



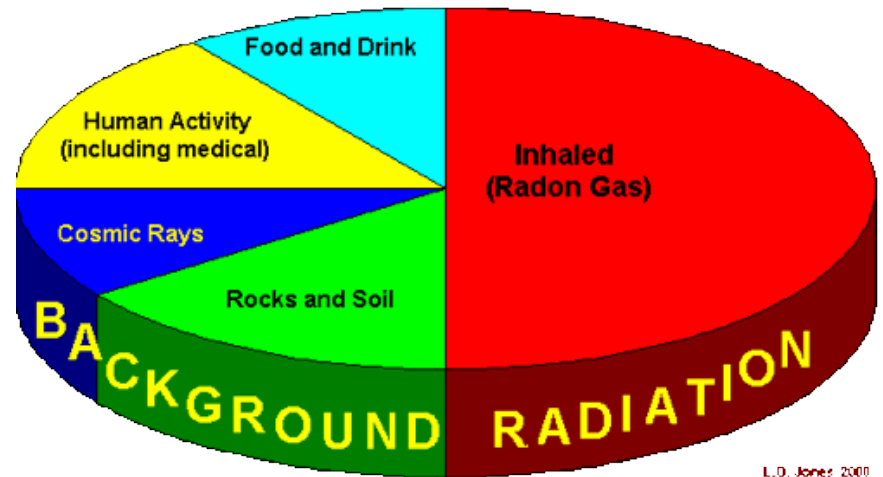
THE EFFECTS OF RADON ON HUMAN HEALTH

ELENA SAGIA



HEALTH EFFECTS OF RADON

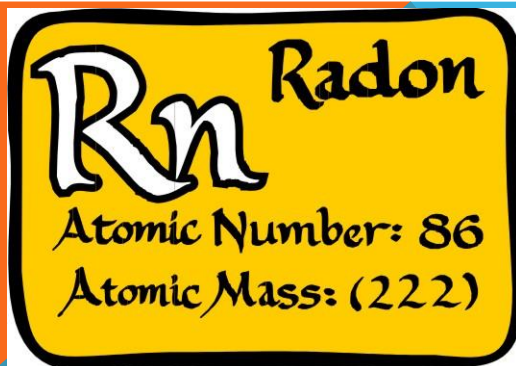
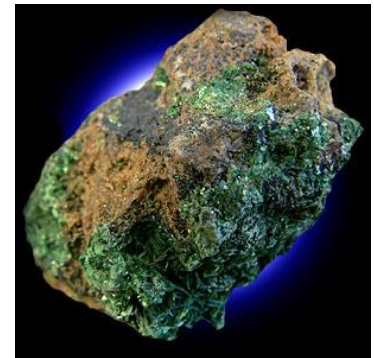
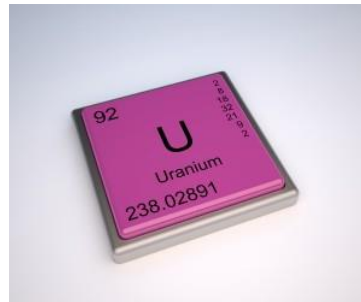
RADIATION & NATURE



