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Criteria for the Control of Food and Drinking Water in the Recovery Phase after a Nuclear or Radiological Emergency

Some views about Drinking Water Quality

Dr Maria del Rosario Pérez
Department Public Health and Environmental & Social Determinants of Health (PHE)

WHO guidelines on drinking water quality

Water quality

- The **quality of water,** whether used for drinking, domestic purposes, food production or recreational purposes, has an important impact on health.
- **Water safety** initiatives support public health, socioeconomic development and well-being.
- WHO has adopted a **strategy** to manage water quality as a framework for action to protect and promote human health.
  - ✓ *Building upon World Health Assembly resolutions (e.g. WHA64/24), millennium development goals (MDGs), human rights to water and sanitation, post 2015 MDG process, …*

Drinking water quality

- The **safety** and **accessibility** of **drinking-water** are major concerns throughout the world.
- Health risks may arise from water consumption (e.g. infectious agents, toxic chemicals, radioactivity)
- Improving **access to safe drinking-water** can result in tangible improvements to health

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WHO guidelines on drinking water quality

- WHO norms on water quality and human health in the form of **drinking water quality guidelines** (**DWQG)** are used as the basis for regulation and standard setting worldwide.

- The WHO DWQG were updated in 2011. A working group was established to review and update the chapter 9 (**radiological aspects**), including WHO staff from PHE Radiation Team, experts from the DWQ Advisory Group, WHO Collaborating Centres (IRSN, BfS, HPA) and IAEA.

- The 4th Edition of the WHO Guidelines on DWQ was published on 2011

http://www.who.int/water_sanitation_health/publications/2011/dwq_guidelines/en/index.html

WHO DWQG / target audience

- Addressed primarily to **water and health regulators**, **policymakers and their advisors**, to assist in the development of national standards and as a source of information on water quality and health and on effective management approaches.

- Recognized as representing the position of the UN system on issues of drinking-water quality and health by “UN-Water”, the body that coordinates among the 24 UN agencies and programmes concerned with water issues.

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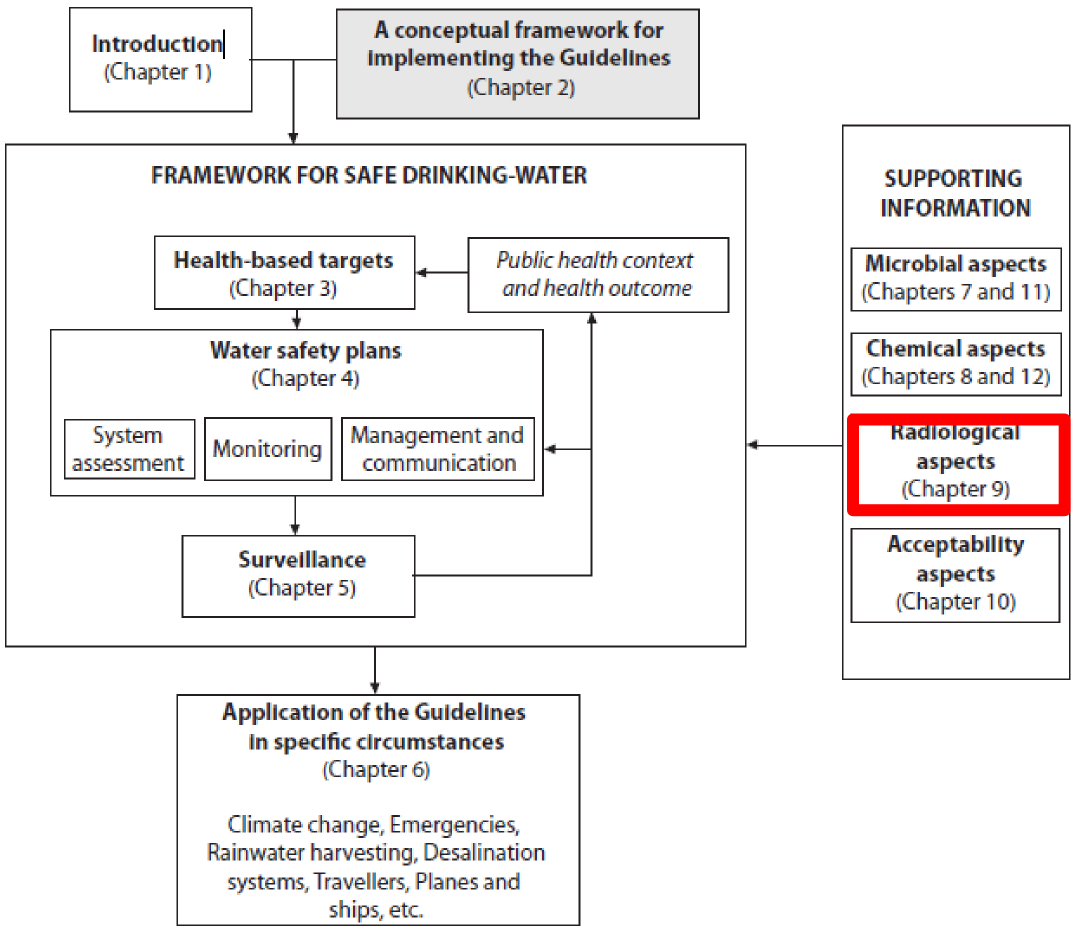
Conceptual framework



