

An international perspective on radon from WHO



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Outline

- Introduction
- Radon, a health issue and a public health issue
- Some national perspectives
- Discussion

The World Health Organization



- Established on **7 April 1948**
- **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
- **Health:** a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (*WHO Constitution, 1948*)



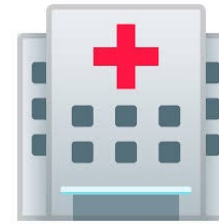
The WHO 3-level structure

7000 people work for WHO in

- 150 WHO offices in countries, territories and areas,
- 6 regional offices,
- at IARC, and
- at the headquarters (Geneva)



Public health through the life course



Integrating Radiation Protection through the life course



The exposure situations and categories of exposure are combined in the same individual through the life course

Radon

in the context of radioprotection



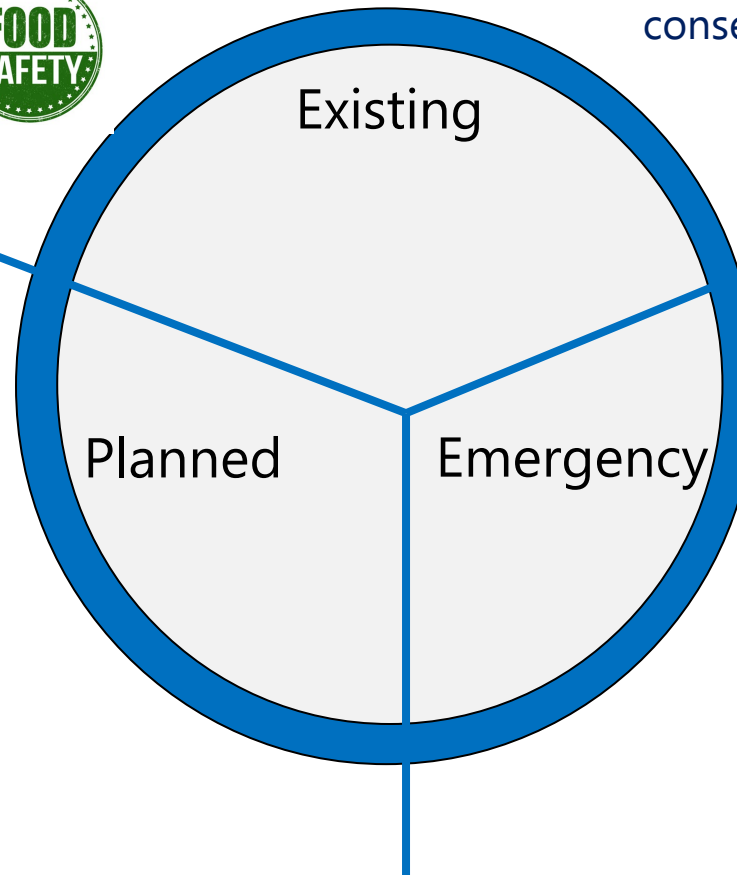
Natural radiation,
(radon, NORM, cosmic,
food, drinking water)



Nuclear tests in 50-60s,
Chernobyl and Fukushima
consequences



Medical,
occupational

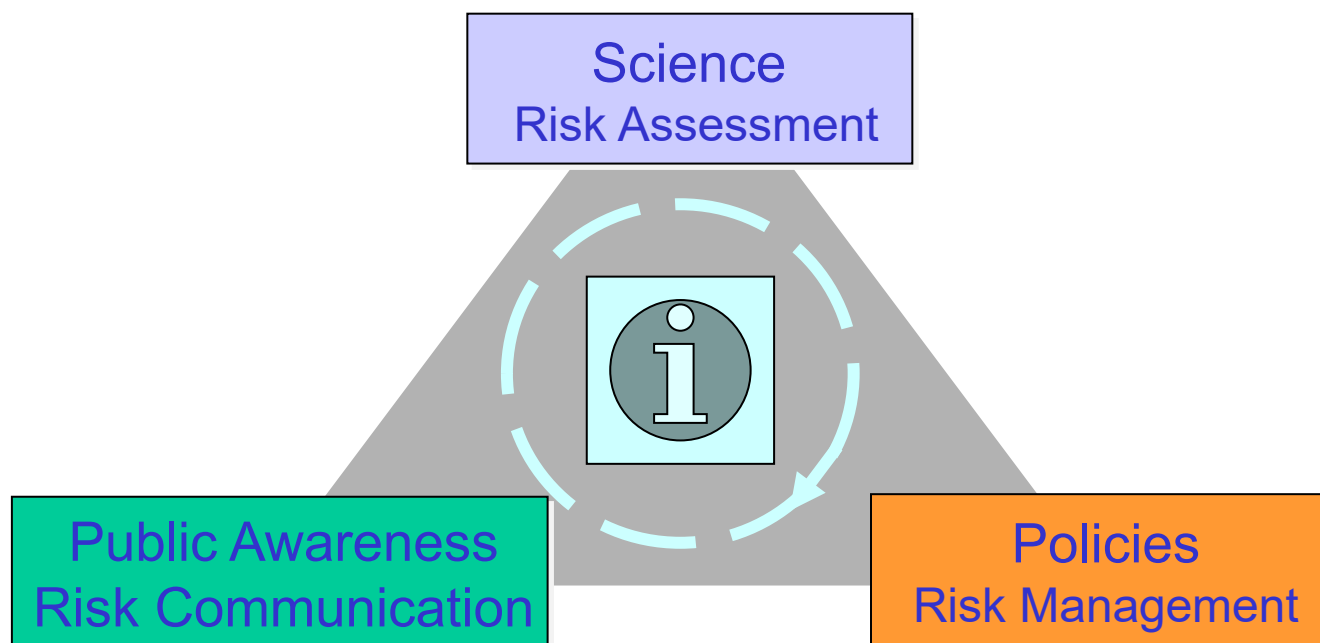


Accidents, incidents,
deliberate events

Outline

- Introduction
- Radon, a health issue and a public health issue

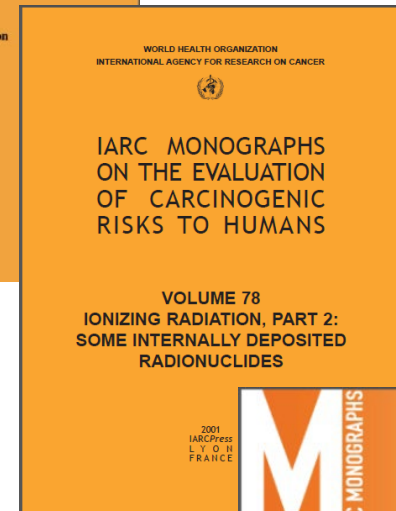
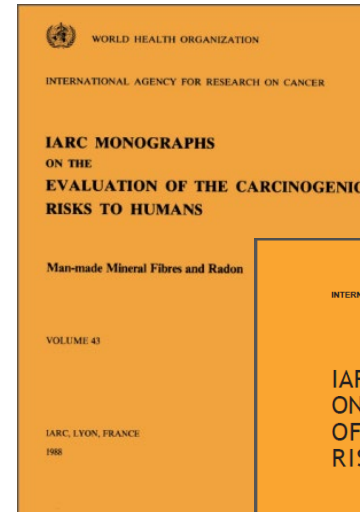
Assess and respond to health risks



Radon, a carcinogen

Radon and its decay products are carcinogenic to humans (IARC: 1988, 2001, 2012)

Cancer risks from radon derived largely from cohort studies of underground miners that had been exposed to high levels of radon in the past



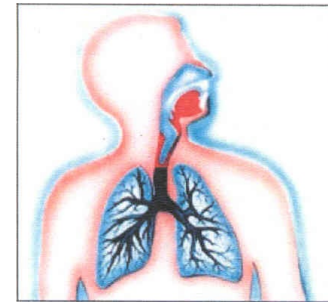
Health effects

The major recipient of the dose from inhalation of radon and its decay products is the **lung**

Only a small proportion of inhaled radon gas reaches the blood and other non-respiratory organs

- Doses to organs other than the respiratory tract are appreciably lower (<100 times)

There is limited, though inconsistent, evidence of other cancer risks due to radon

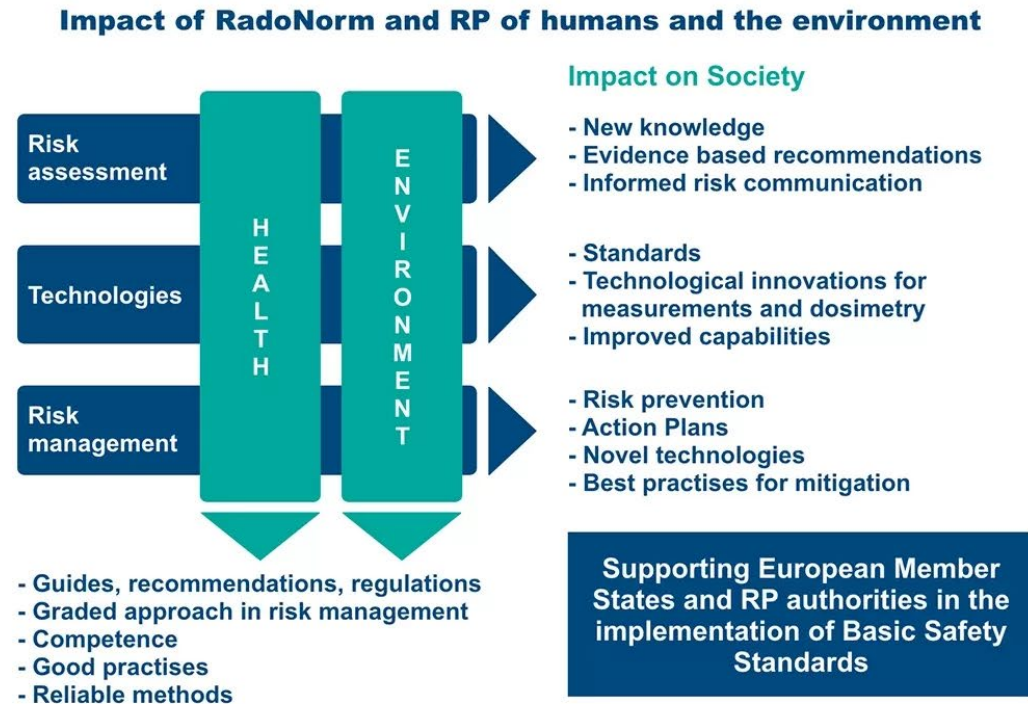




RadoNorm
Managing risks from radon and NORM



The RadoNorm project under EURATOM Horizon 2020 aims at managing risks from radon and NORM exposure situations to assure effective radiation protection based on improved scientific evidence and social considerations