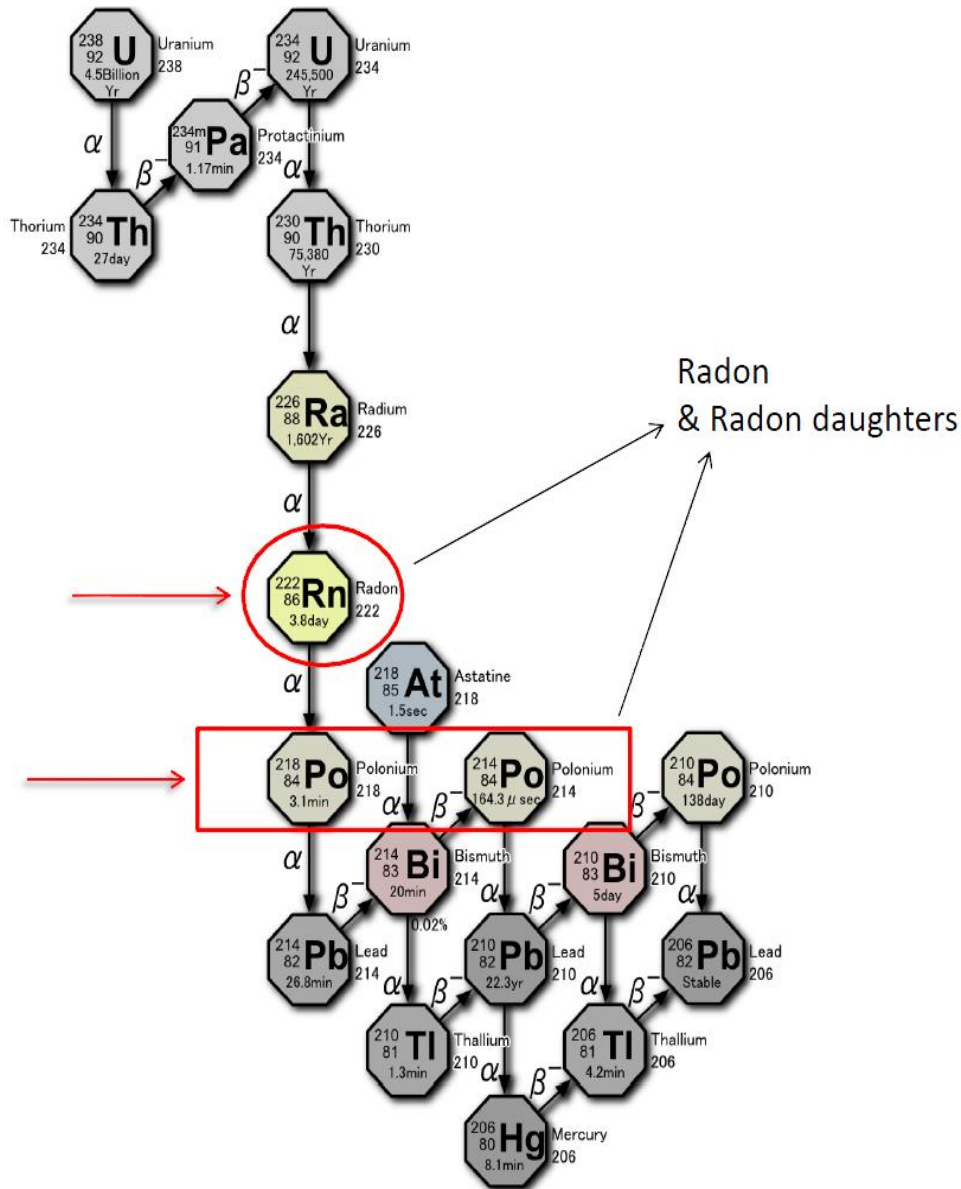
L.O. Jones 2000

WHAT IS RADON?

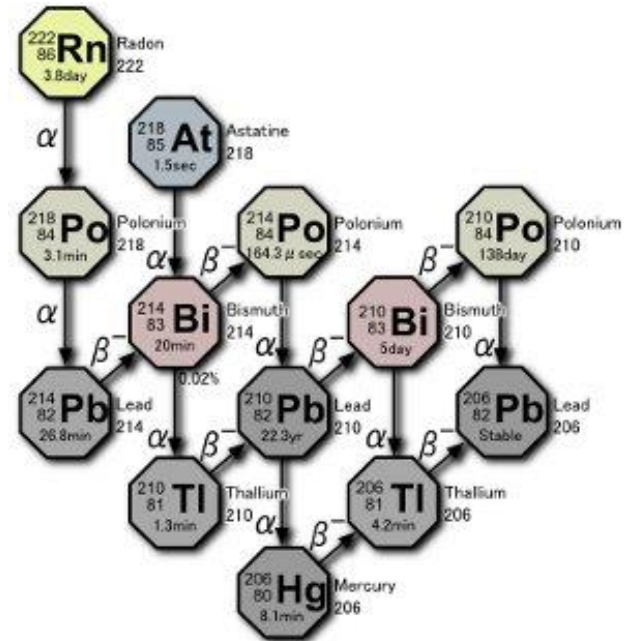
- Natural radioactive gas without colour, smell or taste
- Product of uranium decay