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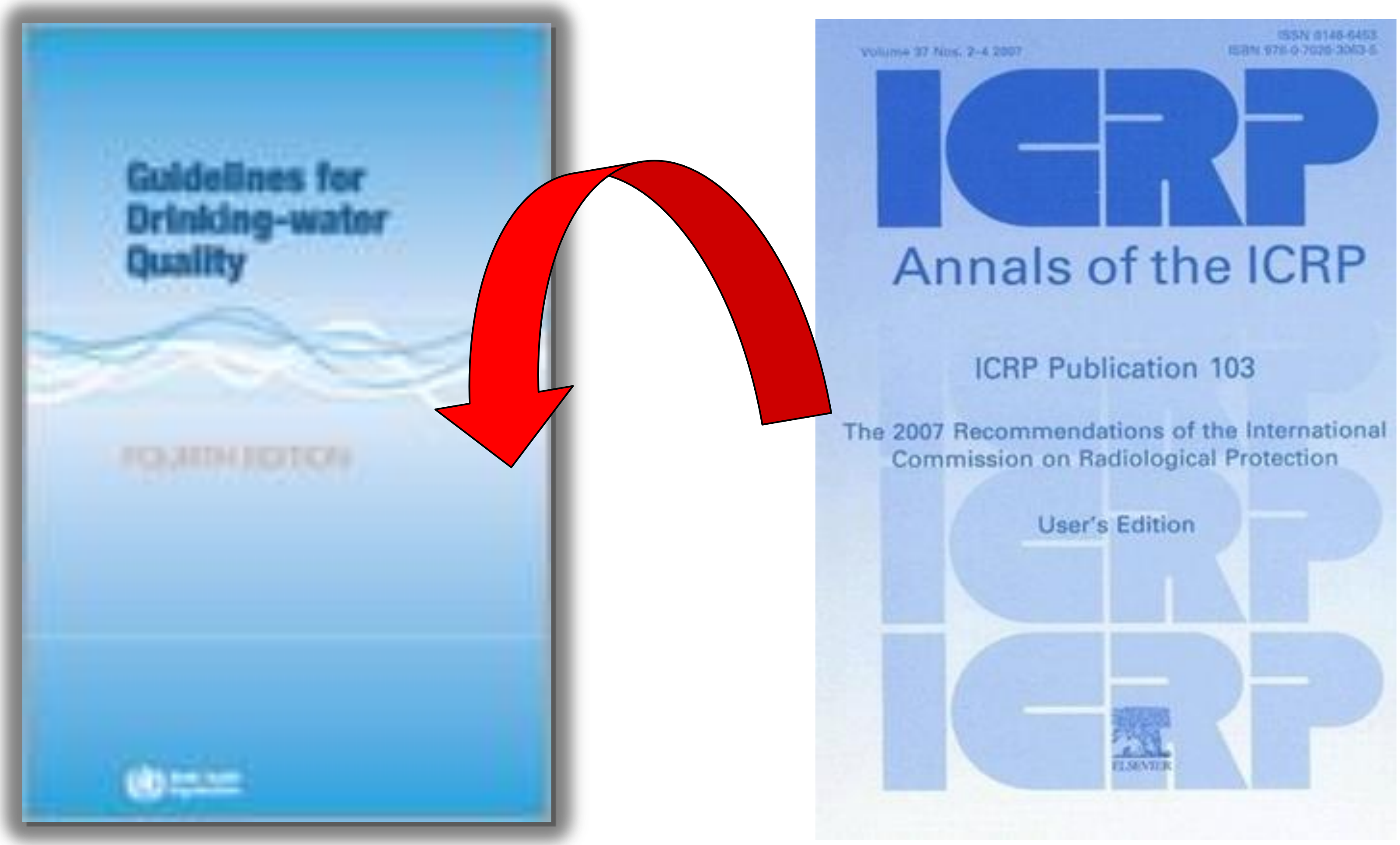
Health/based targets in the framework

