

European Atlas of Natural Radiation: publication and online version

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What is the Atlas? What does it contain?

 Encyclopaedia of natural radiation: it describes the different sources of this kind of radioactivity and represents the current state of knowledge on this topic.

 <u>Collection maps</u> of Europe that show the levels of natural background radiation from various sources: cosmic radiation, terrestrial radionuclides and radiation, indoor radon



Aims of the Atlas

 Provide <u>reference values</u> as well as <u>harmonised</u> data for the scientific community and national competent authorities

- A tool for the public:
 - ✓ to familiarise itself with natural radioactivity; and
 - ✓ to be informed about levels of natural radioactivity caused by different sources.
 - √ have a more balanced view of the annual dose received by the world's population



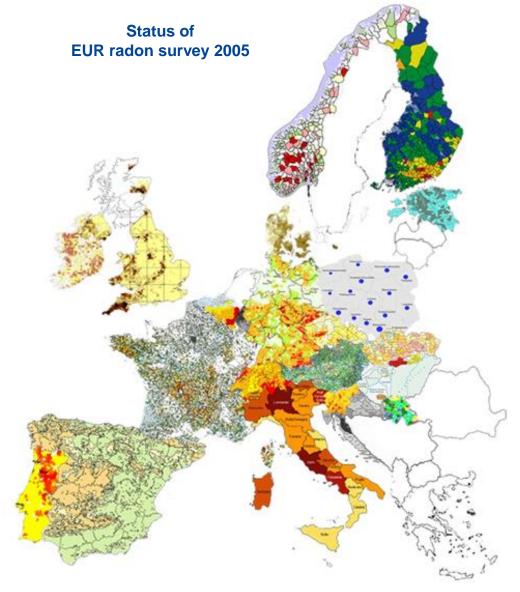
A bit of history....

EUR radon survey 2005:

- Many countries had radon "maps" (indoor conc., radon potential etc.)
- Measurement techniques and strategies differ between countries
- Different mapping methods and visualization techniques
- => Colourful patchwork (but not very useful for analysis)

Prague Radon conference 2006:

 JRC to collect statistics of these data from National Authorities on 10 km x 10 km grid cells



Dubois, G. (2005): An Overview of Radon Surveys in Europe EUR Report 21892



European Indoor Radon Map

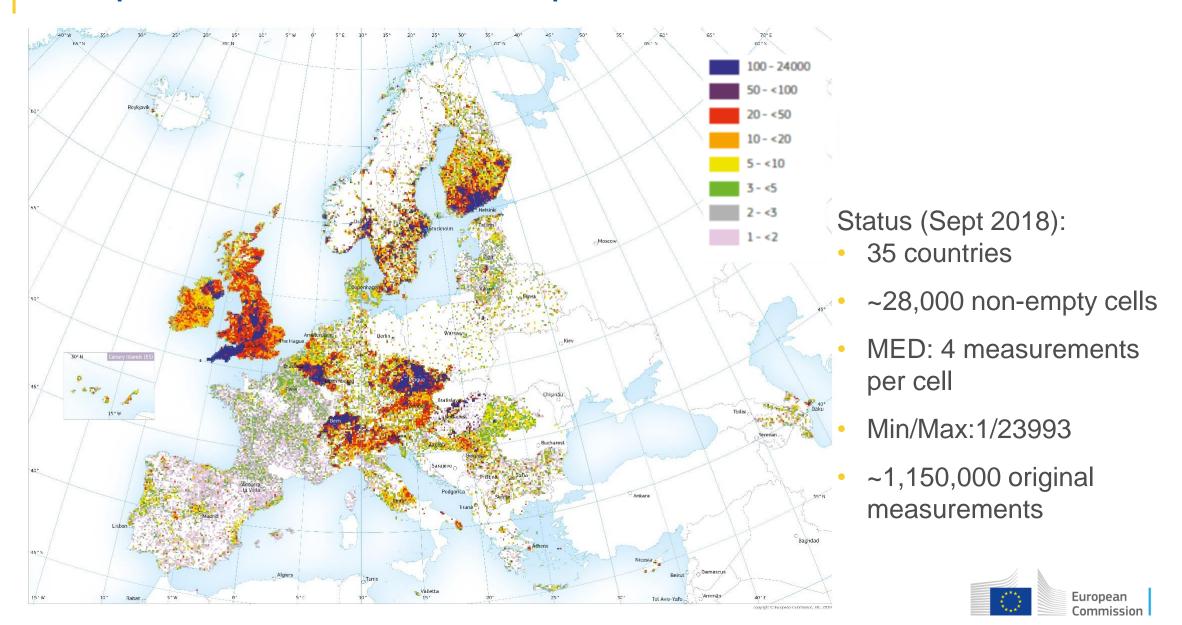
- 10 km x 10 km grid cells
- Living rooms, ground floor
- Participants send statistics:
 - ✓ Arithmetic mean (AM);
 - ✓ Standard deviation (SD);
 - ✓ AM and SD of the In-transformed data;
 - ✓ Median (MED);
 - ✓ Minimum (Min) and maximum (Max);
 - ✓ Number of original measurements per cell (N).

