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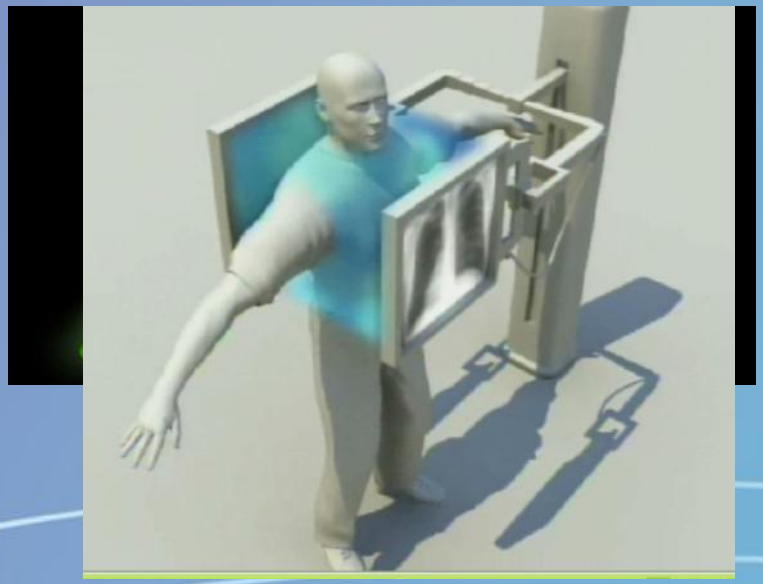
Let's Talk about Radioactivity

How much radiation are the Irish exposed to?

Ciara McMahon



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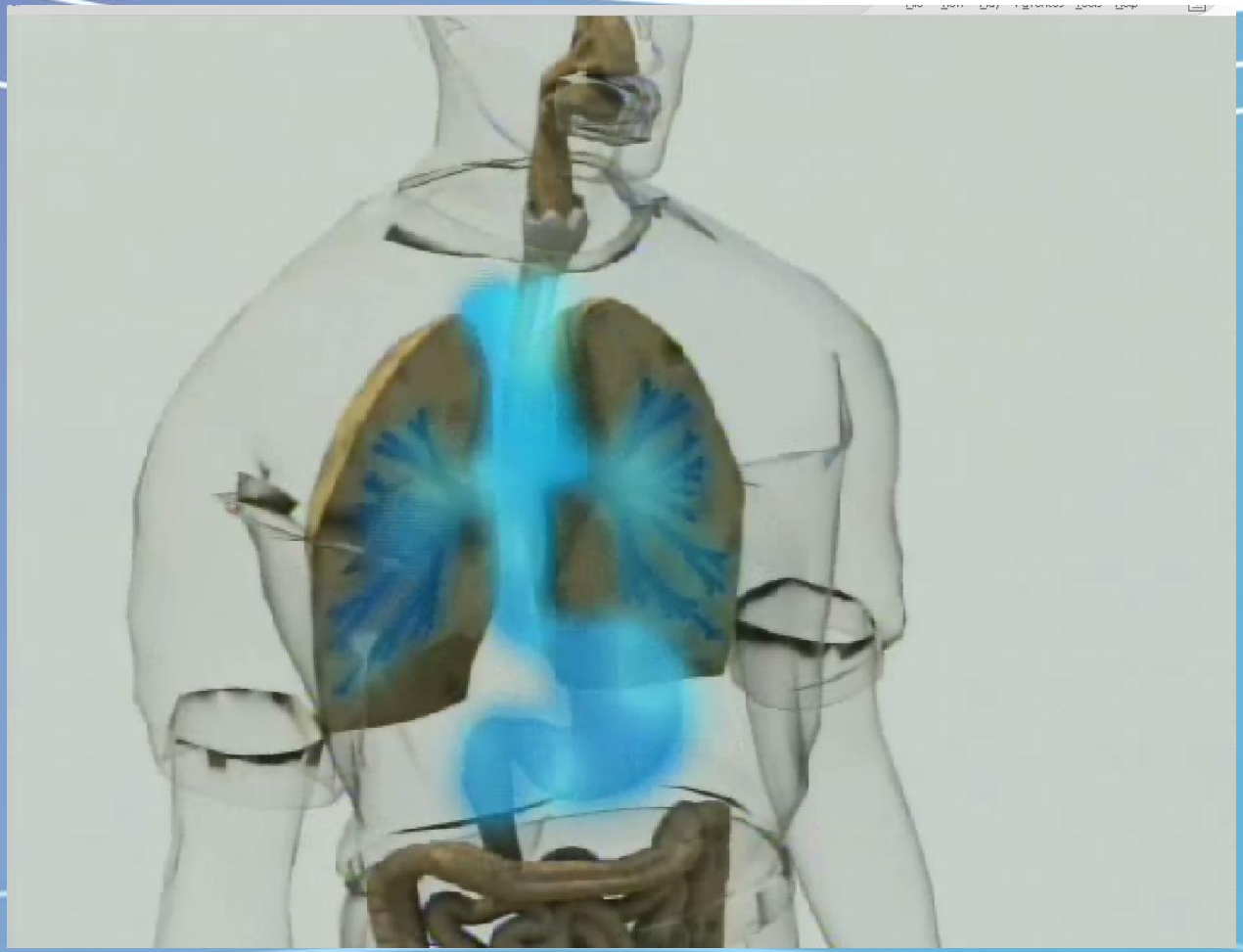
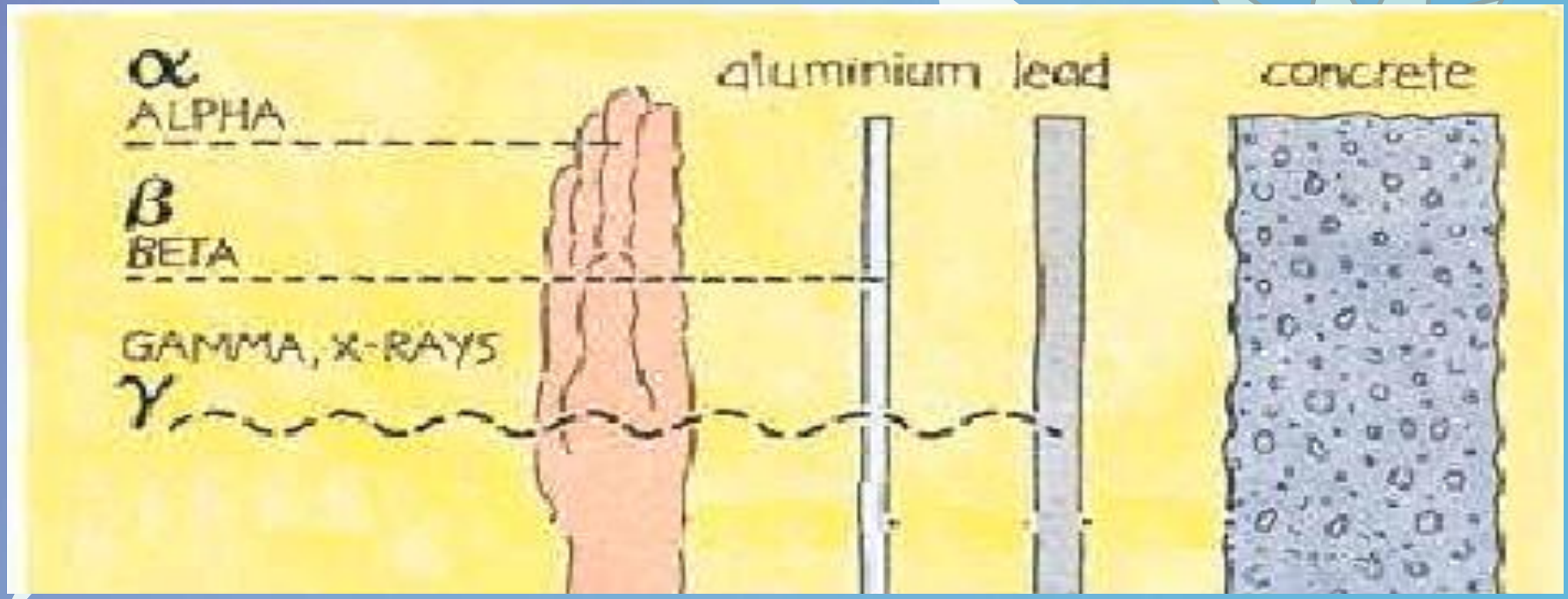
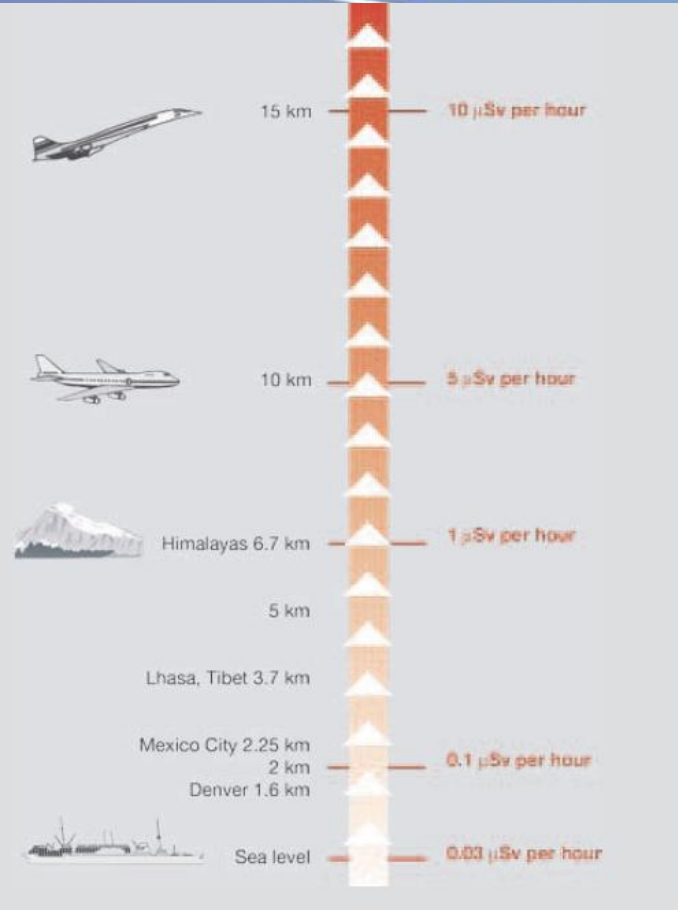
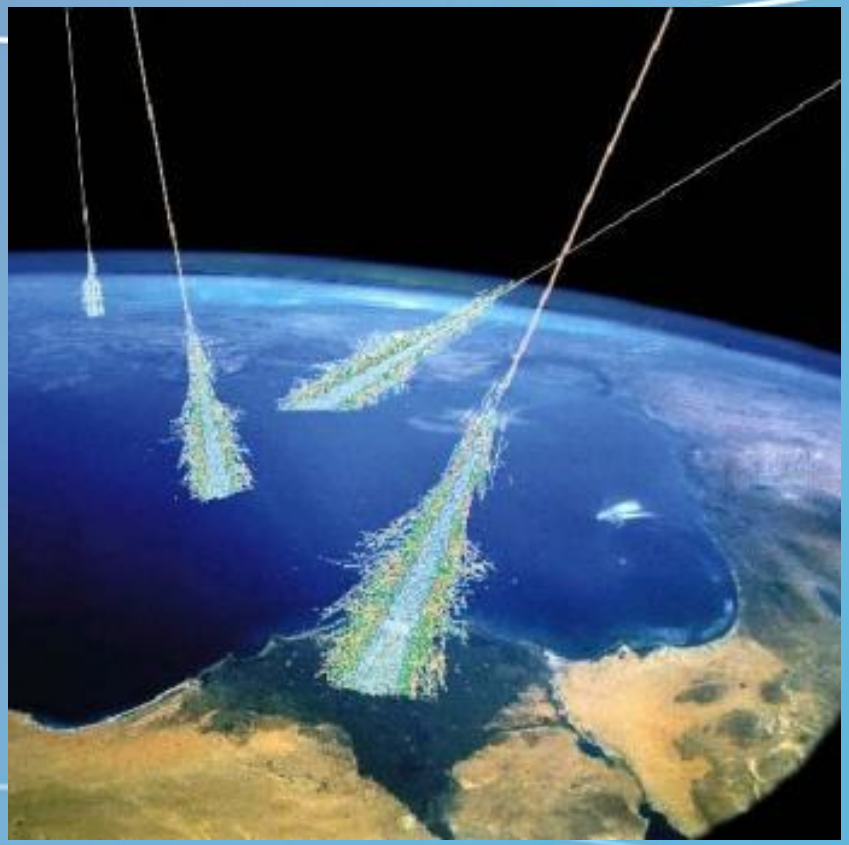