- Health-based targets: essential component of the drinking-water safety framework.

- Established by a high-level authority responsible for health in consultation with others, including water suppliers and affected communities

- They must take account of the importance of ensuring access to water for all consumers.

Chapter 9 of the WHO DWQG takes into account the latest ICRP recommendations



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Radiological aspects

- Radiological risks are normally **small** compared with the risks from microorganisms and chemicals that may be present in drinking-water.
- Except in extreme circumstances, the radiation dose resulting from the ingestion of radionuclides in drinking-water is **much lower** than that received from other sources of radiation.
- When considering what action to take in assessing and managing radiological risks, care should be taken to ensure that scarce resources are not diverted away from other, more important public health concerns.

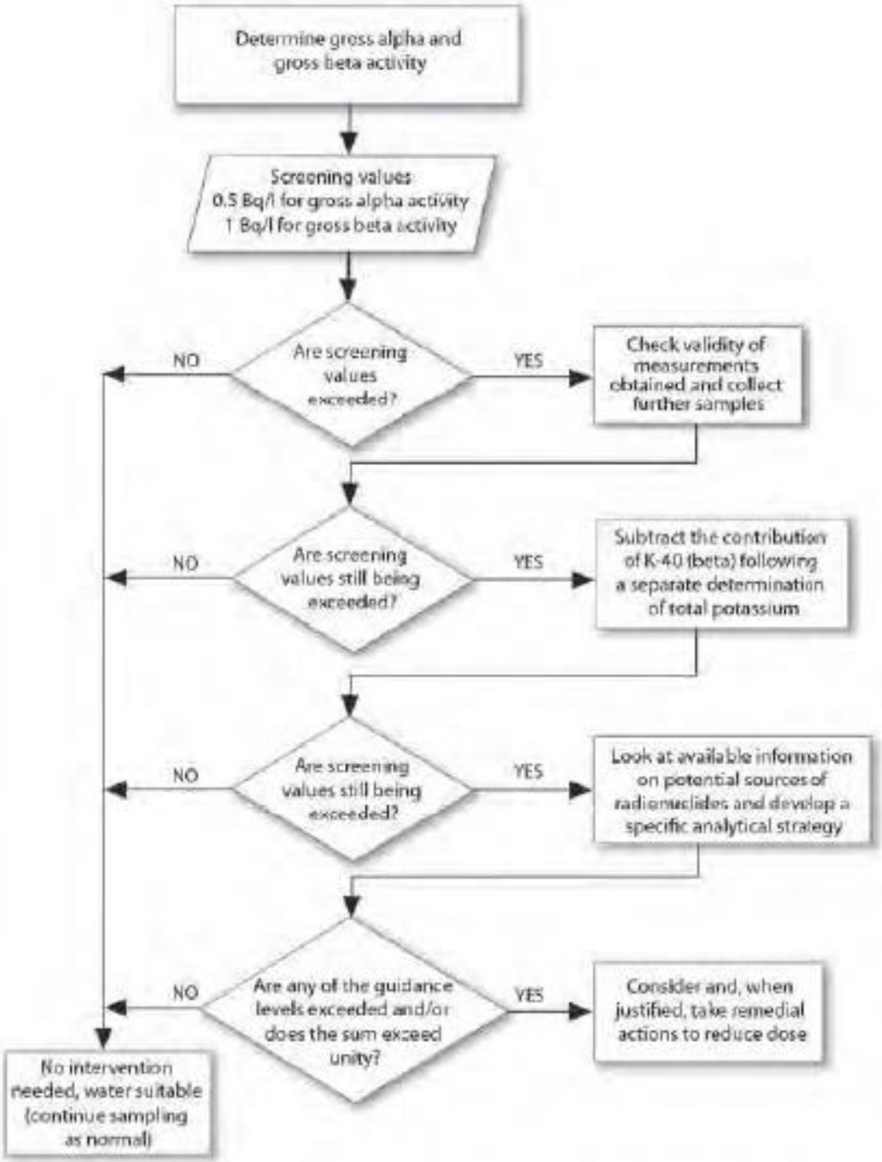

Figure 9.2 Application of screening and guidance levels for radionuclides in drinking-water

Strategy for assessing drinking-water if screening levels are exceeded

$$\sum_i \frac{C_i}{GL_i} \leq 1$$

where:

Ci = measured activity concentration of radionuclide

GL = guidance level of radionuclide *I* that, at an intake of 2 litres/day1 for 1 year, will result in an effective dose of 0.1 mSv/year.

How to interpret this equation?

- If any of the guidance levels is exceeded, then the sum will exceed unity. The sum may also exceed unity even if none of the individual guidance levels is exceeded.

- Where the sum exceeds unity for a single sample, the IDC of 0.1 mSv/year would be exceeded only if the exposure to the same measured concentrations were to continue for a full year.

- ***<u>Hence, such a result does not in itself imply that the water is unsuitable for consumption.</u>***

Table 9.2 Guidance levels for common[a] natural and artificial radionuclides for members of the public

Category	Radionuclide	Dose coefficient (Sv/Bq)	Guidance level[b] (Bq/l)
Naturally occurring radioactive isotope that starts the uranium decay series[c]	Uranium-238	4.5×10^{-8}	10