Participants:

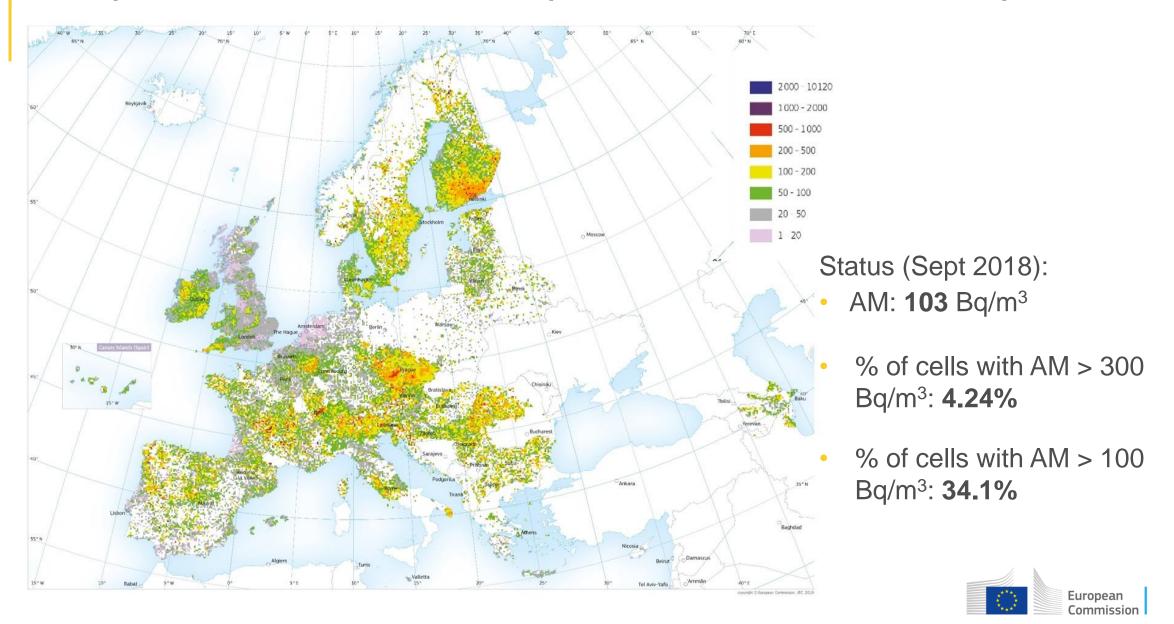
- 2007: AT, CH, FI, LT, PL, UK
- 2008: BE, CZ, DE, EE, ES, PT
- 2009: AL, DK, FR, HR, IT, NL, SI
- 2010: GR, HU, MK
- 2011: NO, RO
- 2012:
- 2013:
- 2014: IS
- 2015: AZ, BG, IE, MT, SE
- 2016:
- 2017: LU
- 2018: BY, CY, LV, RS