Radiation dose



Cosmic radiation

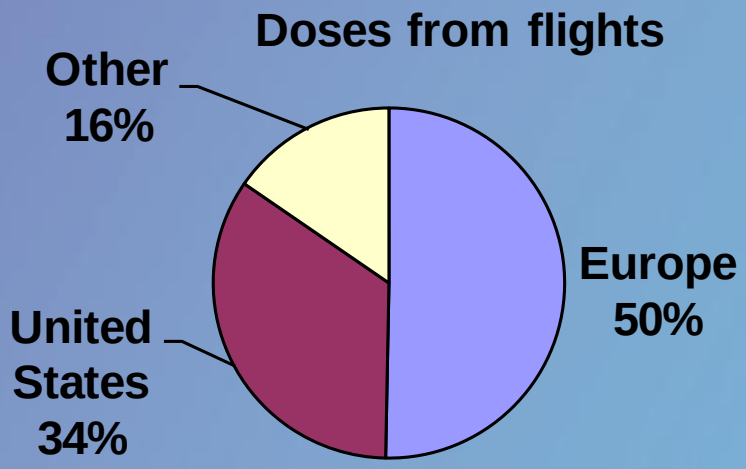




Cosmic radiation: on the ground

- Dose depends on latitude, longitude and altitude
- Ireland, at sea level – 300 µSv/year

Cosmic radiation: in the air

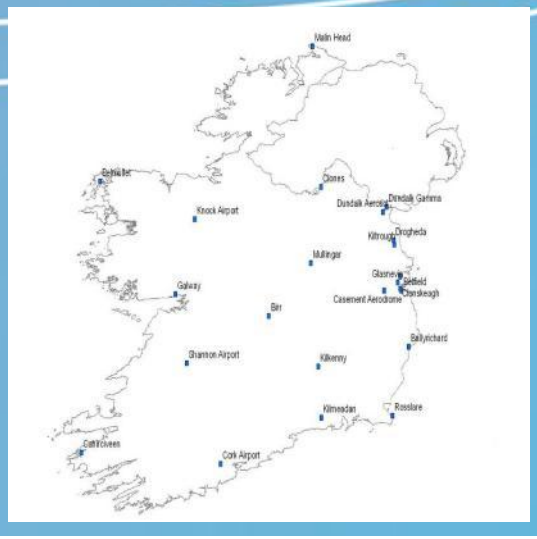


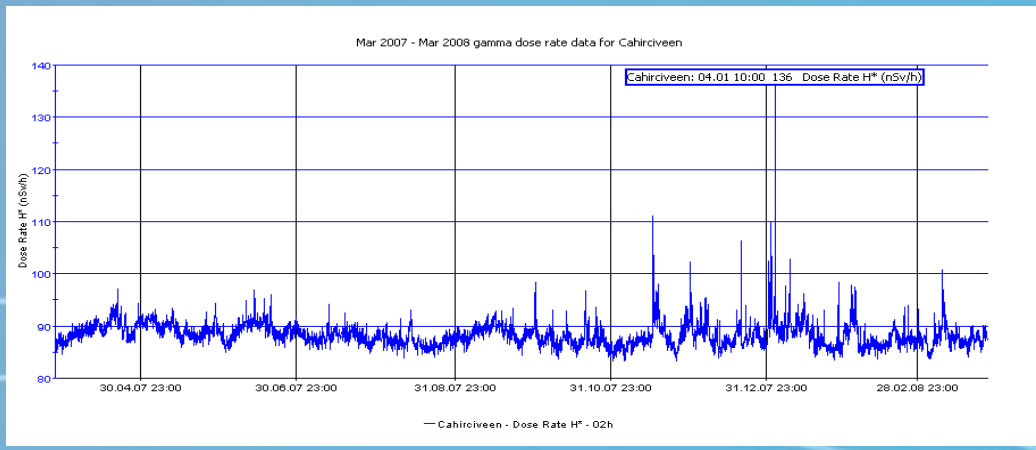
Destination	Return flight dose (µSv)
London	8
Paris	14
Tenerife	40
New York	106