Naturally occurring radioactive isotopes belonging to the uranium decay series	Uranium-234	4.9×10^{-8}	1
	Thorium-230	2.1×10^{-7}	1
	Radium-226	2.8×10^{-7}	1
	Lead-210	6.9×10^{-7}	0.1
	Polonium-210	1.2×10^{-6}	0.1
Naturally occurring radioactive isotope that starts the thorium decay series	Thorium-232	2.3×10^{-7}	1
Naturally occurring radioactive isotopes belonging to the thorium decay series	Radium-228	6.9×10^{-7}	0.1
	Thorium-228	7.2×10^{-8}	1

Artificial radionuclides that can be released to the environment as part of the fission products found in reactor emissions or nuclear weapons tests	Caesium-134[d]	1.9×10^{-8}	10
	Caesium-137[d]	1.3×10^{-8}	10
	Strontium-90[d]	2.8×10^{-8}	10
Artificial radionuclide that can be released to the environment as a fission product (see above). It is also used in nuclear medicine procedures and thus can be released into water bodies through sewage effluent.	Iodine-131[d,e]	2.2×10^{-8}	10
Radioactive isotope of the hydrogen produced artificially as a fission product from nuclear power reactors and nuclear weapons tests. It may be naturally present in the environment in a very small amount. Its presence in a water source suggests potential industrial contamination.	Tritium[e]	1.8×10^{-11}	10 000
Naturally occurring radioactive isotope widely distributed in nature and present in organic compounds and in the human body	Carbon-14	5.8×10^{-10}	100
Artificial isotope formed in nuclear reactors that also exists in trace quantities in *natural* uranium ores	Plutonium-239[d]	2.5×10^{-7}	1
Artificial isotope by-product formed in nuclear reactors	Americium-241[d]	2.0×10^{-7}	1

Monitoring programmes

- Criteria for monitoring taking into account local conditions.
  - New water supplies vs. existing supplies
  - Are measured concentrations consistently below screening levels?
  - Are there sources of potential radionuclide contamination nearby? Are they expected to be changing rapidly with time?

- Graded approach to sampling frequency also commensurate with the size of the population served, the expected variability of radionuclide concentrations and the availability and results of historical monitoring records, taking into account available resources and potential risks.

