- Compliance with other relevant requirements of these Standards.

Employers, registrants and licensees shall ensure, for all workers engaged in activities in which they are or could be subject to occupational exposure, that:

- Occupational exposure is controlled so that the relevant dose limits for occupational exposure are not exceeded;
- Protection and safety is optimized;
- Suitable and adequate facilities, equipment and services for protection and safety are provided, the type and extent of which are commensurate with the expected likelihood and magnitude of occupational exposure.

Decision making process



Examples of workplaces

Examples of the workplaces that may become subject to all or some of the requirements of planned exposure situations, based on the annual average activity concentration of 222Rn, could include:

- ✓ Any of the NORM industries,
- ✓ Underground mines,
- ✓ Tunnels and galleries,
- ✓ Underground carparks,
- ✓ Tourist caves,
- ✓ Fish hatcheries,
- ✓ Agricultural caves (e.g. wines, cheese, mushrooms, etc), and
- ✓ Other workplaces where the radon levels may be elevated due to the geological conditions or limited ventilation.

IAEA
International Atomic Energy Agency

Thank you!