- Irish Average: 45 µSv/year

Gamma radiation

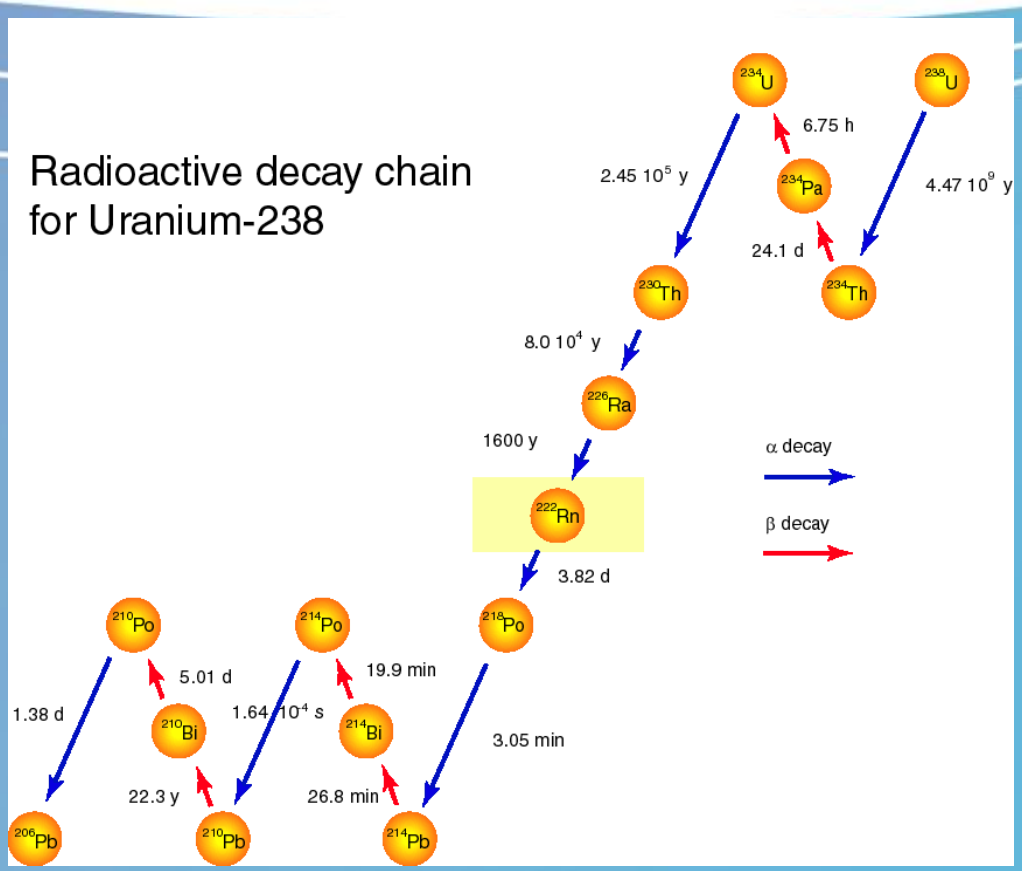
- Dose rates indoors 38% higher than outdoors
- Assume 80% of time indoors
- Annual per caput dose: 300 µSv/year





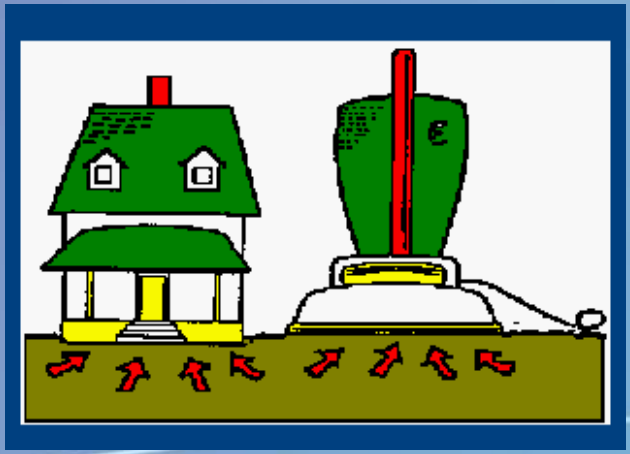
Radon gas

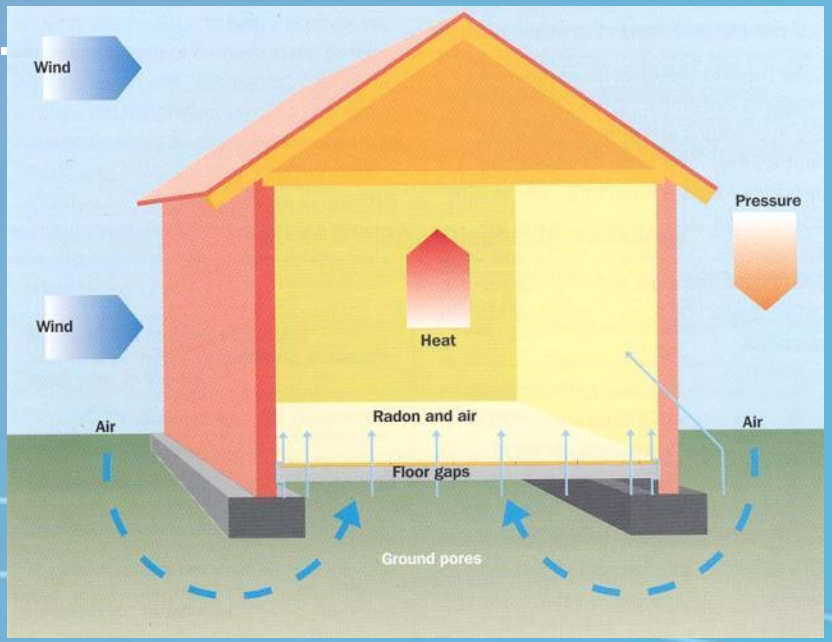
- Radon is a gas
- Constantly produced by radioactive decay of uranium (naturally found in soils and rocks)
- Radon escapes into the open air which surrounds us



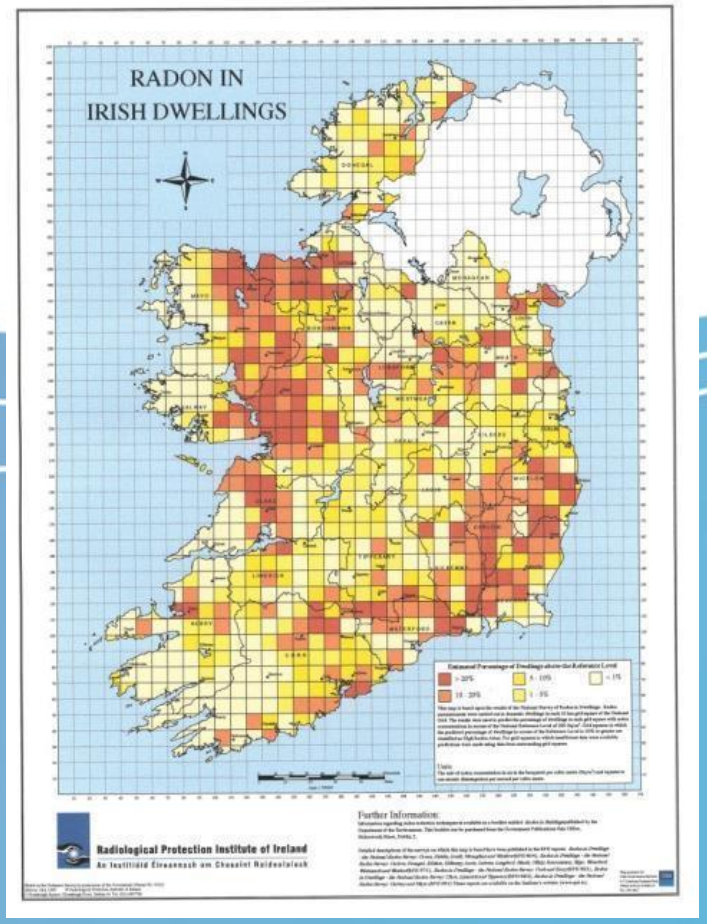
How does radon get into a building?