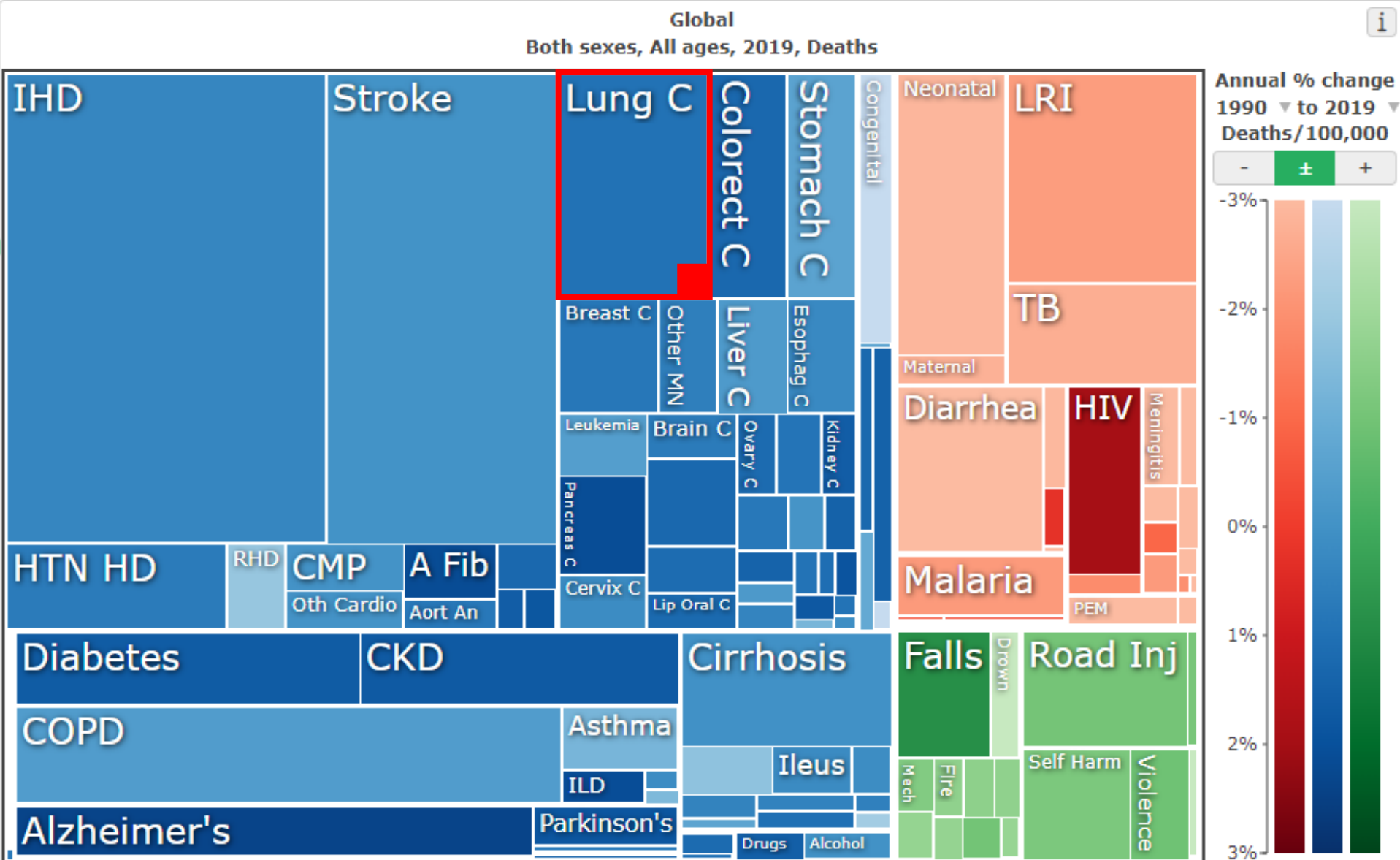


WP4 – Effects and risks

- ✓ interaction between radon and smoking for lung cancer,
- ✓ risks of radon outside of the lung,
- ✓ risks associated with radon exposure during childhood,
- ✓ risks from radon and NORM in drinking water,
- ✓ mechanisms of radiation action in the disease processes, and
- ✓ quantification of various sources of uncertainties in risk inference.

The public health perspective

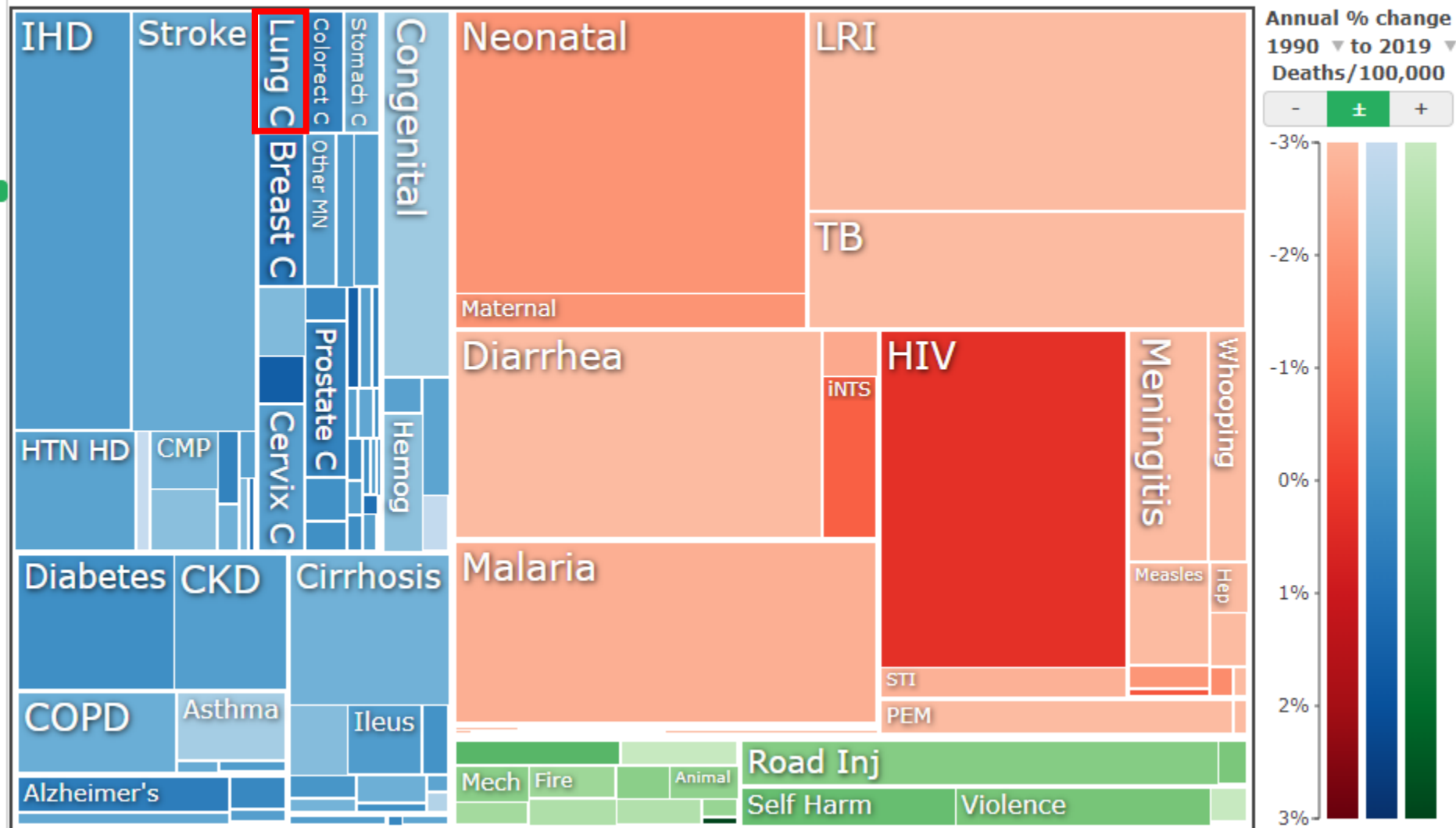
<http://vizhub.healthdata.org/gbd-compare/>