European Indoor Radon Map: Number of measurements



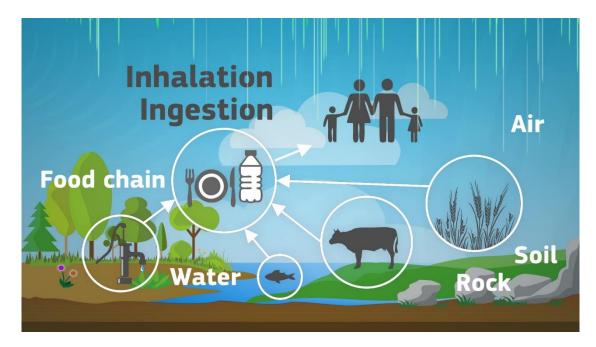
European Indoor Radon Map: Arithmetic mean in Bq/m³



In addition to indoor radon map...

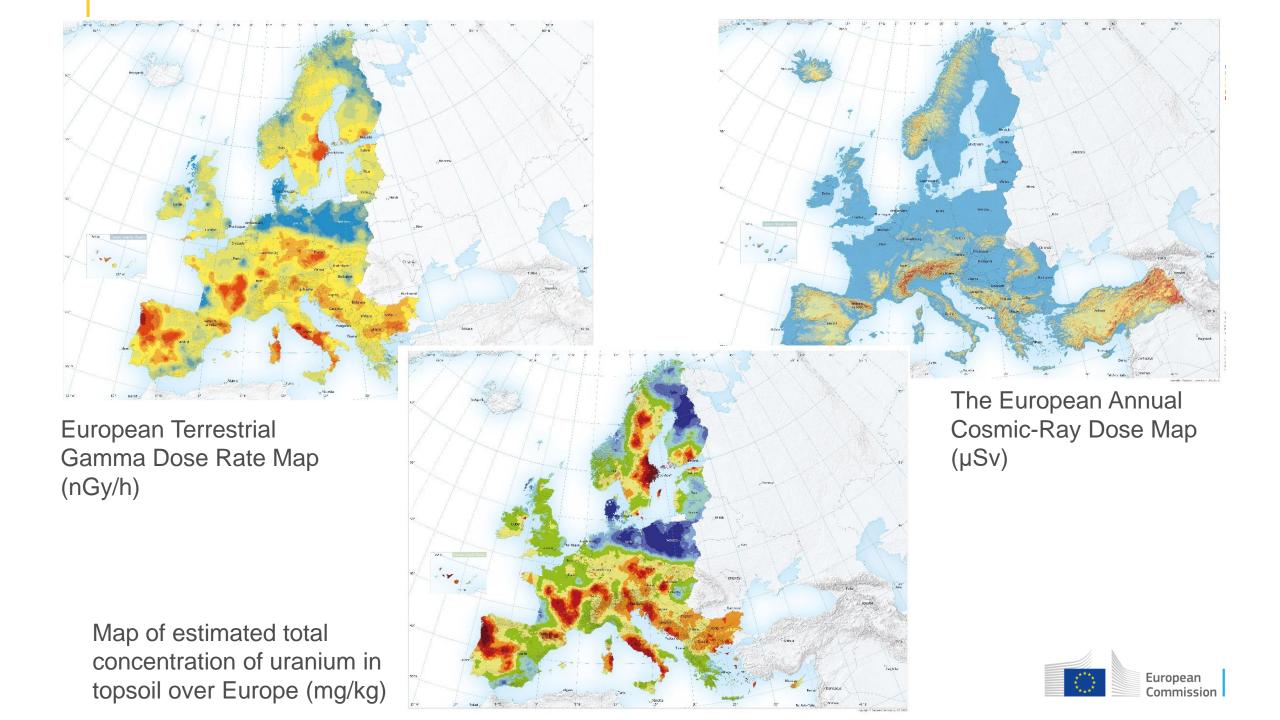
The Atlas provides a clear overview of **all natural sources** of radiation and contains maps displaying these sources*:

- Cosmic Radiation
- U, Th and K in soil and rocks
- Terrestrial gamma dose rate



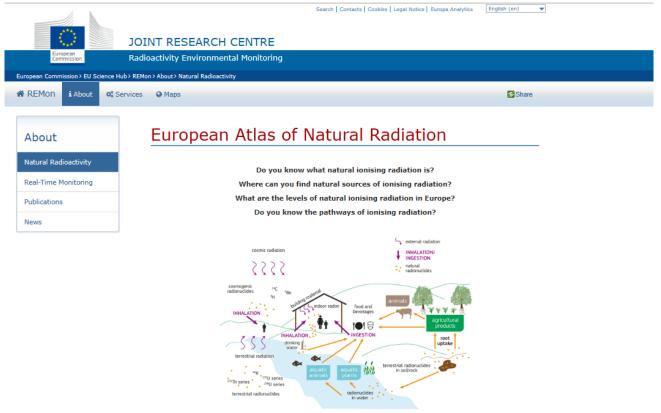
^{*}Water and food: no maps developed but there are chapters describing the topic and the state of art





How to get the Atlas

https://remon.jrc.ec.europa.eu/About/Atlas-of-Natural-Radiation



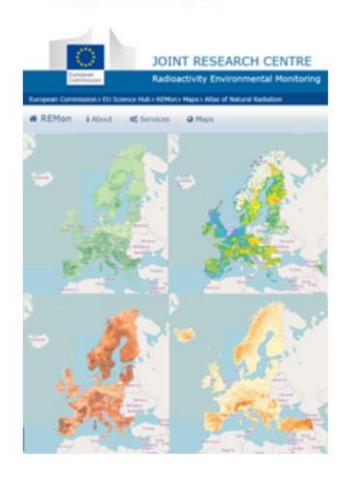
Natural radionuclides, both terrestrial and cosmogenic, migrate in the environment through different pathways: air, water, rock, soil and the food chain. Radionuclides may then enter the human body through ingestion (food and drinking water) and inhalation giving, so-called, internal exposure. External exposure is due to cosmic radiation and radiation from terrestrial radionuclides present in soil, rocks and building materials.

The first-ever detailed European Atlas of Natural Radiation uses informative texts, stunning photographs and striking maps to answer and explain these and other questions. This Atlas aims to provide reference values and harmonized data for scientific community and national competent authorities. At the same time, it should help the public to become familiar with natural radioactive environment.

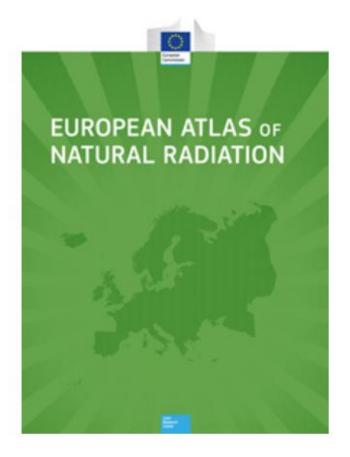


Publication and Online version

Online version



Download Publication





Digital Atlas of Natural Radiation

The human population is continuously exposed to ionizing radiation from several natural sources that can be classified in two categories:

- Cosmic contribution: high-energy cosmic rays incident on the Earth's atmosphere and releasing secondary radiation
- Terrestrial contribution: radioactive nuclides generated during the formation of the Earth and still present in the Earth's crust: mostly uranium and thorium radioactive families together with potassium (⁴⁰K), which is a long-lived radioactive isotope of the elemental potassium. In most circumstances radon, a noble gas produced in the radioactive decay of the Uranium progeny, is the major contributor to the total dose.

On this page

- · Annual cosmic-ray dose
- · Indoor radon concentration
- Indoor radon No of measurements
- Uranium in soil
- Thorium in soil
- Potassium in soil
- Terrestrial gamma dose
- Uranium in bedrock
- Thorium in bedrock
- · Potassium in bedrock
- · Soil permeability
- Geogenic radon

The European Atlas of Natural Radiation

The European Atlas of Natural Radiation is a collection of maps displaying the levels of radioactivity caused by different natural sources in Europe.