- Pressure differences between inside and outside
- Through cracks, fissures, unsealed joints around service pipes….





Doses from radon

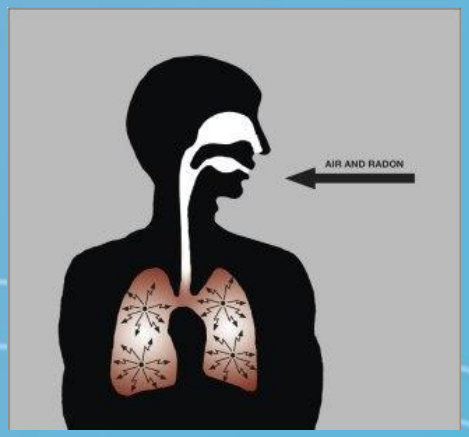


National Radon Survey (NRS)

Sample = 11,319 homes (1 in 116)
Average = 89 Bq/m^3

Average dose = 2250 µSv/year

Very variable: 250 µSv/year to 1,250,000 µSv/year



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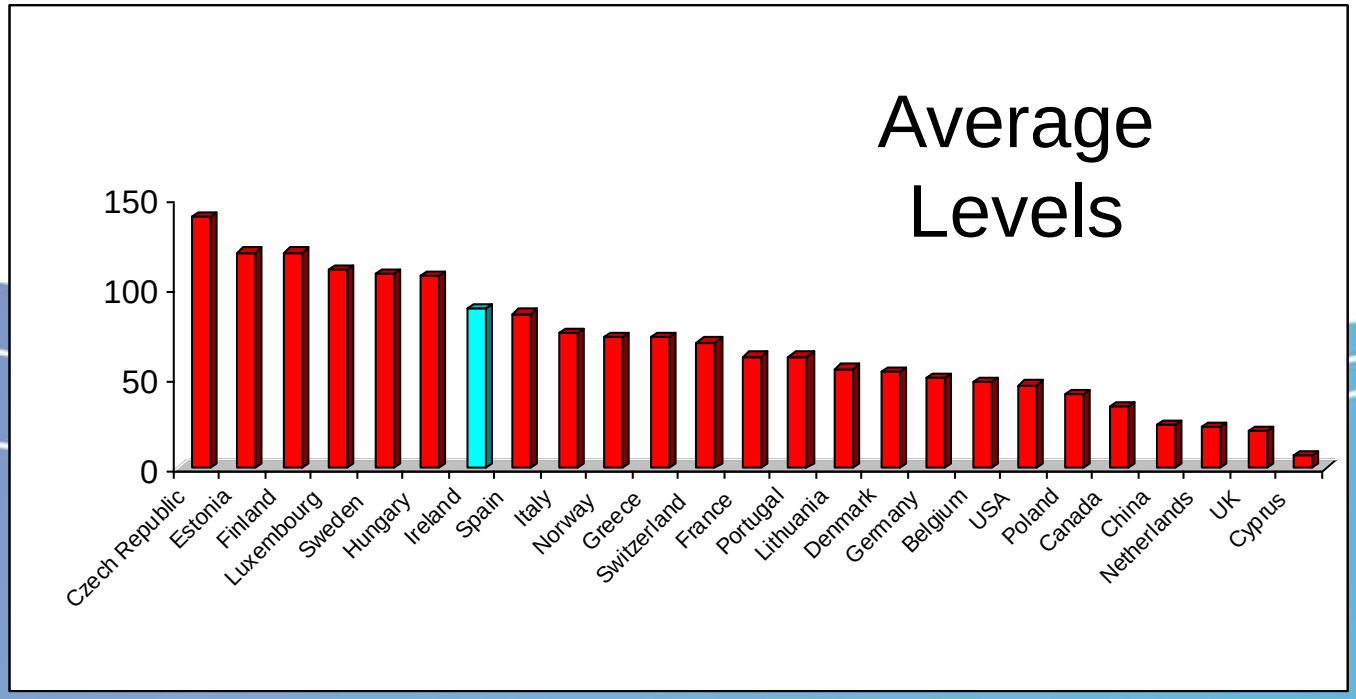
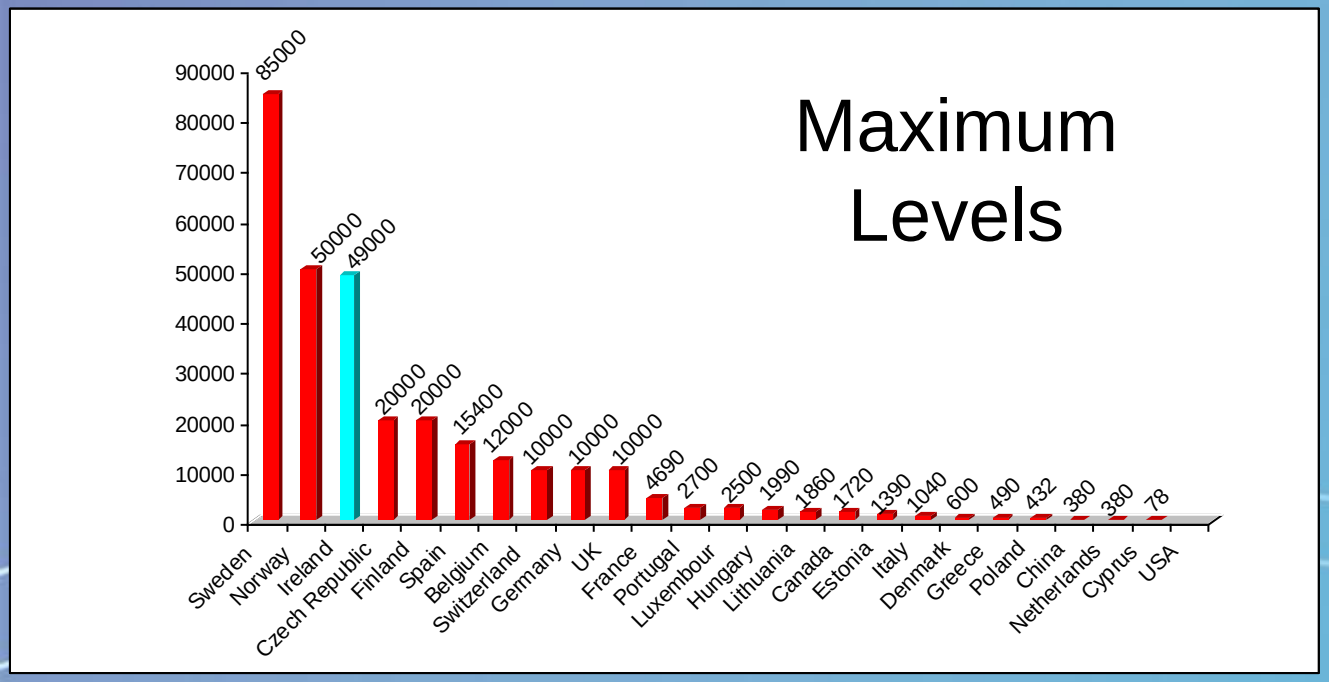
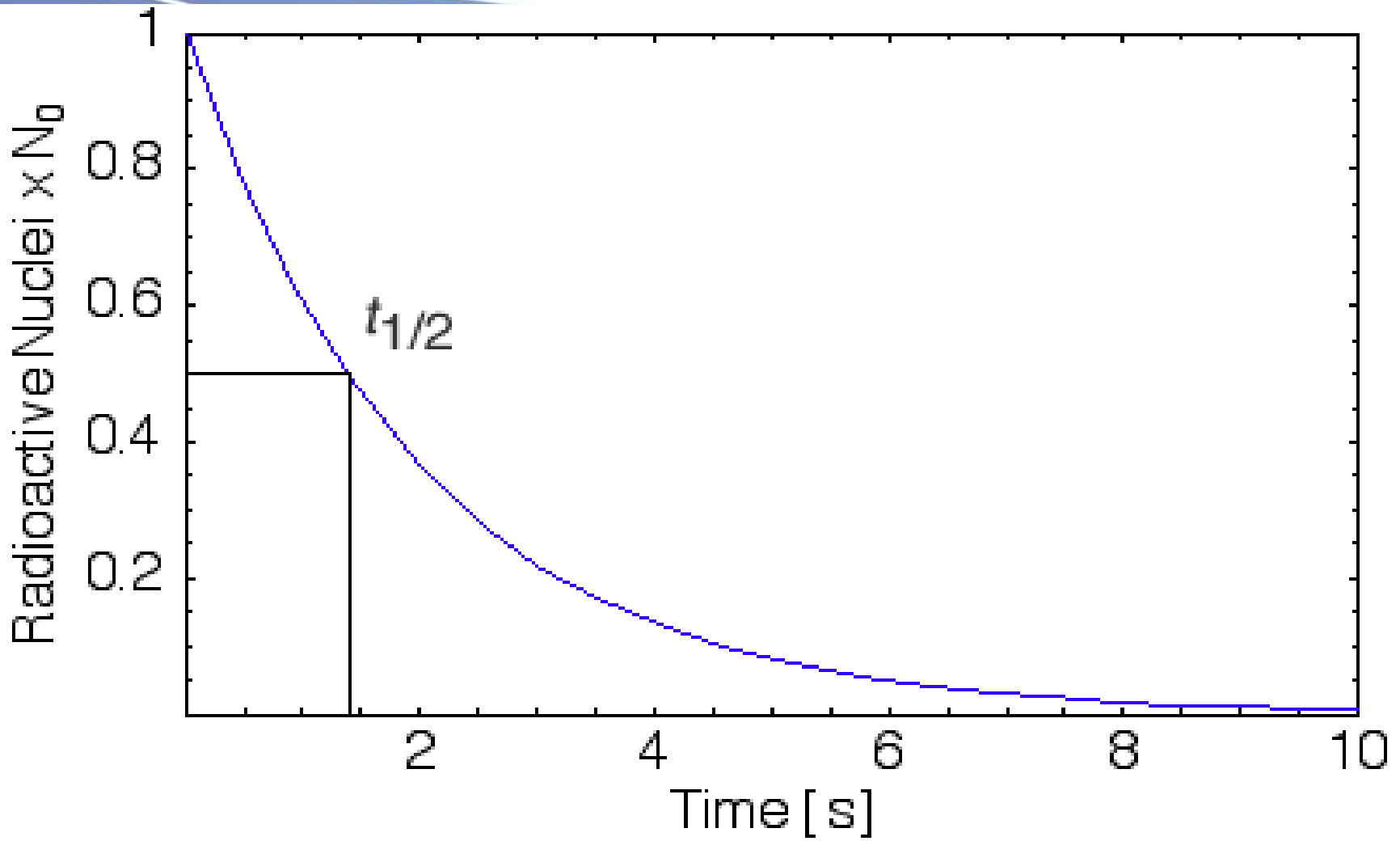
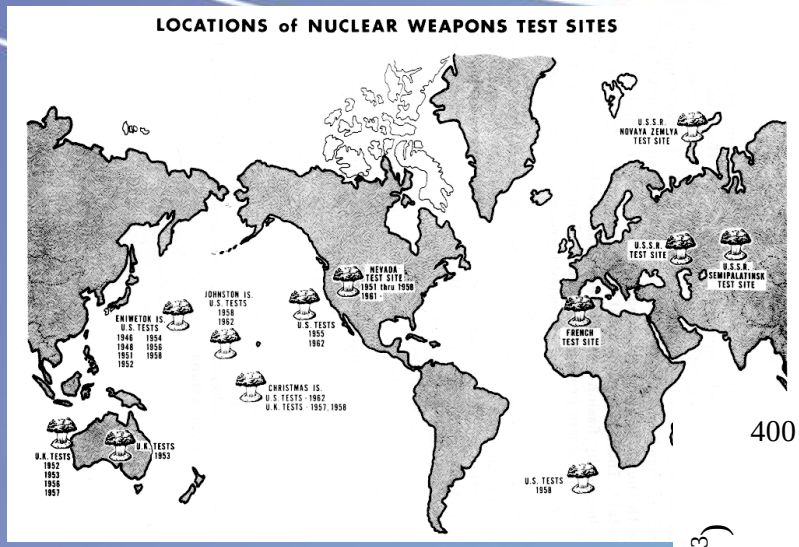