Sub-Saharan Africa

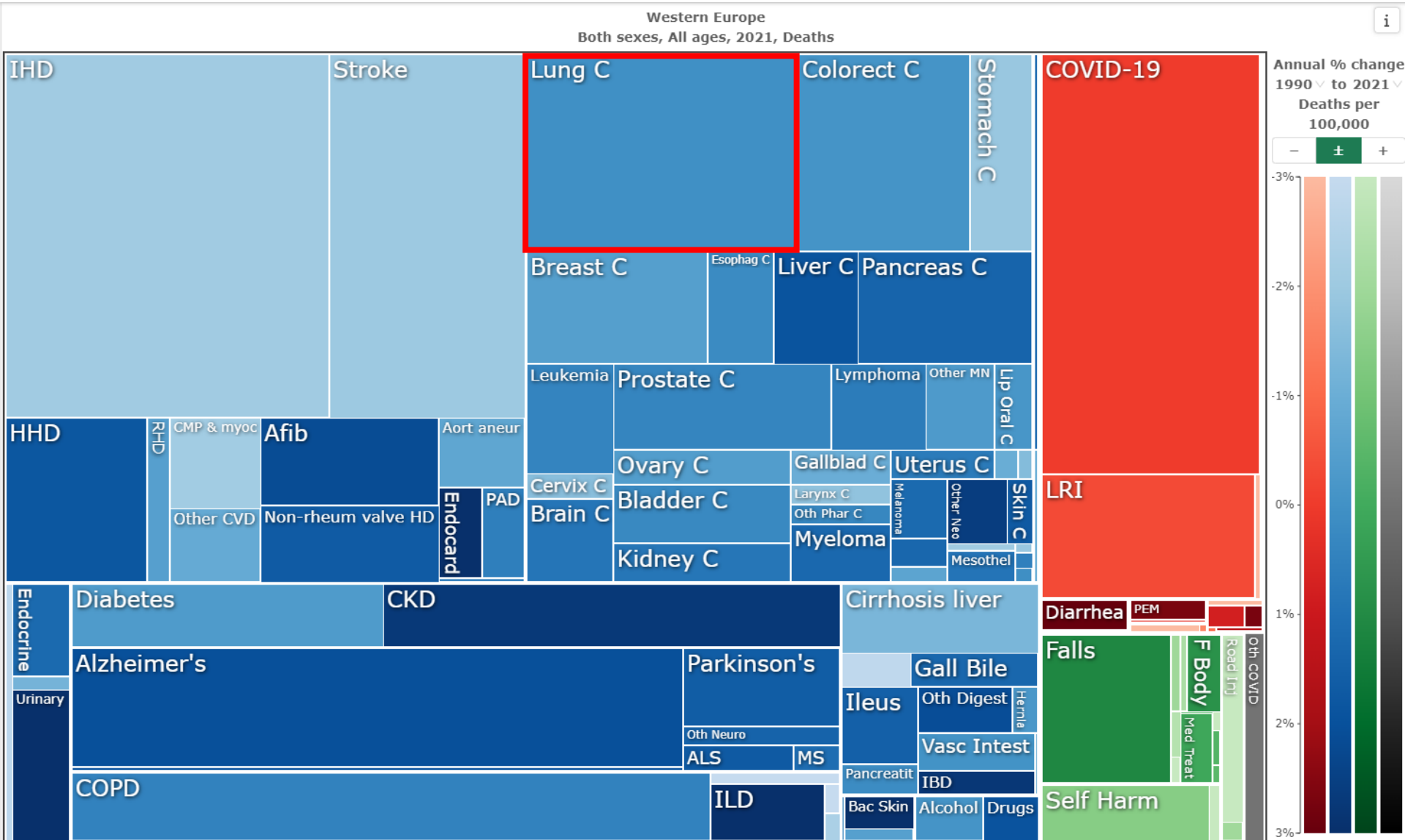
(premature mortality, 2019)

Sub-Saharan Africa
Both sexes, All ages, 2019, Deaths

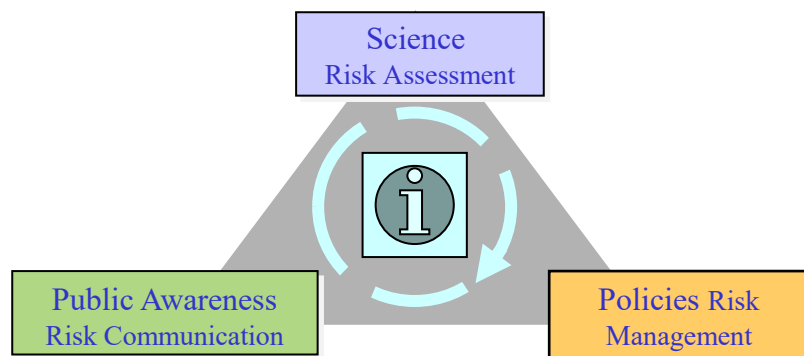
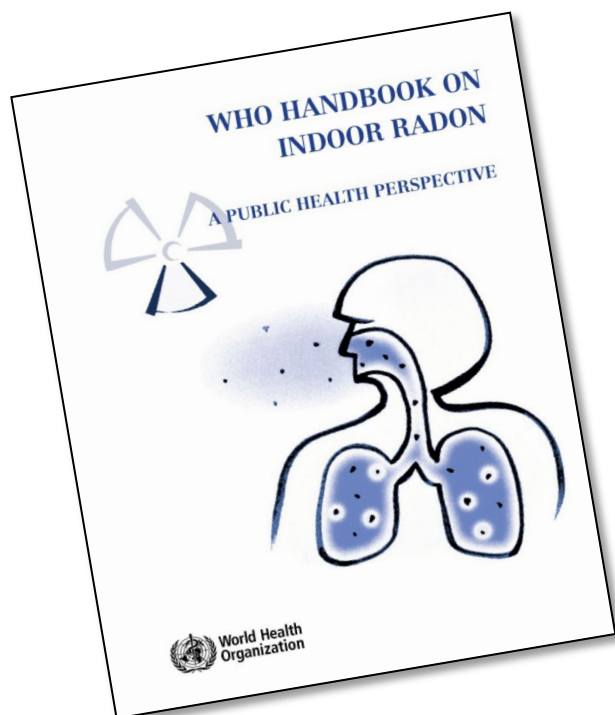


Western Europe

(premature mortality, 2021)



WHO Radon Handbook (2009)



1. HEALTH EFFECTS OF RADON

- 1.1 Lung cancer risks in radon-exposed miners
- 1.2 Lung cancer risks in the general population from indoor radon
- 1.3 Radon and diseases other than lung cancer
- 1.4 Burden of lung cancer caused by indoor radon

2. RADON MEASUREMENTS

- 2.1 Measurement devices
- 2.2 Measurement protocols
- 2.3 Quality assurance for radon measurements

3. RADON PREVENTION AND MITIGATION

- 3.1 Organization of radon prevention and mitigation actions
- 3.2 Radon prevention strategies in new constructions
- 3.3 Radon mitigation strategies in existing buildings

4. COST-EFFECTIVENESS OF RADON CONTROL

- 4.1 The framework of cost-effectiveness analysis
- 4.2 Previous economic evaluations of radon prevention and mitigation
- 4.3 Example of a cost-effectiveness analysis

5. RADON RISK COMMUNICATION

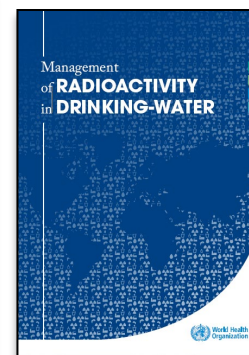
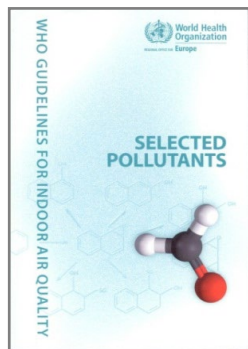
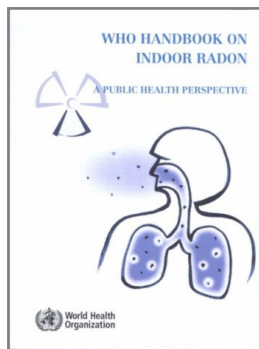
- 5.1 Fundamentals, strategies and channels
- 5.2 Framing radon risk issues for risk communication
- 5.3 Core messages for radon risk communication
- 5.4 Communication campaigns

6. NATIONAL RADON PROGRAMMES

- 6.1 Organization of a national radon programme
- 6.2 National radon surveys
- 6.3 National reference levels
- 6.4 Building regulations and building codes
- 6.5 Identification and remediation of homes with high radon concentrations

Since 2009...

Radon in WHO documents



2009

2010

2011

2012

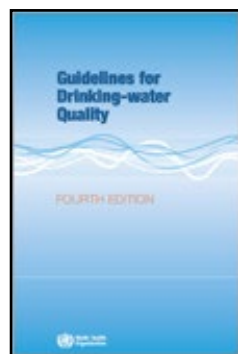
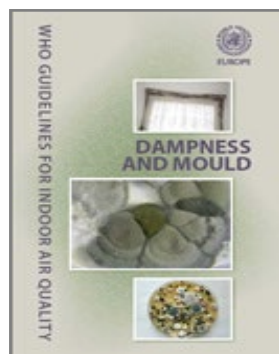
...