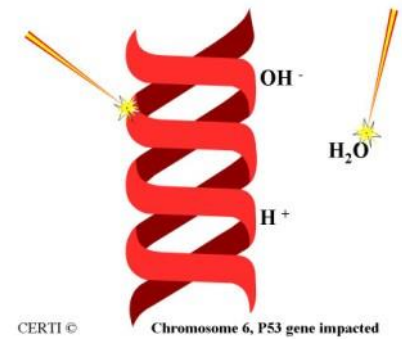
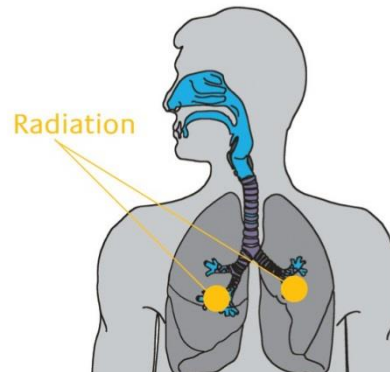
RADON PRODUCTION



For Radon $\rightarrow T_{1/2} = 3.8$ days



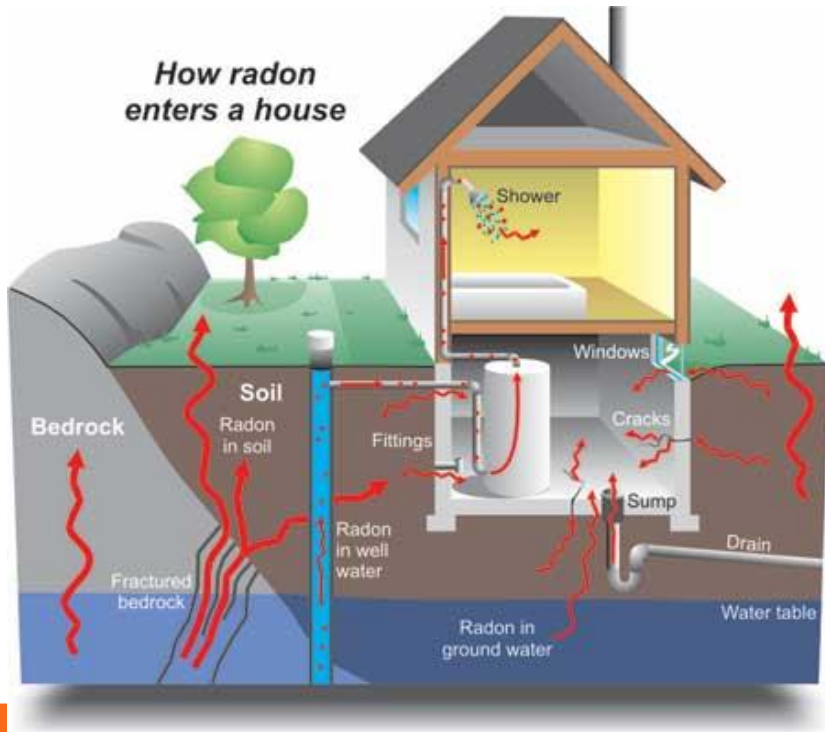
RADON & LUNG DAMAGE



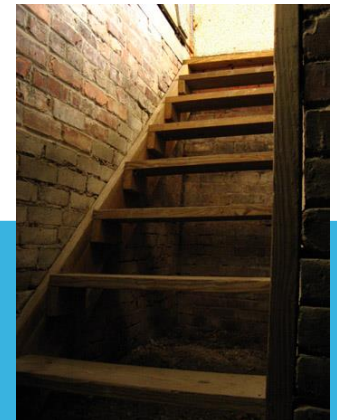
WHERE DO WE FIND RADON?

EVERYWHERE

How radon enters a house



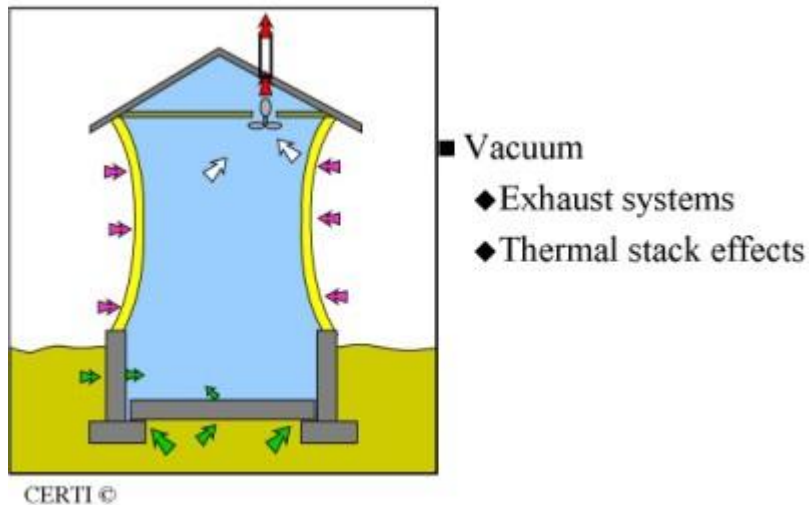
High concentration



**Granite
soil**

WHY RADON GOES INSIDE HOUSES?

