Radon, a public health priority
The concept of national radon programs in the WHO Radon Handbook

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World Health Organization
World Health Organization

- **Function**: act as the UN directing and coordinating authority on international health work

- **Objective**: attainment by all peoples of the highest possible level of health

- **Definition**: "HEALTH is a state of COMPLETE physical, mental and social well-being and not merely the ABSENCE of disease or infirmity" *(Constitution, 1948)*
WHO actions on radon

1979: A WHO/EURO working group on indoor air quality first drew attention to the health effects from residential radon exposures.

1988: Radon classified as a human carcinogen by IARC.

1993: An international WHO workshop on indoor radon considered for the first time a unified approach to control radon exposures and advised on communication of associated health risks.

2005: WHO established the *International Radon Project*
- to identify effective strategies for reducing the health impact of radon
- to raise awareness about the consequences of long-term radon exposures.
http://www.who.int/ionizing_radiation/env/radon
Since then...

- 2009
- 2010
- 2011
- 2012
- ...

WHO Handbook on Indoor Radon
WHO Guidelines for Indoor Air Quality
Dampness and Mould
Selected Pollutants
Guidelines for Drinking-water Quality
Radiation Volume 1060: A Review of Human Carcinogenic Risks to Humans

WHO Housing and health guidelines

IAEA Safety Standards for Protecting People and the Environment
Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards
General Safety Requirements Part 3
No. GSR Part 3

IAEA Safety Standards
Annals of the ICRP
Radiological Protection against Radioactive Sources

World Health Organization
Radon: an environmental health risk

Science
Risk Assessment

Public Awareness
Risk Perception

Policies
Risk Management
WHO Handbook on Indoor Radon (2009)

Structure

Introduction

1. Health Effects of Radon
2. Radon Measurements
3. Prevention and Mitigation
4. Cost-Effectiveness
5. Radon Risk Communication
6. National Radon Programmes

Key messages for each chapter
WHO Handbook on Indoor Radon (2009)

Structure

Introduction

1. Health Effects of Radon
2. Radon Measurements
3. Prevention and Mitigation
4. Cost-Effectiveness
5. Radon Risk Communication
6. National Radon Programmes
National radon programmes

- Organize a national radon programme
- Conduct radon surveys
- Set national reference levels
- Implement building regulations and building codes
- Identify and remediate homes with high radon concentrations
- Develop risk communication programmes
National radon programme

(1) Is it needed?

Initiate an assessment

Designate a national lead agency
National radon programme

(1) Is it needed?

- Initiate an assessment
- Designate a national lead agency
- Specify measurements techniques and protocols
National radon programme
(1) Is it needed?

- Initiate an assessment
- Designate a national lead agency
- Specify measurements techniques and protocols
- Conduct national and regional surveys

- Population-weighted survey
- Geographically-based survey
National radon programme

(2) What is needed?

- Set national reference levels (RL) for dwellings
  - A RL reflects the maximum accepted average annual radon concentrations in a dwelling
  - It should be established at national level
  - When RLs are exceeded, action should be taken to reduce radon concentration
  - Compulsory vs. voluntary levels
  - Existing homes vs. new buildings

Is further action needed? yes
WHO Reference Levels

- A reference level of **100 Bq/m³** is justified from a public health viewpoint based on the current scientific evidence
  
  - Epidemiological studies do not support the evidence of a "safe" threshold level
  - Most lung cancer deaths are associated with low / moderate concentrations and not with the high levels
  - WHO recommends a reference level as low as reasonably achievable
WHO Reference Levels (cont'd)

- A reference level of 100 Bq/m³ is justified from a public health viewpoint based on the newest scientific evidence.

- However, if this level cannot be implemented because of country-specific factors, the reference level should not exceed 300 Bq/m³.

- The decision to set a national reference level needs to take into account the prevailing economical and societal circumstances as well as various national factors such as:
  - Distribution of radon
  - Number of existing homes with high radon concentrations
  - Prevalence of smoking
National radon programme

(2) What is needed?

- **Set** national reference levels (RL) for dwellings
- **Develop and implement** building regulations/building codes for new buildings
- **Identify and remediate** existing buildings that exceed RLs
- **Provide** training for building professionals
- **Develop** programs of information/awareness for stakeholders
- **Establish** a national database on radon levels
- **Impose** radon measurements as part of property transactions
Some recent National Action Plans

Radon Program of the Czech Republic 2010 – 2019 – Action Plan

The Radon Program of the CR 2010 - 2019 - Action Plan follows up the results of the Radon Program of the Czech Republic, which was approved for the period of 2000 to 2009 by the Czech Government Resolution No. 538, dated May 31, 1999, supplemented with the Czech Government Resolution No. 970, dated Oct. 7, 2002 (as a consequence of changing the territorial-administrative organization of the CR). It has been produced in accordance with the existing legislation of the CR in the area of radiation protection and takes into consideration the current trends in the Member States of the EU, which are projected in the upcoming amendment to the Directive No. 96/29/Euratom, which is being discussed in the EC working group.
International Standards

WHO and PAHO are working to support implementation of the International BSS

Final version published July 2014
International BSS (2014)

Requirement 50: Public exposure due to radon indoors

The government shall provide information on levels of radon indoors and the associated health risks and, if appropriate, shall establish and implement an action plan for controlling public exposure due to radon indoors.

Requirement 52: Exposure in workplaces

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

IAEA Safety Standards
for protecting people and the environment

Radiation Protection and Safety of Radiation Sources:
International Basic Safety Standards

General Safety Requirements Part 3
No. GSR Part 3

Published January 2014
Radon Regulations
Drinking-water

- WHO Guidelines on Drinking-water Quality (2011)

Chapter 9 – Radiological aspects

9.7.3 Guidance on radon in drinking-water supplies
As the dose from radon present in drinking-water is normally received from inhalation rather than ingestion, it is more appropriate to measure the radon concentration in air than in drinking-water.

The World Health Organization reference level for radon concentration in indoor air is 100 Bq/m³ in dwellings. If this level cannot be reached under prevailing country-specific conditions, the level should not exceed 300 Bq/m³, corresponding to an annual dose of approximately 10 mSv (WHO, 2009). This recommendation is consistent with the International Basic Safety Standards¹ and with the most recent recommendations of the ICRP (2009b).

Screening levels for radon in water should be set on the basis of the national reference level for radon in air and the distribution of radon in the national housing stock. Where high radon concentrations are identified in indoor air, this is nearly always due to ingress of radon from the soil rather than degassing from the drinking-water supply. Nevertheless, in circumstances where high radon concentrations might be expected in drinking-water, it is prudent to measure for radon and, if high concentrations are identified, consider whether measures to reduce the concentrations present are justified.

The concentration of radon in groundwater supplies can vary considerably. Consequently, in situations where high radon concentrations have been identified or are suspected, the frequency of gross alpha and gross beta measurements may need to be increased so that the presence of radon progeny (in particular polonium-210), which can be major contributors to dose, can be assessed and monitored on an ongoing basis.
Radon Regulations
Drinking-water

- WHO Guidelines on Drinking-water Quality (2011)
Key points for discussion

- Awareness and interest of politicians and authorities
- Indicators to measure the effectiveness of interventions
- Pros/cons of mandatory vs. voluntary measures
- Financial considerations