2017

2018

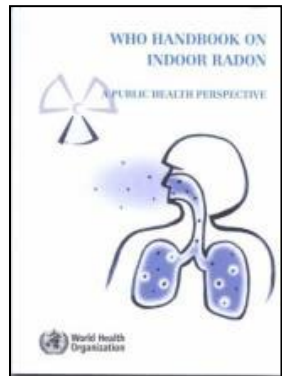
2020

2021

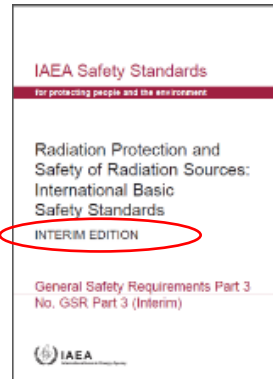


Since 2009

International publications



2009

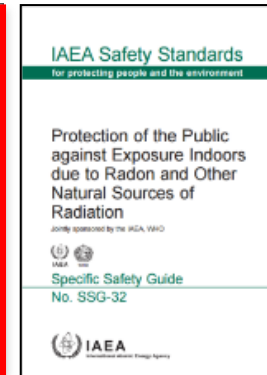


2010

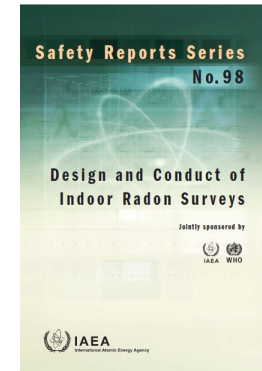
2011 2012



2014

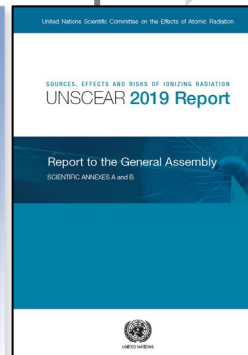
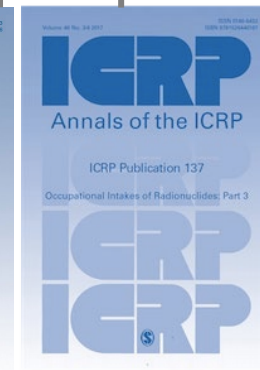
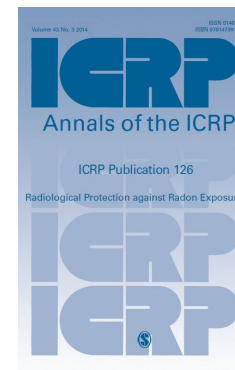
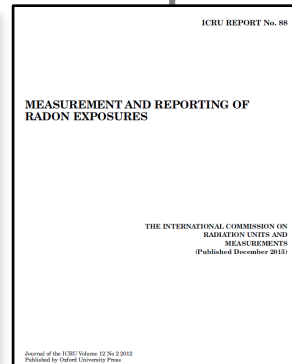
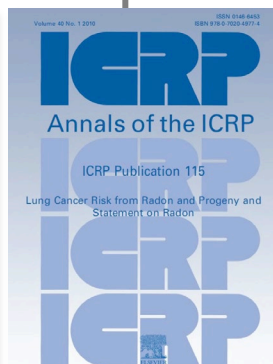
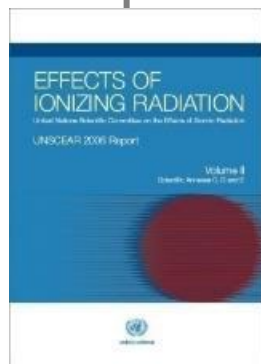


2015



2018

2020



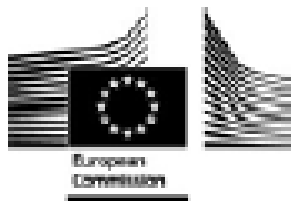
Ionizing Radiation Basic Safety Standards



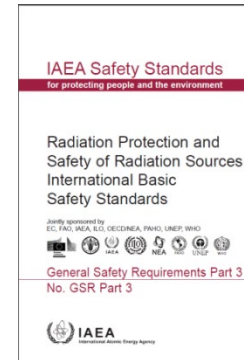
- The **International Radiation Basic Safety Standards (BSS)** are the global benchmark on radiation safety requirements
- BSS cosponsoring organizations are cooperating to foster its **implementation** worldwide

Jointly sponsored by

EC, FAO, IAEA, ILO, OECD/NEA, PAHO, UNEP, WHO



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.

Outline

- Introduction
- Radon, a health issue and a public health issue
- **Radon database – national policies from around the world**

WHO Radon Database

Main objectives:

- Facilitate the implementation of the International Basic Safety Standards
- Enable policy-makers to compare regulations and guidelines globally
- Promote evidence-informed policies on radon
- Provide a tool for people working on public health advocacy at national/local level

The **database** is available on WHO's Global Health Observatory

<https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/gho-phe-radon-database>





THE GLOBAL HEALTH OBSERVATORY

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[Data](#) / [GHO](#) / [Indicators](#)

Existence of any national radon activity



Appears in: [National radon activities](#)

[Visualisations](#)[Data](#)[Metadata](#)[Related indicators](#)

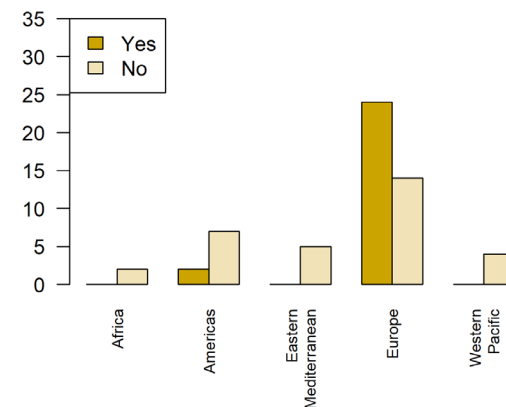
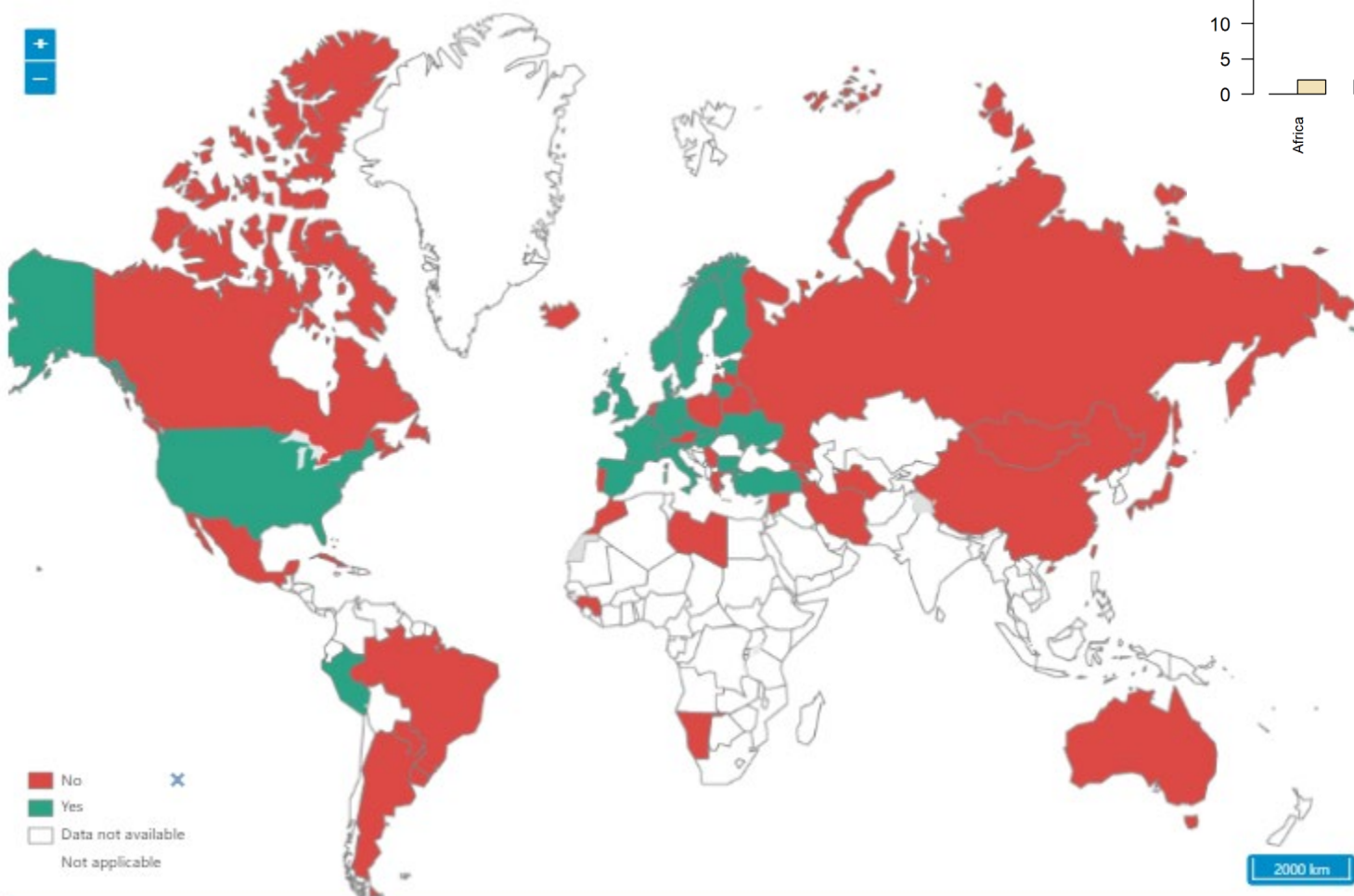
FILTERS

EXPORT DATA in CSV format:
[Right-click here & Save link](#)

Last updated: 2021-06-04

Indicator	Existence of any national radon activity	
Location	2021	2019
Andorra		No
Argentina		Yes
Armenia		No
Australia		No
Austria		Yes
Bahrain		No
Belarus		Yes
Belgium		Yes
Brazil		Yes
Bulgaria		Yes
Canada		Yes
China		Yes
Cuba		Yes
Cyprus		Yes
Czechia		Yes

National Radon Action Plans

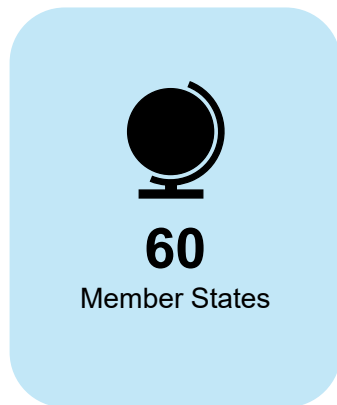


WHO Radon Survey

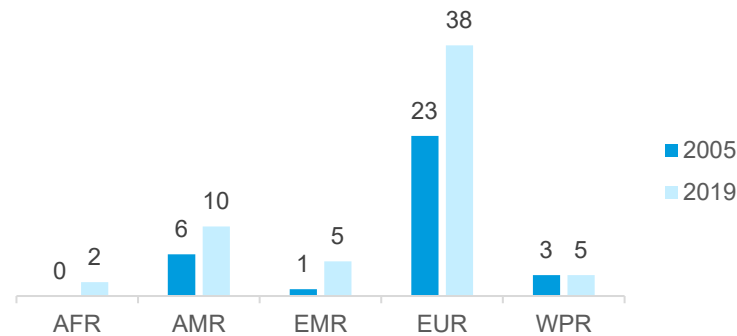
- WHO survey in 2019-21
 1. National radon activities
 2. National radon regulations and action plans
 3. National reference levels
 4. Radon concentration measurements
 5. Radon prevention and mitigation
 6. Radon communication and linkages to other national health-related strategies
- New survey in preparation