It's **physics!!!**



Buildings are at a lower pressure than the surrounding air & soil.



Radon & other soil gases are drawn into the building.

When air is exhausted, outside air enters the building to replace it. Much of the replacement air comes from the underlying soil.

HOW RADON IS MEASURED?

Radioactivity  Becquerel (Bq)

1 Bq = 1 nucleus decay per second

For Radon, we measure the amount of radioactivity in air volume for a specific amount of time!

So...

how many **Bq** in a cubic metre of air **m³**?!
For how long?!

Radon exposure: $\rho_{\text{tracks}} / C_f$
(Bq * h / m³)

Radon concentration: **exposure / exposition time**
(Bq / m³)



RADON CONCENTRATION FACTORS

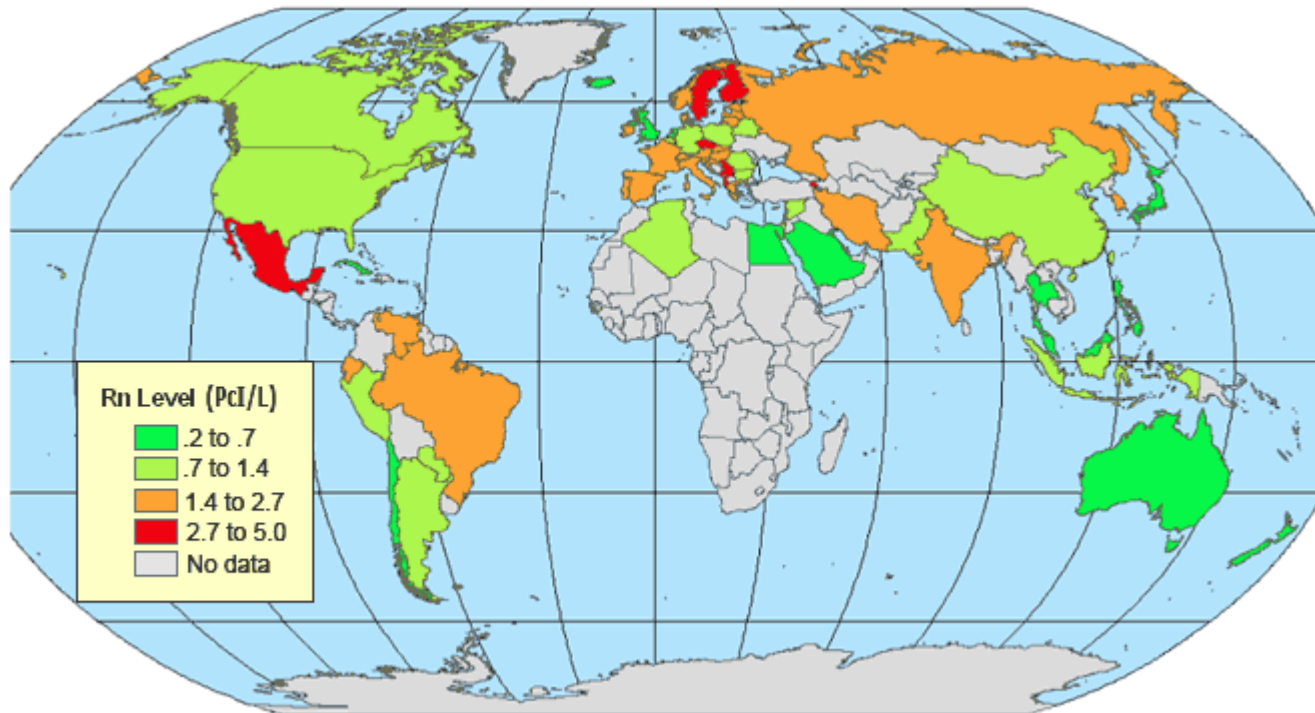
The amount of radon changes:

- During the day
- Between summer and winter
- With the air temperature

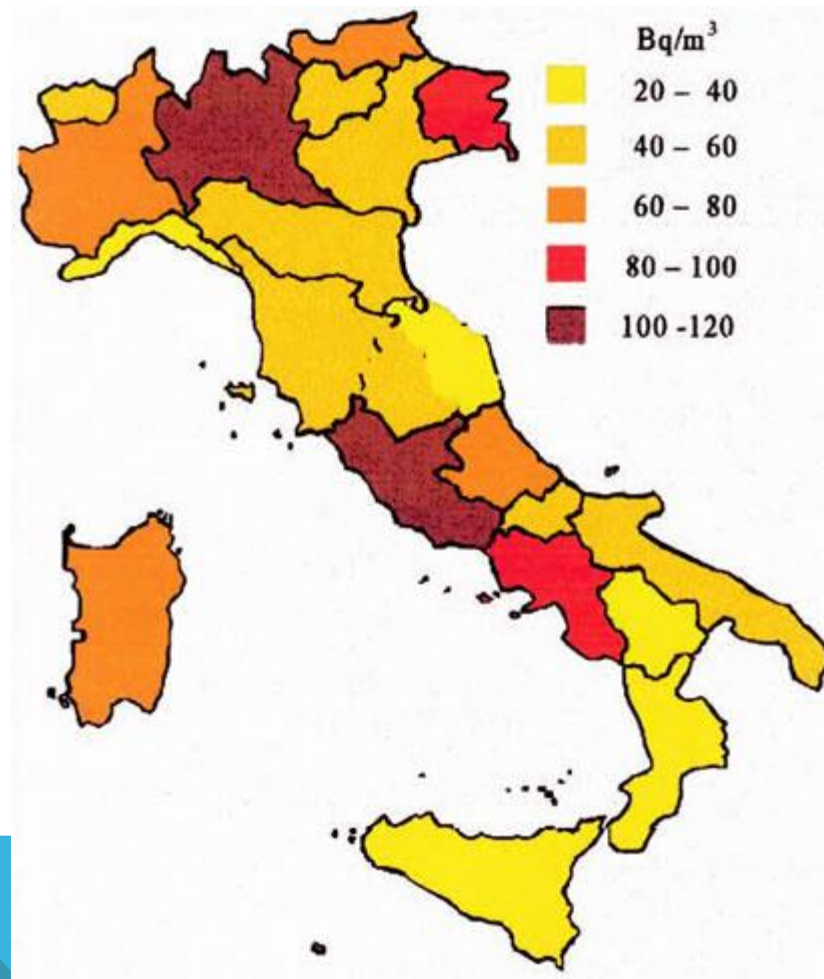
More Radon:

**Winter
&
Night**

RADON LEVELS AROUND THE WORLD



RADON IN ITALY



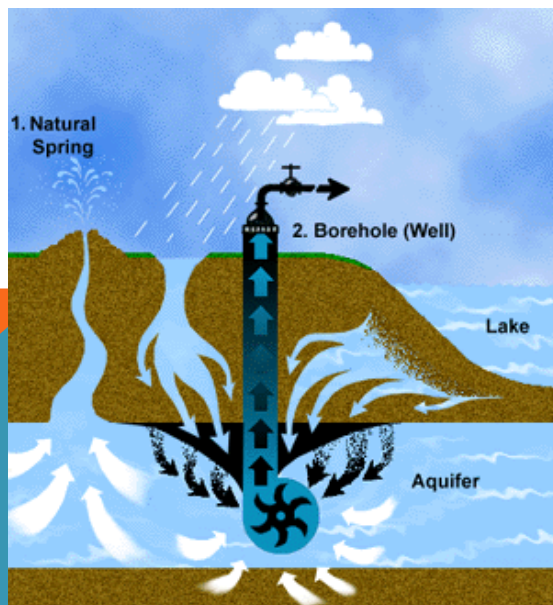
RADON IN WATER

Exposure to radon:

- 95% from indoor air
- 1% from drinking water sources

Most of this 1% is from inhalation of radon gas released from running water activities, such as bathing, showering and cleaning.

Only 0.1% is from swallowing water contaminated with radon gas.



HEALTH EFFECTS OF RADON

☹ Increases the probability of lung cancer

↘ x 10 times for smokers

☹ Stomach cancer

☹ Liver cancer

☹ Skin cancer

☹ Leukimia



NO SMOKING

PROBABILITIES OF CANCER

Probability of cancer occurred depends on:

- How much one is exposed?
- For how long is exposed?