Average Levels
150
100
50
0
Czech Republic
Estonia
Finland
Luxembourg
Sweden
Hungary
Ireland
Spain
Italy
Norway
Greece
Switzerland
France
Portugal
Lithuania
Denmark
Germany
Belgium
USA
Poland
Canada
China
Netherlands
UK
Cyprus

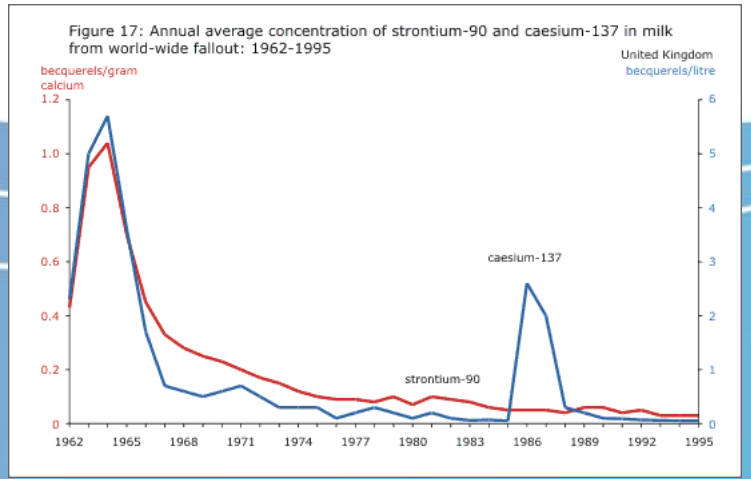

Maximum Levels
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
85000
50000
49000
20000
20000
15400
12000
10000
10000
10000
4690
2700
2500
1990
1860
1720
1390
1040
600
490
432
380
380
78
Sweden
Norway
Ireland
Czech Republic
Finland
Spain
Belgium
Switzerland
Germany
UK
France
Portugal
Luxembour
Hungary
Lithuania
Canada
Estonia
Italy
Denmark
Greece
Poland
China
Netherlands
Cyprus
USA