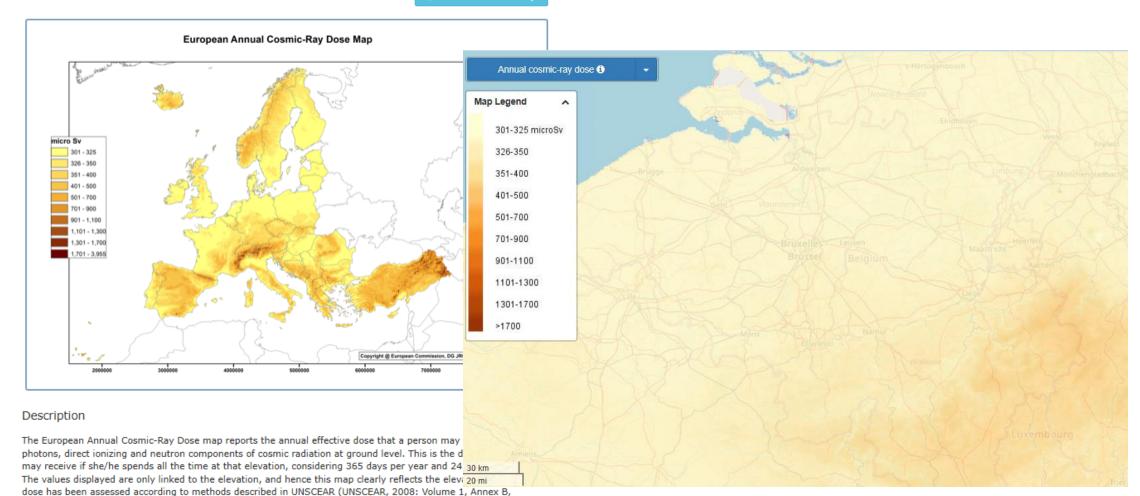
The Atlas is intended to familiarise the public with the radioactive environment, to give a more balanced view of the annual dose that it may receive from natural radioactivity and to provide reference material and generate harmonised data for the scientific community. The overall goal of the Atlas is to estimate the annual dose that the public may receive from natural radioactivity, combining all the information from the different maps. Indeed, natural ionizing radiation is considered the largest contributor to the collective effective dose received by the world population.

The Atlas is developed and maintained by the Joint Research Centre of the European Commission.



Annual cosmic-ray dose

◀ Back to the list of maps



References

 Giorgia Cinelli, Valeria Gruber, Luca De Felice, Peter Bossew, Miguel Angel Hernandez-Ceballos, Tore Tollefsen, Stefan Mundigl & Marc De Cort. European annual cosmic-ray dose: estimation of population exposure. Journal of MapsVol. 13, Iss. 2,2017. http://dx.doi.org/10.1080/17445647.2017.1384934

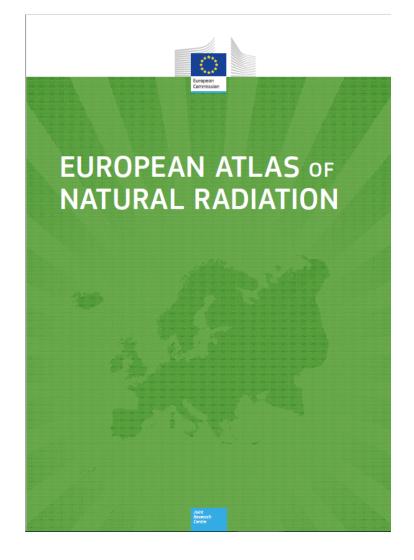
Chap.2) and a global digital elevation model (DEM), called the GTOPO30 dataset (https://lta.cr.usgs.gov/GTOPO30), was used. Such a dataset was derived from several raster and vector sources of topographic information and is a

raster georeferenced TIFF with a horizontal grid spacing of 30 arc seconds (approximately 1 km).