The more one is exposed

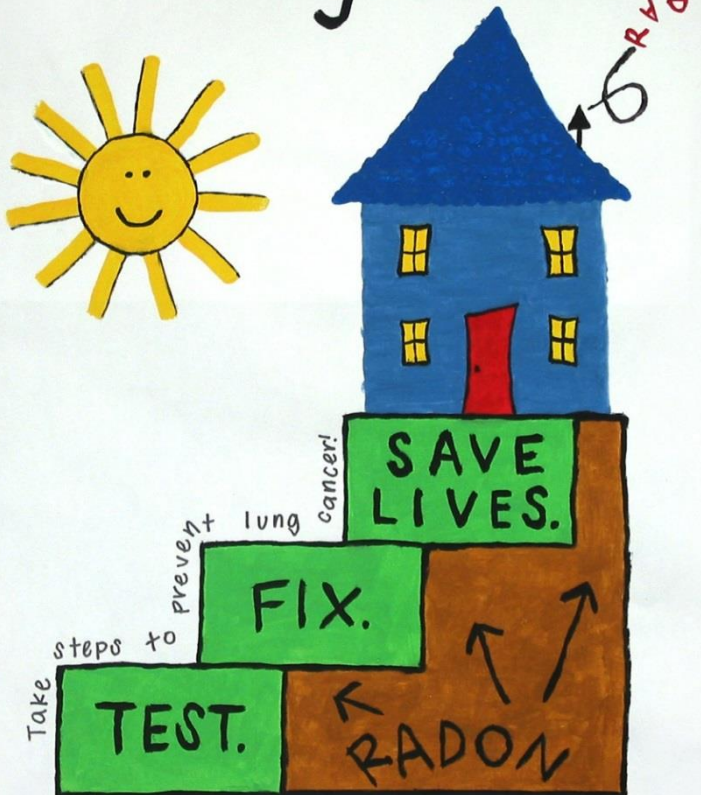


The higher the probabilities



LUNG CANCER STATISTICS

Radon is the 2nd
leading cause
of lung cancer



Scientists estimate that 15.000 to 20.000 lung cancer deaths in the US are related to radon.

10% of radon-related cancer deaths occur among non-smokers.

RADON DETECTION

Measurements are performed with detectors which are left in the house for periods from days to months.

- Different measurement for every house
- Many detectors in different rooms

The levels are different for every country.

The reference level should not exceed 300 Bq/m^3 .

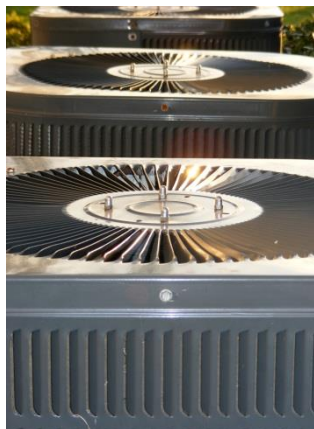
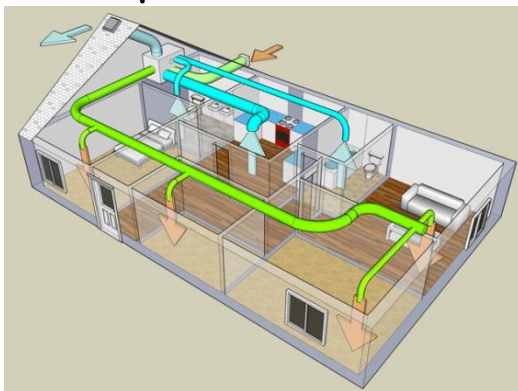
Radon in public drinking **water** supplies should not exceed **100 Bq/l**.



Public buildings & offices: 500 Bq/m^3
Schools: 400 Bq/m^3

SOLUTIONS FOR RADON REDUCTION

Improve ventilation



Underfloor ventilation



Sealing floors, walls & cracks



Install a radon sump system



INFORMAZIONE IN ITALIANO



<http://www.miam.it/>



<http://www.ispesl.it>

THANK YOU



REFERENCE

- www.certi.info
- www.who.int
- www.cancer.gov
- www.radon.com
- www.ukradon.org
- www.sosradon.org
- www.epa.gov
- www.miam.it
- www.radon.it
- www.ispesl.it
- www.eeae.gr