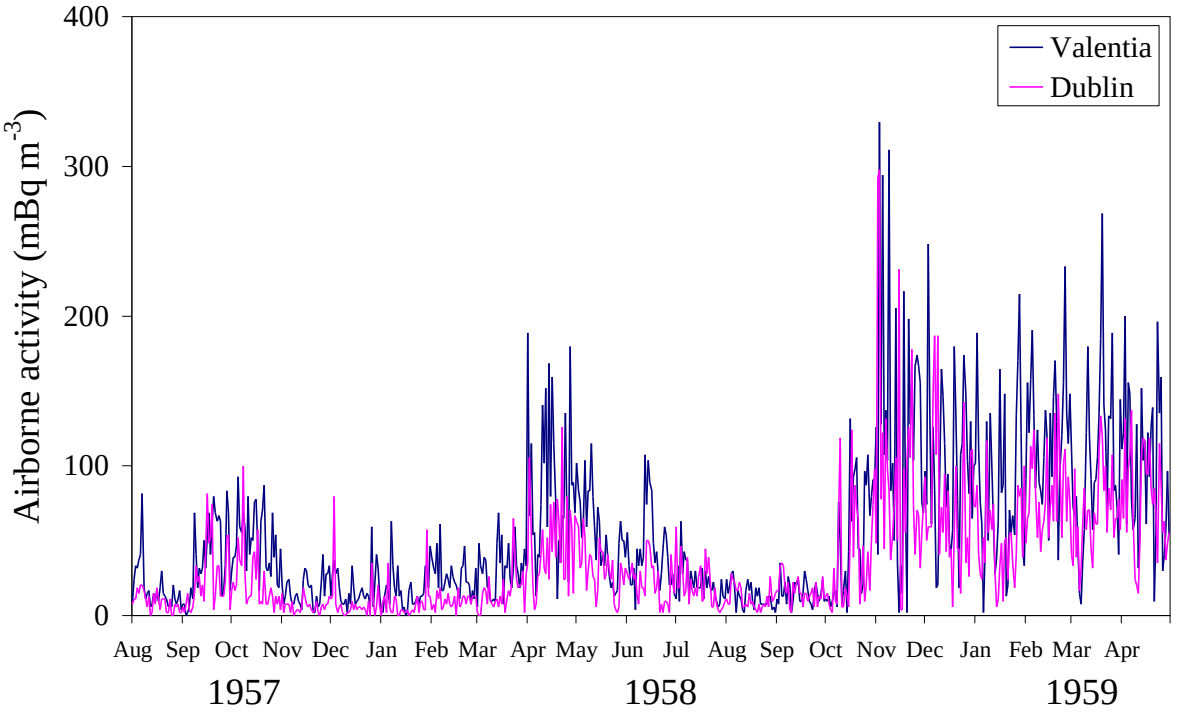
Indoor thoron: another radioactive gas! (Radon-220)