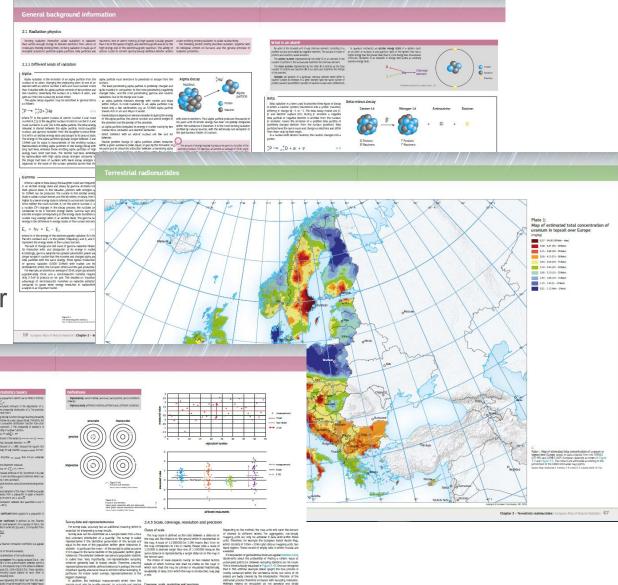
UNSCEAR (United Nations Scientific Committee on the effects of Atomic Radiation) (2008). Sources and effects
of ionizing radiation. Report to General Assembly, Annex B, United Nations, New York.



Atlas Publication



- A3 format
- 190 pp
- Digital and paper





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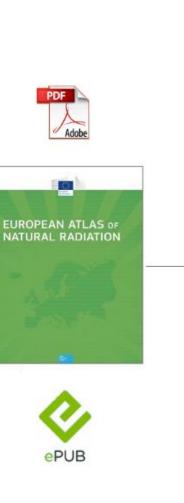
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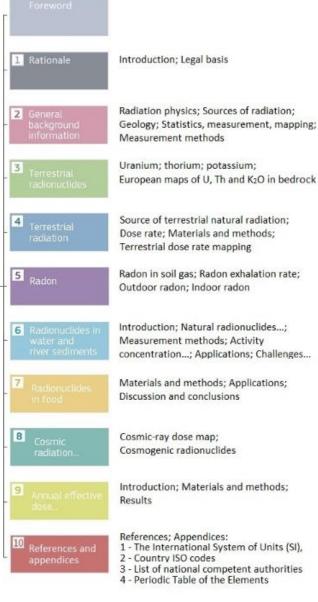
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Who made the Atlas possible?

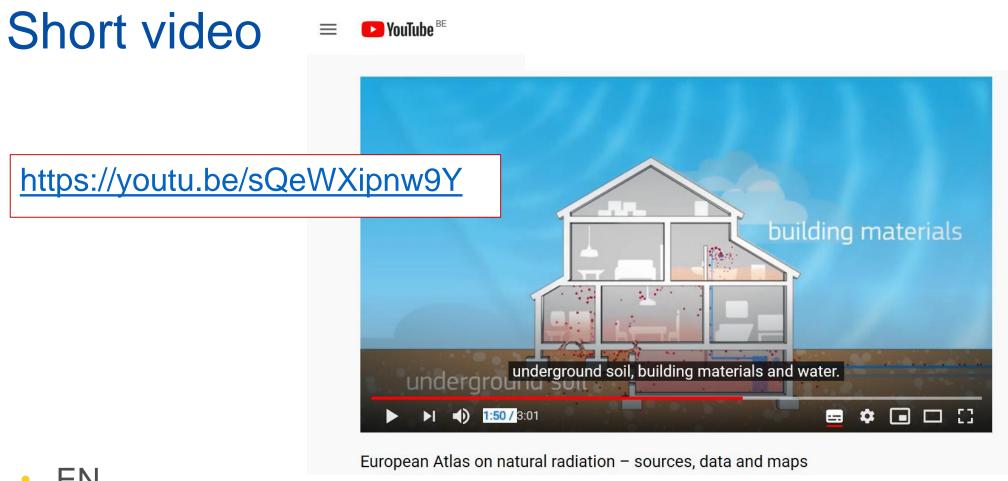
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Thank you



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