Implementation of DWQ guidance values

- Both the screening levels and guidance levels (**GLs**) are **highly conservative**. Although the majority of water supplies comply with them, occasionally, guidance levels might be consistently exceeded (one RN or a combination of RNs).

- National authorities will make a decision regarding the need to implement remedial measures or to place some restriction. **One key consideration is the extent to which the GLs are exceeded.**

DWQG and BSS

- **BSS** requirement: highest annual individual doses do not exceed a value of approximately **1 mSv**.
- This is **neither an "acceptable" dose nor a dose limit**: all reasonable efforts should be made to minimize the doses received.
- Each situation will be different, and non-radiological factors, such as the costs of remediation and the availability of other drinking-water supplies, will need to be taken into account in reaching a final decision.

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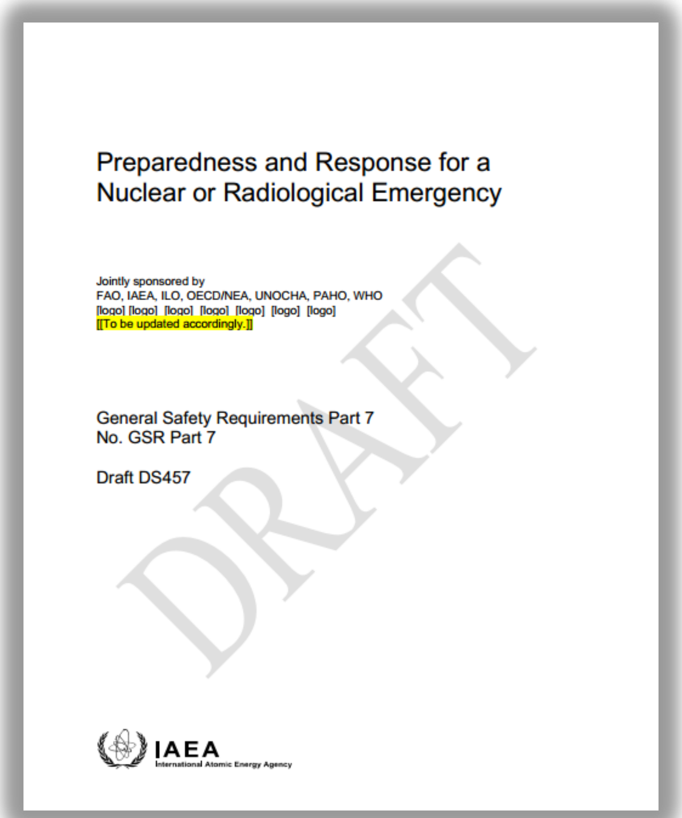
Radon in drinking water

- Radon can be released from water that is intended for human consumption. Underground rock containing natural uranium releases radon into the surrounding water.
- Radon is readily released from surface water into the air. Groundwater, on the other hand, is known to have a higher concentration of radon.
- In most cases radon from drinking water contributes only marginally to the overall radiation dose from radon. Several treatment options to reduce elevated radon concentrations in drinking water supplies are available.

In emergencies…


Preparedness and Response for a
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[[To be updated accordingly.]]

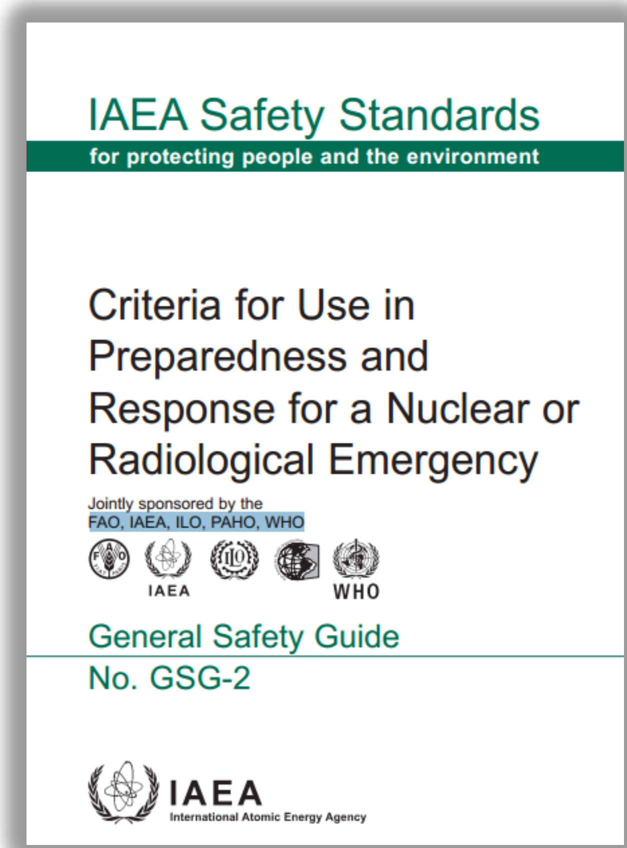
General Safety Requirements Part 7
No. GSR Part 7