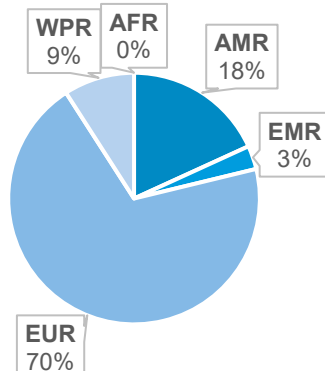
WHO Radon Surveys



of Participating Member States by Region

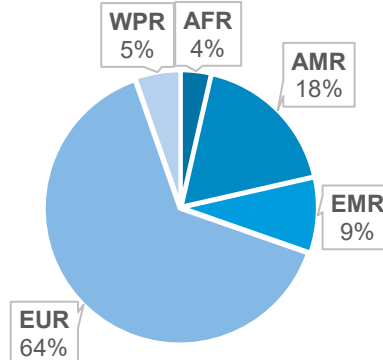


% of Participating Member States by Region (2005)

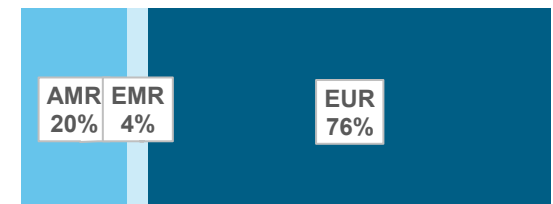


vs.

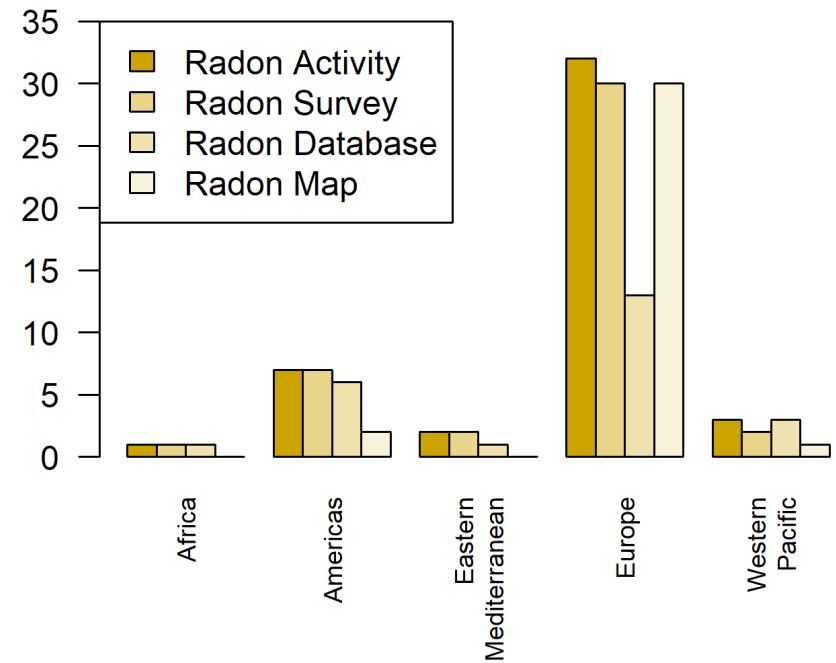
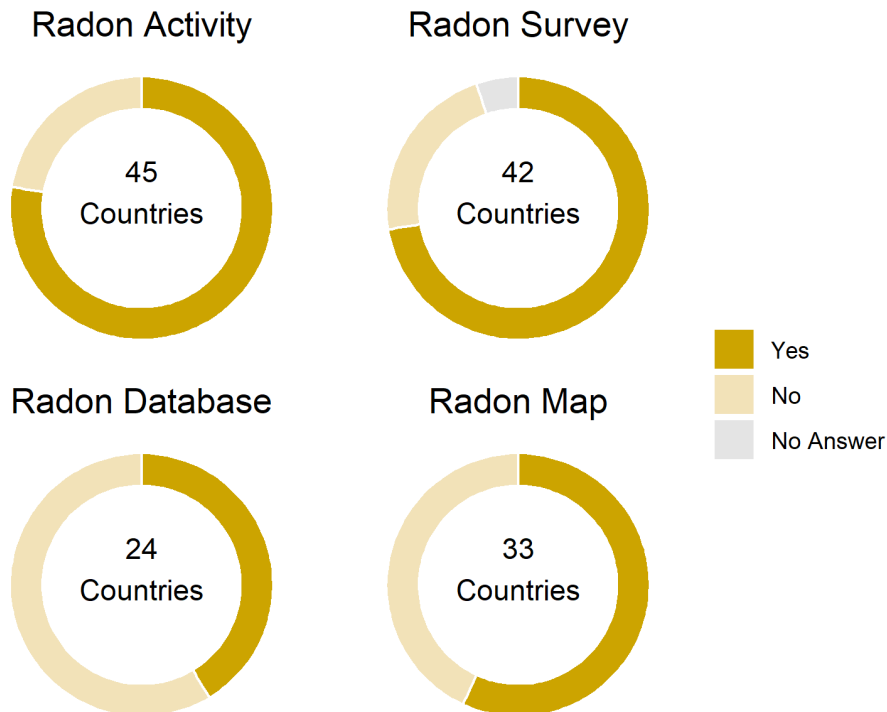
% of Participating Member States by Region (2019)



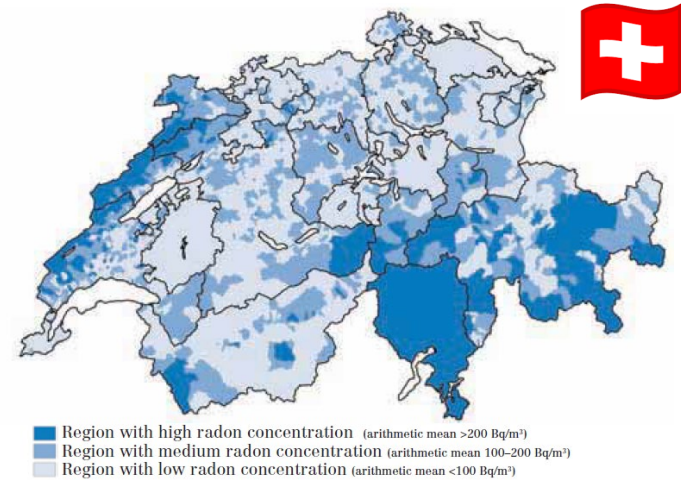
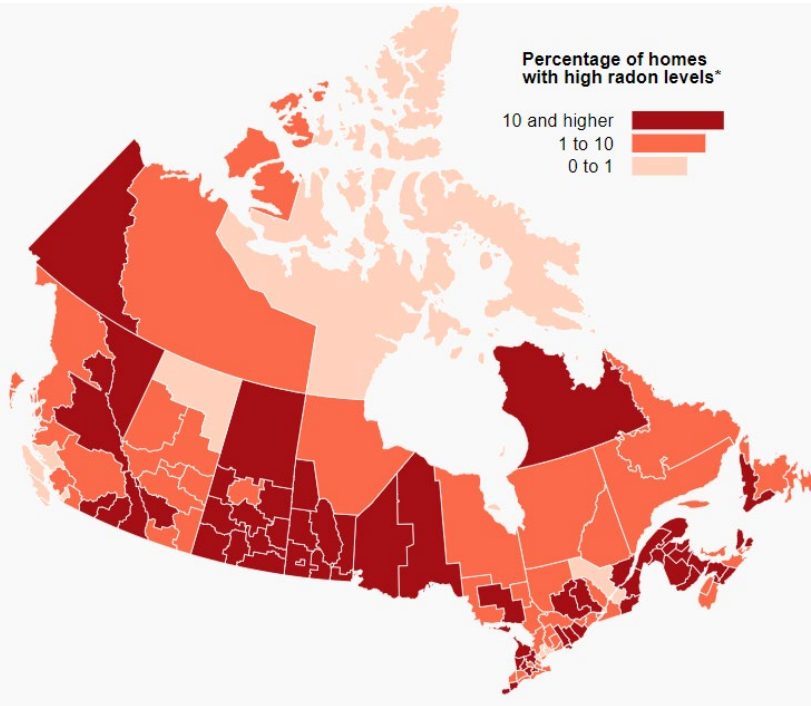
Proportion of Member States Participating in both surveys



