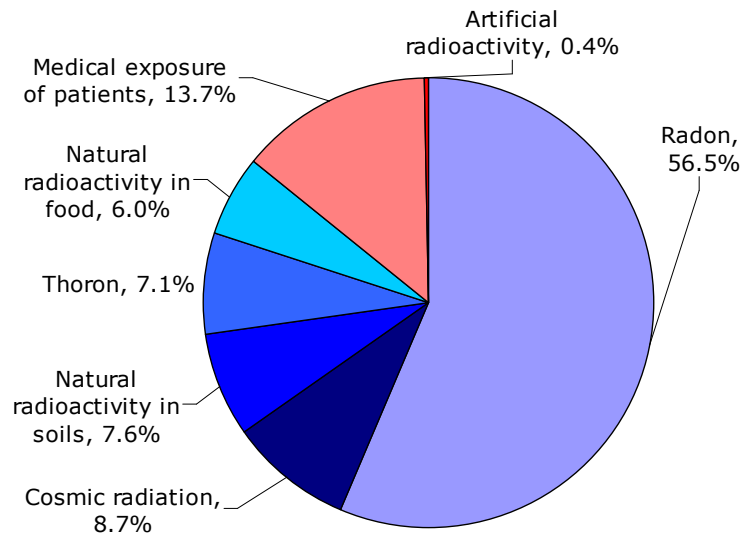




Sources of Ionising Radiation

Ionising radiation in our environment can occur either naturally or can be produced artificially, through human activity. The effects of artificial and naturally occurring radiation are the same.

Figure 1. Distribution of natural and man-made sources that contribute to the annual average radiation dose in Ireland.



1. Natural sources

Natural sources of radiation account for approximately 86 per cent of our annual average radiation dose. An explanation of each of these sources is given below.

Radon

Radon is a naturally occurring radioactive gas produced from the uranium that is present in varying amounts in all rocks and soils. Radon enters buildings from the ground and can sometimes build up to unacceptable levels. Radon accounts for the largest proportion, approximately 56 per cent, of our annual average radiation dose. There are large variations in the dose received by individuals in the Irish population from radon. Exposure to radon increases the risk of lung cancer and is linked to approximately 200 lung cancer deaths in Ireland every year.

Cosmic radiation

The earth is continuously bombarded by high-energy radiation from either the sun (solar radiation) or from outside the solar system (galactic radiation). Collectively this is termed cosmic radiation. Radiation doses from cosmic radiation are greater at higher altitudes and those who fly regularly receive an additional dose.

Natural radioactivity in soils

Naturally occurring radioactivity has existed since the creation of the earth. Radionuclides of uranium, thorium and potassium are relatively abundant in rocks and soils. The gamma radiation emitted from these radionuclides gives us all a radiation dose.

Thoron

Like radon, thoron is a naturally occurring radioactive gas. The principal source of thoron in indoor air is building materials. Radiation doses are normally much lower than those from radon.

Natural Radioactivity in Food

The radioactivity present in soils and in the sea is transferred in small amounts to food. When we eat food, we receive a radiation dose. The main contributor to this dose is potassium-40 which is present in all foods. The content of potassium in the body is controlled so that, regardless of the amount of potassium in our diet, the dose we receive varies very little.

2. Man-made sources

Man-made sources of radiation account for approximately 14 per cent of our annual radiation dose and are dominated by the use of radiation in medicine.

Medical uses of radiation

Many procedures carried out routinely in medical diagnosis involve exposure to radiation. Some well-known procedures that involve the use of radiation are: dental and chest X-rays, mammography to check for breast cancer, angiocardiograms to determine heart function, CT scans and nuclear medicine using radioactive pharmaceuticals to determine the functioning of body organs.

Some people receive no dose from medical procedures while others receive much higher doses. All medical exposures to radiation must be clinically justified and should only be carried out if recommended by a GP or medical consultant. Exposure to radiation as part of a routine medical check-up is rarely if ever justified.

Radiation in the workplace

Artificial radiation has a number of beneficial uses in medicine, industry and education/research. People working with radioactive materials may receive a

radiation dose, but this is normally low. More details are given on the separate fact sheet – Uses of Radiation in Medicine, Industry, Education and Research).

Radioactivity in the environment

Radioactivity is also present in our environment due to nuclear weapons testing, accidents at nuclear facilities and the authorised discharge of radioactive wastes from nuclear and other facilities. As with natural radionuclides, this artificial radioactivity is found in the ground, as well as in air, food and water.

- ***Nuclear weapons tests***

Between 1945 and 1980, 543 nuclear weapons tests took place. Nuclear weapons testing in the atmosphere, particularly in the 1950s and early 1960s, produced radioactivity that was globally dispersed. Some of this radioactivity is still present in our environment. We receive a small radiation dose from the radioactivity from this source in the ground and in our diet.

- ***Chernobyl accident***

On April 26, 1986, the explosion and subsequent fire at the nuclear power plant at Chernobyl released substantial quantities of radioactivity into the atmosphere. Over the subsequent few weeks this was dispersed throughout Europe by the prevailing winds. Some of this radioactivity is still present in our environment. We receive a small radiation dose from the radioactivity from this source in the ground and in our diet.

- ***Nuclear discharges from Sellafield***

During the routine operation of nuclear installations, such as nuclear power plants and reprocessing plants in the UK and elsewhere, radioactivity is released into the environment as a waste product. The amount of material that can be released is controlled by regulation. Eating fish and shellfish from the Irish Sea is the principal means by which Irish people receive a radiation dose from Sellafield. Even for heavy consumers, these doses are very low compared with radiation doses from natural sources.

Further Reading

Colgan, P.A., Organo, C., Hone, C. and Fenton, D. (2008) **Radiation Doses Received by the Irish Population** RPII 08/01. Dublin: Radiological Protection Institute of Ireland.

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