Draft DS457

DRAFT

IAEA
International Atomic Energy Agency

Revision finished, to be published in 2015


IAEA Safety Standards
for protecting people and the environment

Criteria for Use in
Preparedness and
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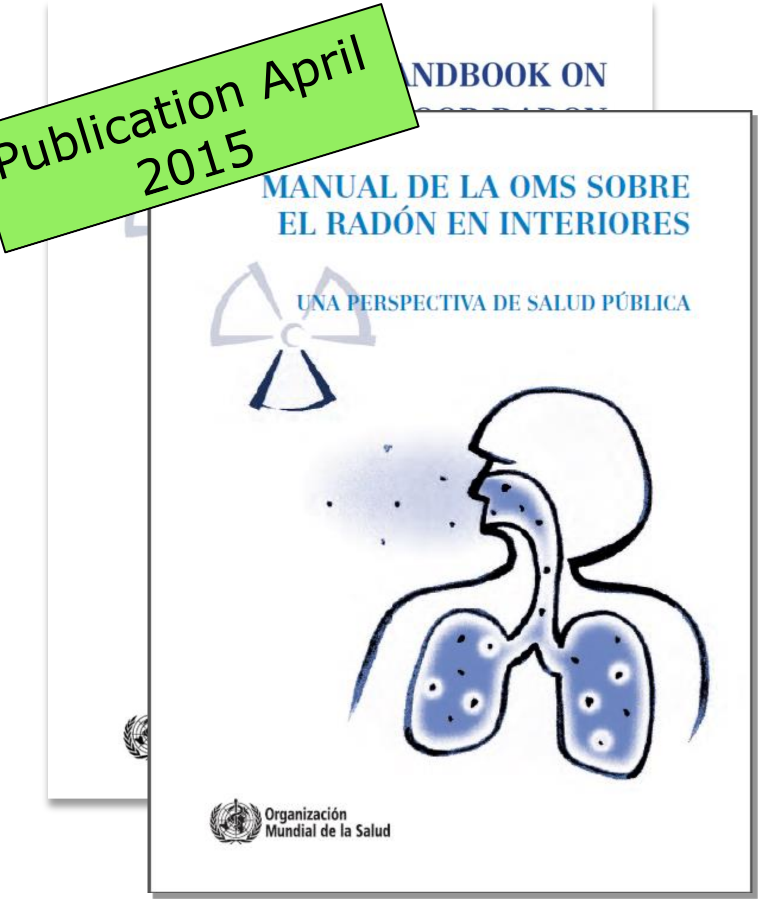
WHO Handbook on Indoor Radon



1. **Efectos del radon sobre la salud**
2. **Mediciones del radon**
3. **Prevención y mitigación del radon**
4. **Costoeficacia del control del radon**
5. **Comunicación de los riesgos del radon**
6. **Programas nacionales de radon**

http://www.who.int/ionizing_radiation/env/9789241547673/en/

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Scope of application of DWQG

- **WHO DWQG** are applied under **planned and existing** exposure situations

- For emergency exposure situations guidance for food and drinking water is provided in:
  - ***General Safety Requirements Part 7 GSR Part 7 "****Preparedness and Response for a Nuclear or Radiological Emergency" FAO, IAEA, ILO, OECD/NEA, UNOCHA, PAHO, WHO (2015).*
  - ***General Safety Guide GSG-2 "****Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency" FAO, IAEA, ILO, PAHO, WHO (2011).*

Thank you very much!
Muchas gracias !
Muito obrigada !