National Radon Activities

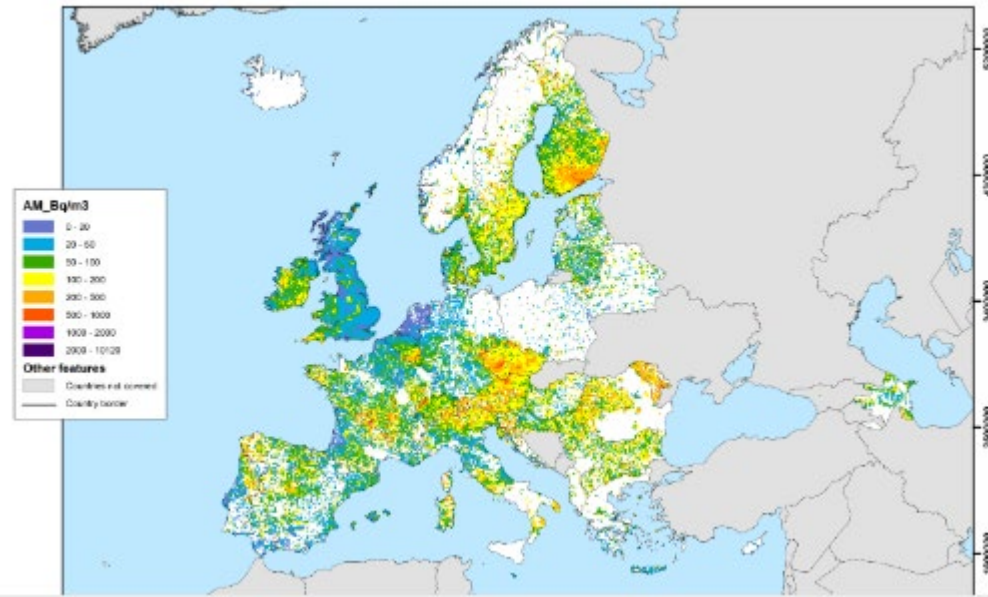


National maps

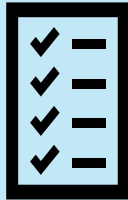


Source: Swiss Federal Office of Public Health (2009)

European Indoor Radon Map, November 2021

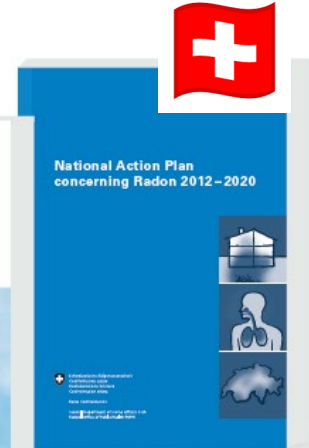
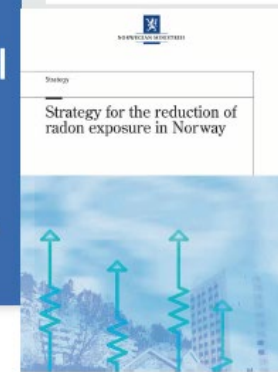
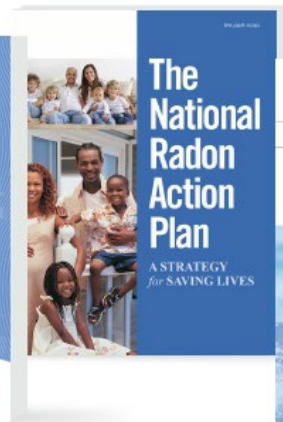
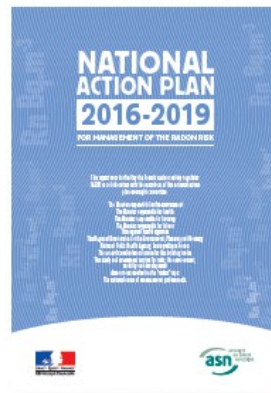


National Radon Action Plans



27/60 =45%

Have national radon action plans

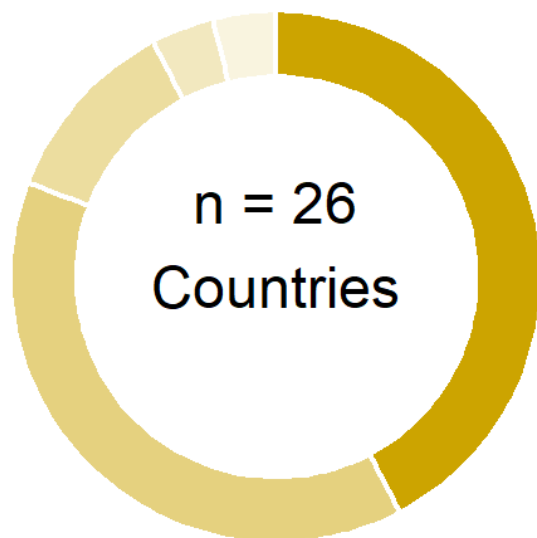


National Radon Action Plans

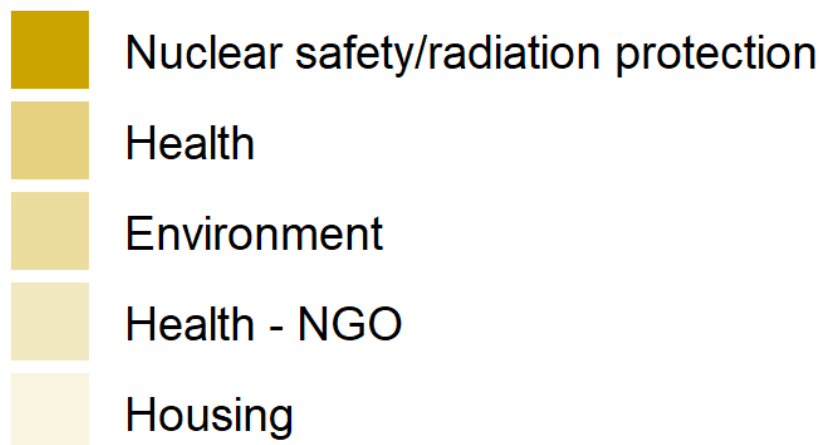
Lead authorities



Radon Action Plan

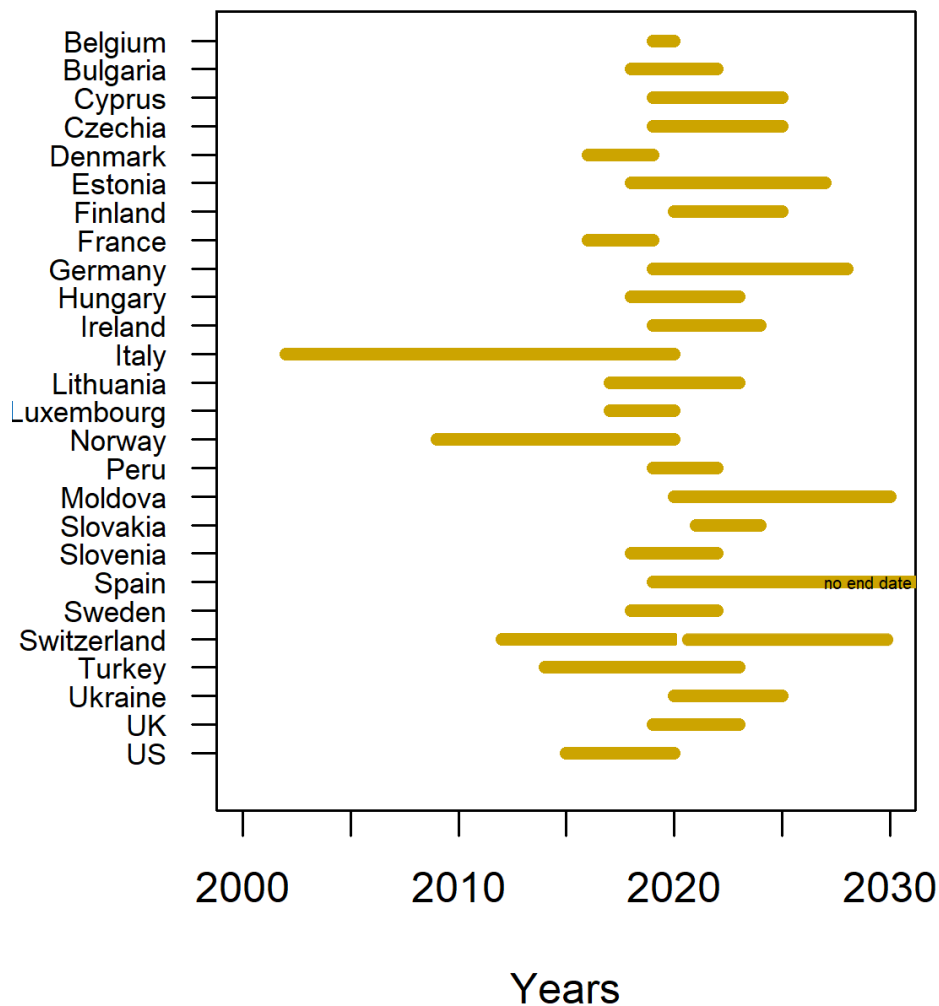


Responsible Authority

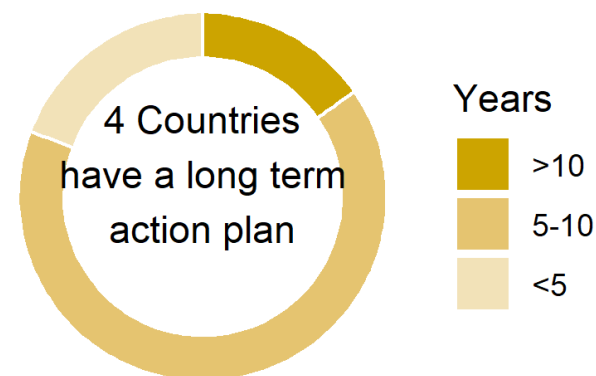


National Radon Action Plans

Duration



Radon Action Plan

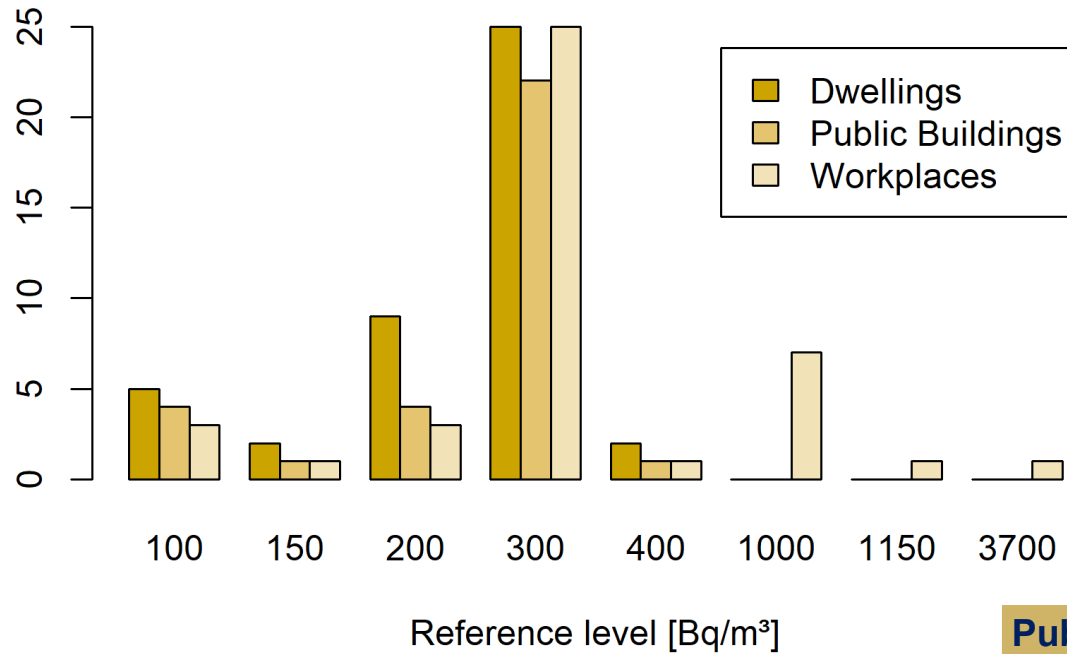


National radon regulations or guidelines

- Existence of national regulations or guidelines for
 - dwellings,
 - buildings with high occupancy factors for members of the public (schools, kindergartens, hospitals,..) and
 - workplaces



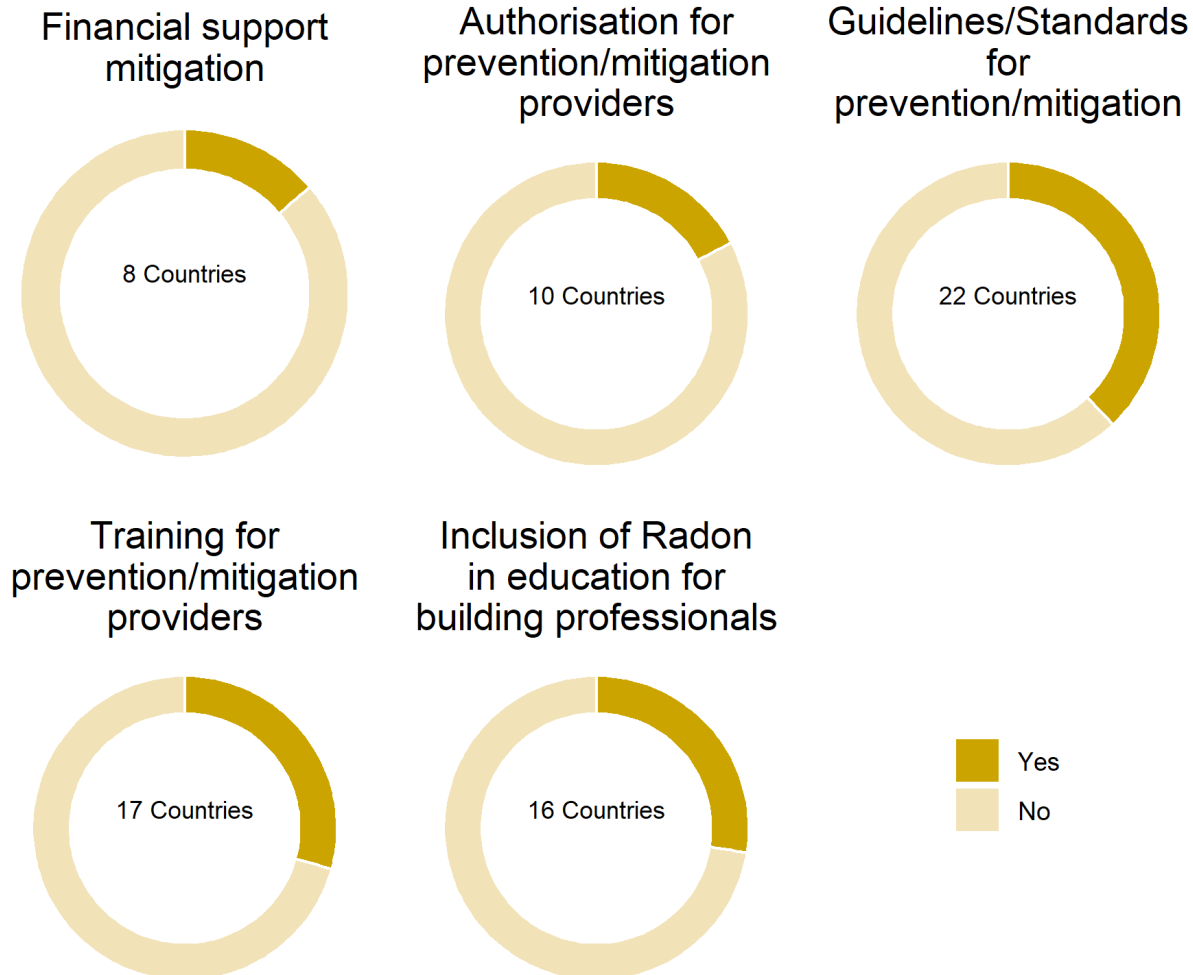
National reference levels



Publication	Year	Public	Workers
WHO handbook	2009	100-300 Bq/m³	N/A
International BSS	2011 (2014)	300 Bq/m³	1000 Bq/m³
EC Council Directive	2013	300 Bq/m³	300 Bq/m³
ICRP 126	2014	300 Bq/m³	300 Bq/m³

Radon Prevention and Mitigation Measures

Overview of the existence of

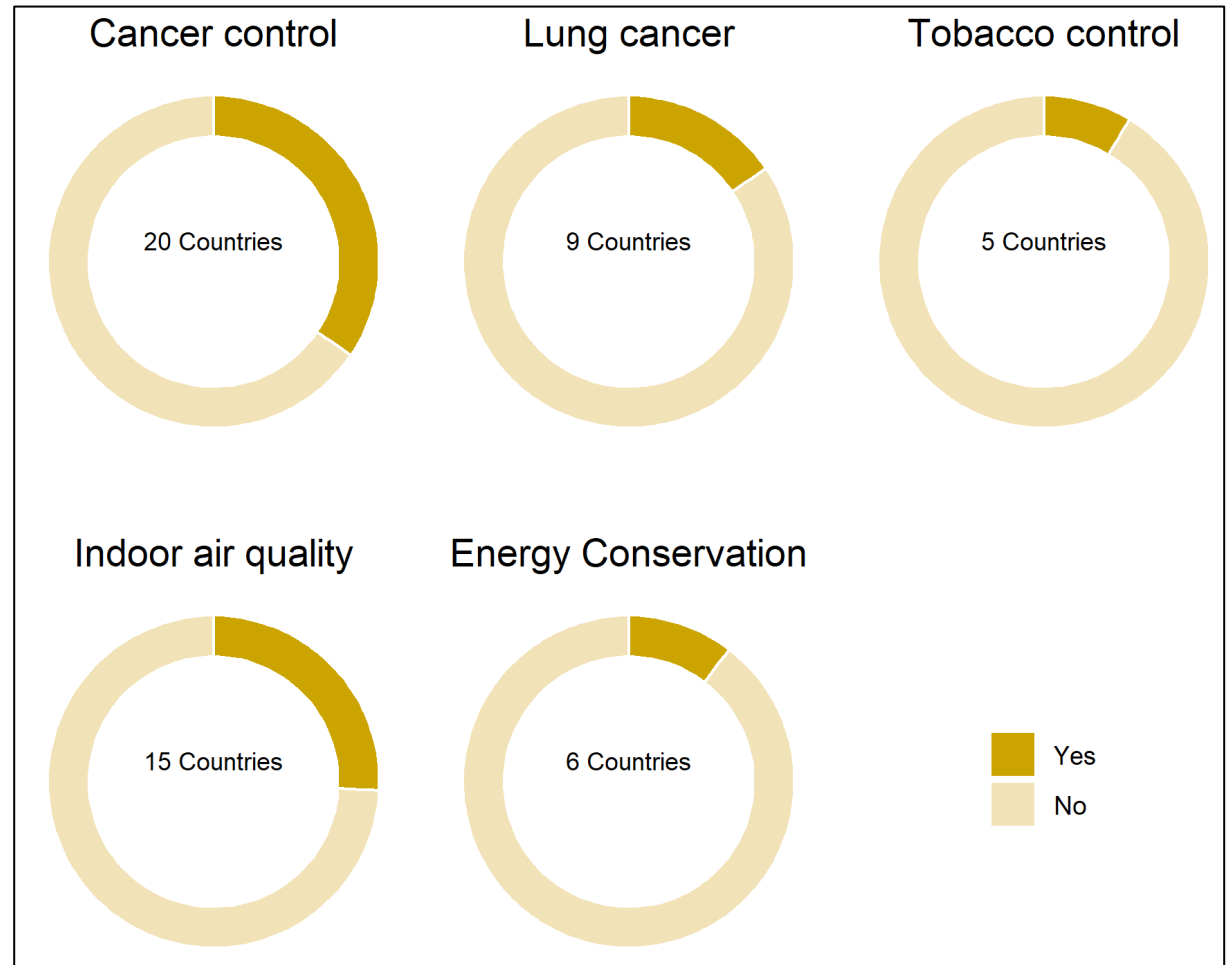


Links to other public health strategies

Linkages to other public health strategies could be an important and efficient tool to increase radon awareness and control radon exposure

Radon as risk factor in

- cancer control strategy, lung cancer reporting/screening, tobacco control strategy, IAQ, energy conservation



Update of the database

- Survey launched in 2019 through WHO Regional Offices to Ministries of Health, and supplemented by direct national contacts in relevant national agencies
- Update needed as some countries have since developed or revised their policies
- Database launched in 2021
- Rolling vs. periodic update

The new online **survey** will be available in June 2025

for Member States to **provide new data** or **update previous entries**

WHO information on radon

- **Health topic: Radon**

<https://www.who.int/health-topics/radon>

- **Fact sheet**

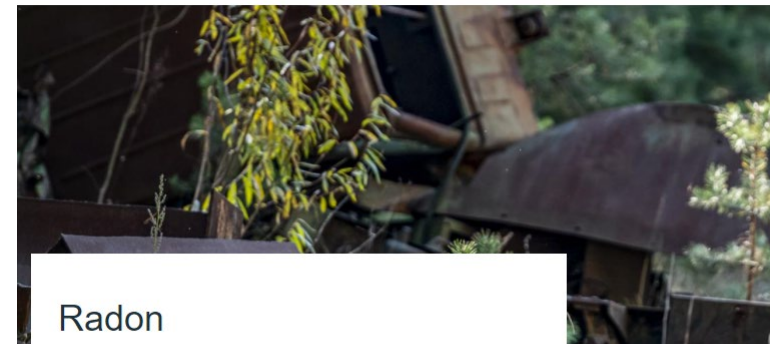
<https://www.who.int/news-room/fact-sheets/detail/radon-and-health>

- **Data**

- The online **survey** is available for Member States to provide new data or update previous entries
<https://extranet.who.int/dataform/622466?lang=en>
- The **database** is available on WHO's Global Health Observatory
<https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/gho-phe-radon-database>

- **WHO Listserv on radon** (> 350 members, > 50 countries)

Home / Health topics / Radon



Overview

Prevention

WHO Response

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Radon database

Appears in: Environment and health

Discussion

Energy efficiency

Importance of ventilation

“To avoid unintended harms of installing insulation, care must be taken to ensure that measures to improve the **warmth** of dwellings also provide **adequate ventilation**. “

“Member States can support measures to **cool housing** through **regulations on minimum requirements for ventilation**, insulation and air conditioning measures through subsidies to support such measures, and through building codes that emphasize the importance of maximizing thermal comfort; and through planning codes that acknowledge the importance of urban design, such as urban forests, shading, wind management and green roofs, in keeping cities cool.”

[WHO Housing and health guidelines](#) (2018)



Energy efficiency

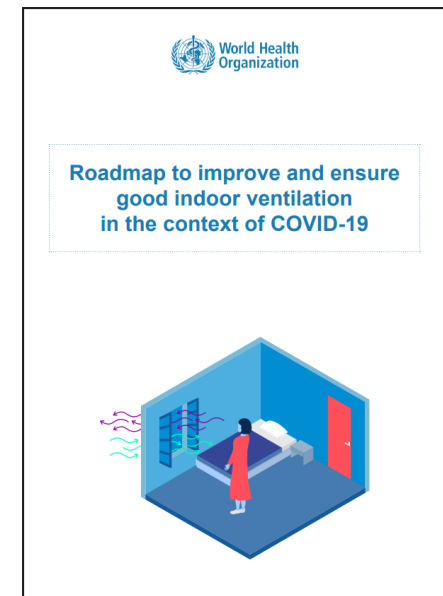
Importance of ventilation

Radon

- “In the quest for improved home energy efficiency, changes to ventilation need to be carefully evaluated to avoid enhanced indoor exposure to radon and risk of lung cancer.”
- [WHO handbook on indoor radon: a public health perspective](#) (2009)

Infection prevention and control (COVID-19)

- [Roadmap to improve and ensure good indoor ventilation in the context of COVID-19](#)



Radon

A contributor to air pollution

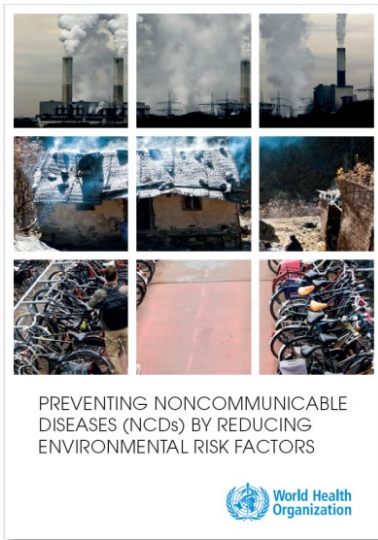
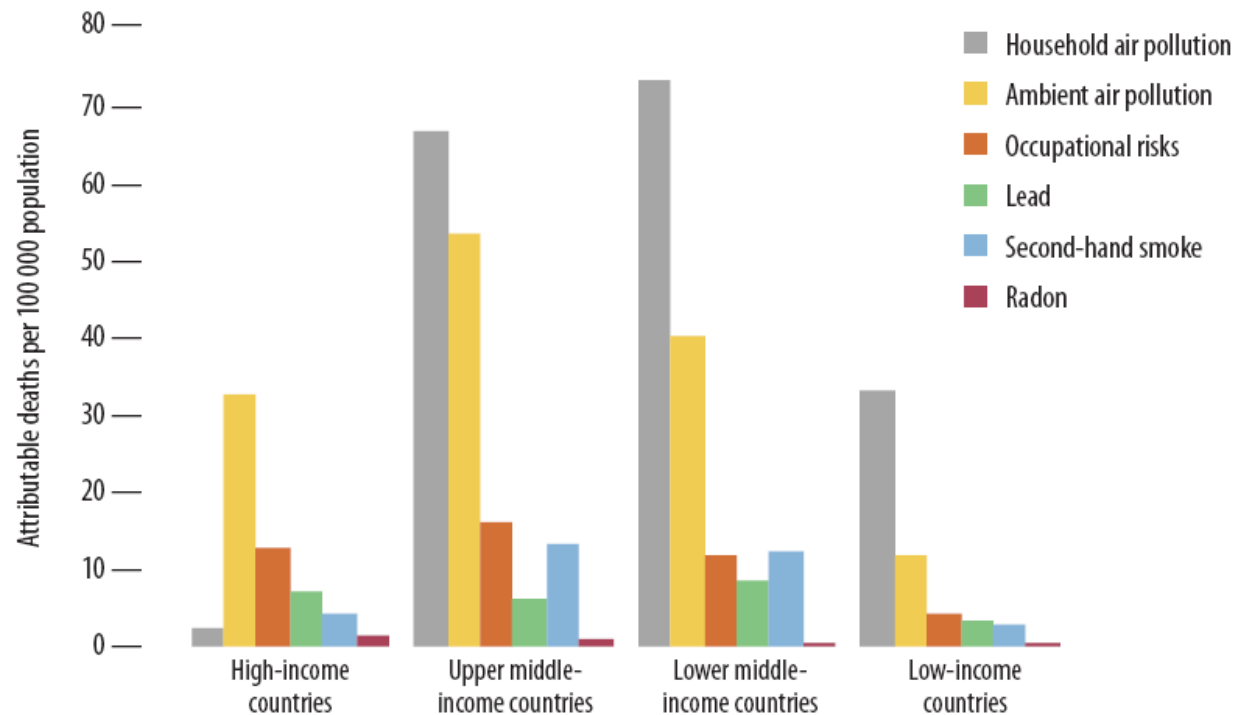


Figure 3. NCD deaths attributable to environmental risks by income level



Sources: Air pollution: (4) for 2012; other risks: (3) for 2015.

Household Air Pollution

Overview

- Some **1/3 global population** is **exposed to harmful HAP** by using **open fires** or **inefficient cook stoves** with solid fuels and kerosene.
- This mainly occurs in **low- and middle-income countries**, especially in **rural areas**.
- **Women** and **children** are the most affected.

▪ HAP:



causes **cardiovascular, respiratory, and other diseases**.
Leading to **> 3 million deaths each year**;



greatly contributes to **climate change** and **ambient air pollution**.



- It is essential to transition to clean fuels and technologies for **protecting health, the climate and the environment**. E.g., solar, electricity, biogas, liquefied petroleum gas, natural gas, alcohol fuels, and biomass stoves that meet the emission targets in the WHO Guidelines.
- WHO developed the **WHO Guidelines for indoor air quality**.

Global conference on air pollution and health:

**Accelerating action for
clean air, clean energy access and climate change mitigation**

**25 - 27 March 2025*
Cartagena, Colombia**

***with pre- and post-conference
sessions on 24 and 28 March**

Experts, key stakeholders and representatives of Member States are being consulted through a collaborative process in advance of the conference.

Participants include Ministers of Health, respective Ministers of Environment, Energy and officials of national, intergovernmental and development agencies; health professionals; mayors, local authorities and planners; critical sectors such as energy, transport, industry, waste and land-use; and delegates from research, academia and civil society.

Attendance is by invitation only.

More information is available at:

<https://www.who.int/news-room/events/detail/2025/03/25/default-calendar/second-global-conference-on-air-pollution-and-health>

Global conference on air pollution and health:

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Triple-win solutions

Improving air quality by implementing well-known and readily available solutions will prevent premature deaths, improve health, drive sustainable economic development and mitigate climate change. Polluted air is a collective problem, it knows no borders. It requires conventions between nations and sectors to identify and implement evidence-based legislation, policies and programmes, innovative financing mechanisms and delivery models.



Promoting and prioritizing an integrated lung health approach

**Draft decision proposed by Bangladesh, Brunei Darussalam,
China, Egypt, Ghana, Guatemala, Japan, Kuwait, Malaysia,
Palestine, Qatar, Romania, Thailand and Vanuatu**

(PP5) Recognizing that **radon exposure** is one of the leading causes of lung cancer after smoking in countries with known data, and acknowledging the lack of prevention and mitigation actions for radon exposure, as well as limited public awareness concerning radon risks;

Thank you!

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