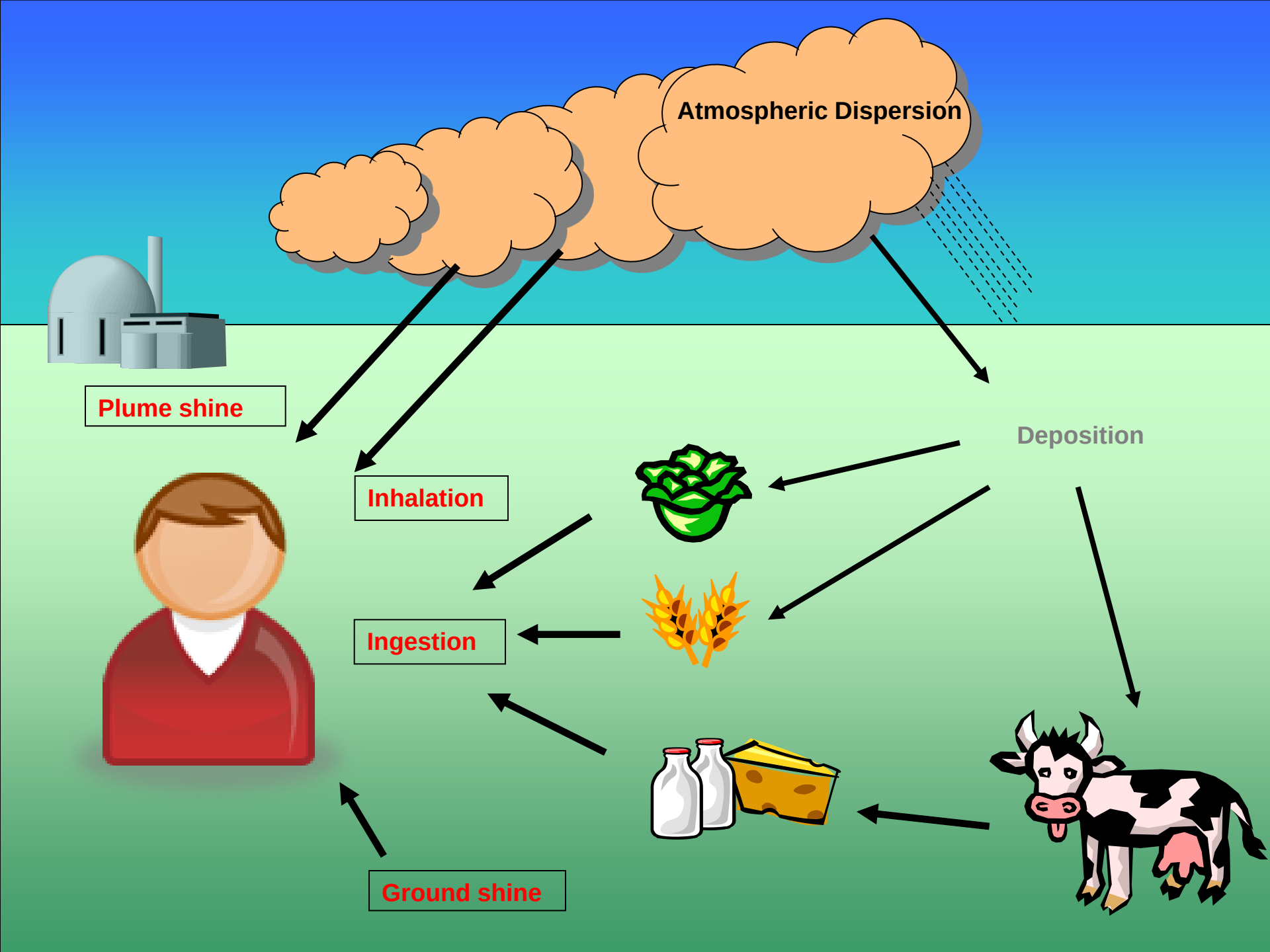


Global fallout due to atmospheric weapons tests



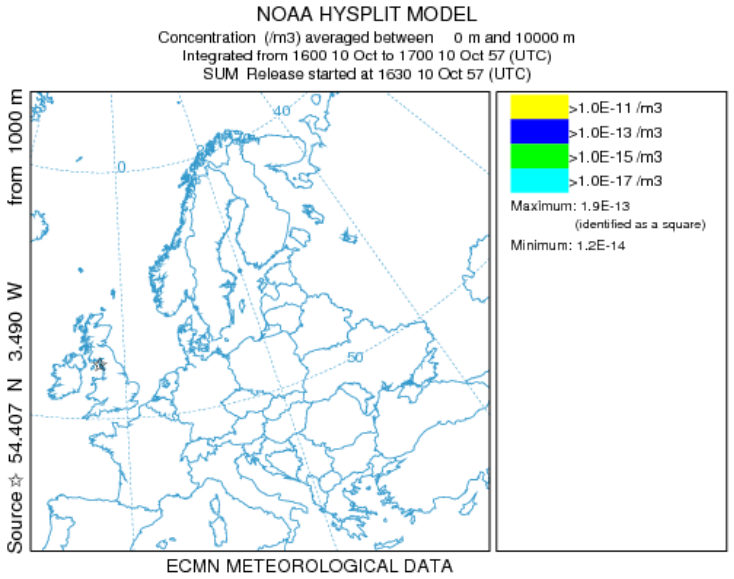




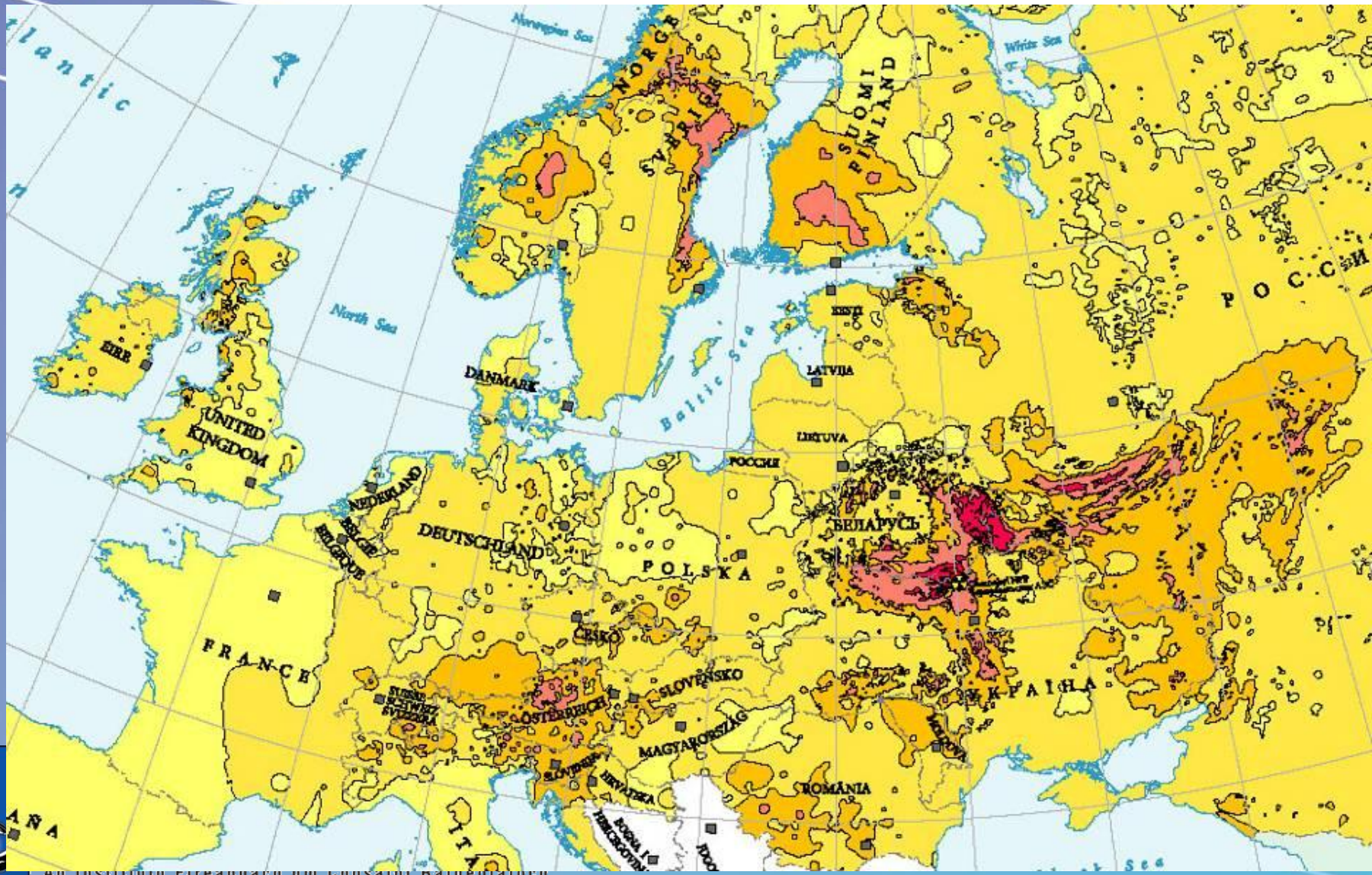

Atmospheric Dispersion
Plume shine
Deposition
Inhalation
Ingestion
Ground shine

Windscale, 1957

- Military reactor in Cumbria, UK
- Overheated and caught fire
- Radioactivity released 10-11 October 1957



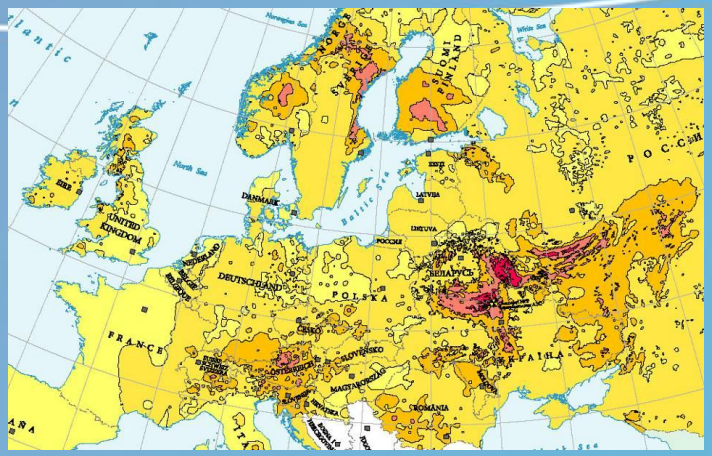
Chernobyl Accident 1986



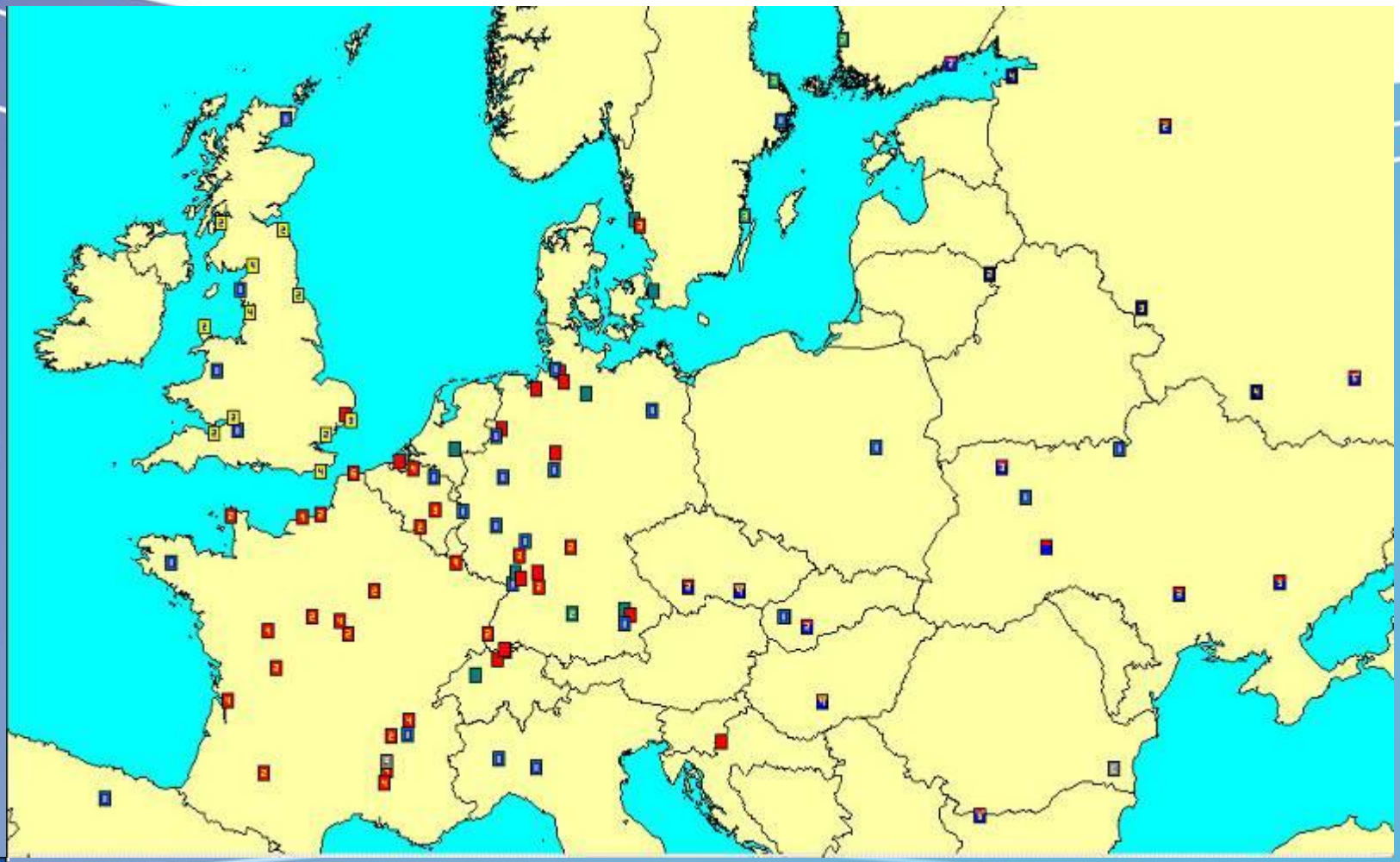
Dose from fallout from weapons tests and accidents

- Additional gamma dose from artificial radioactivity:

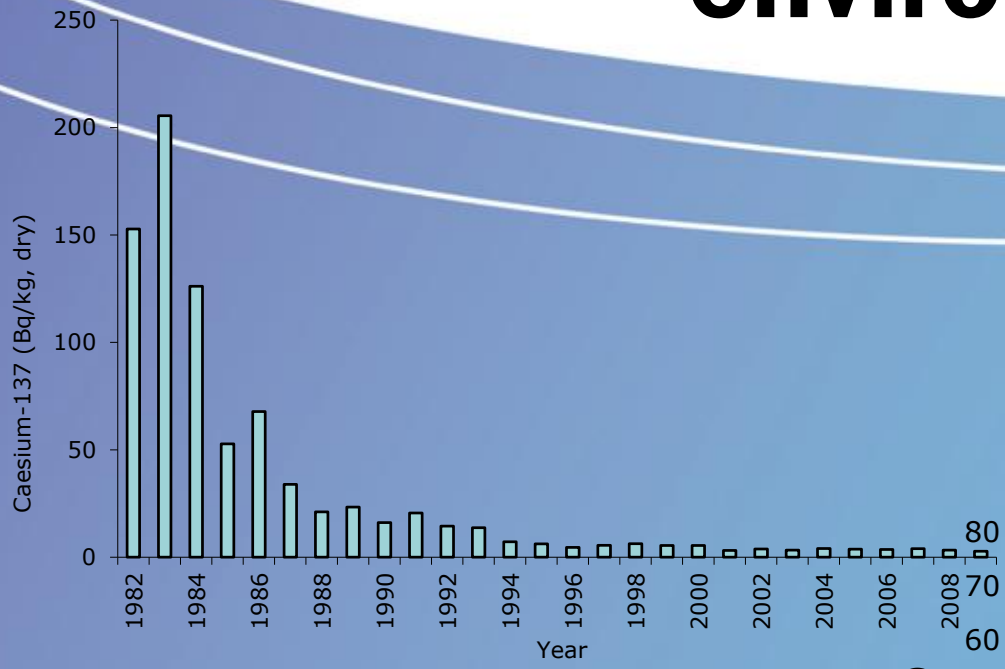
  10 μSv/year



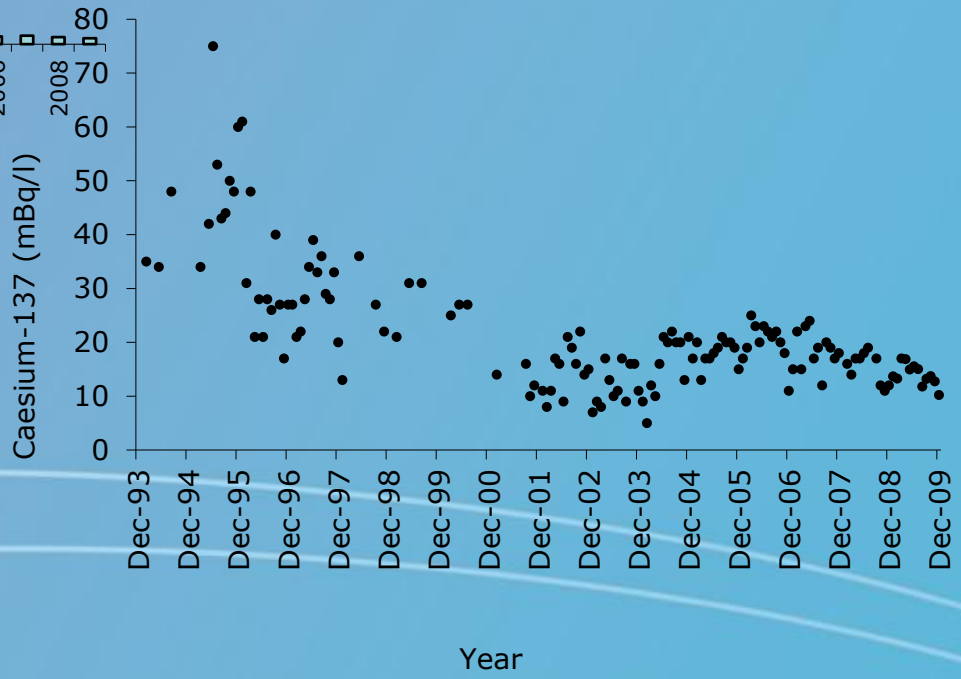
Nuclear Installations in Europe



Radioactivity in marine environment



Cs-137 in seaweed and seawater



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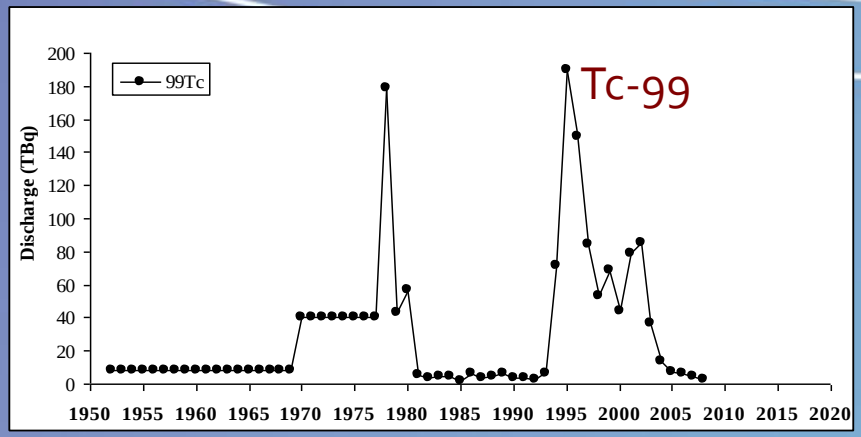
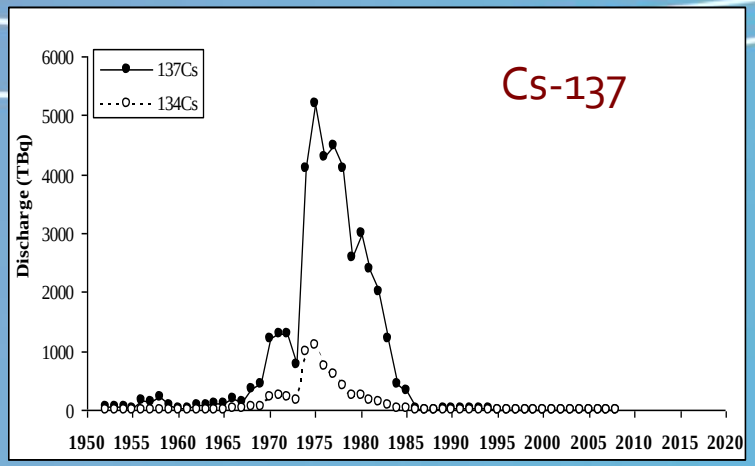
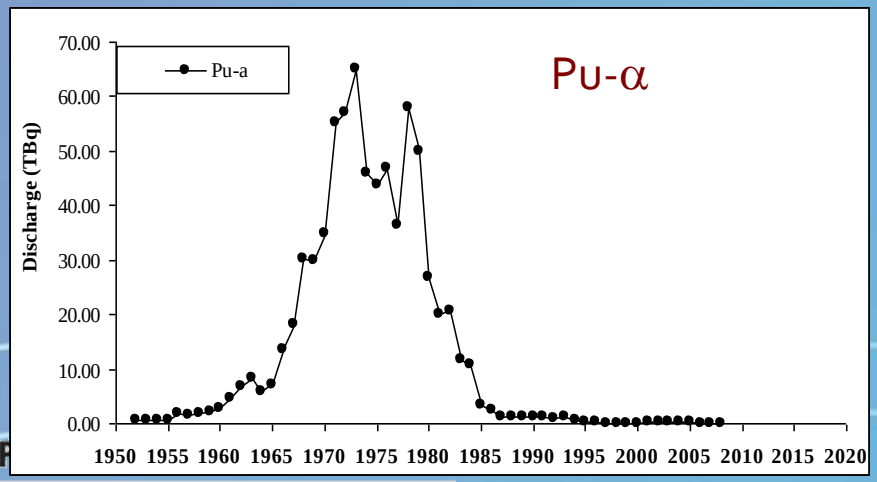
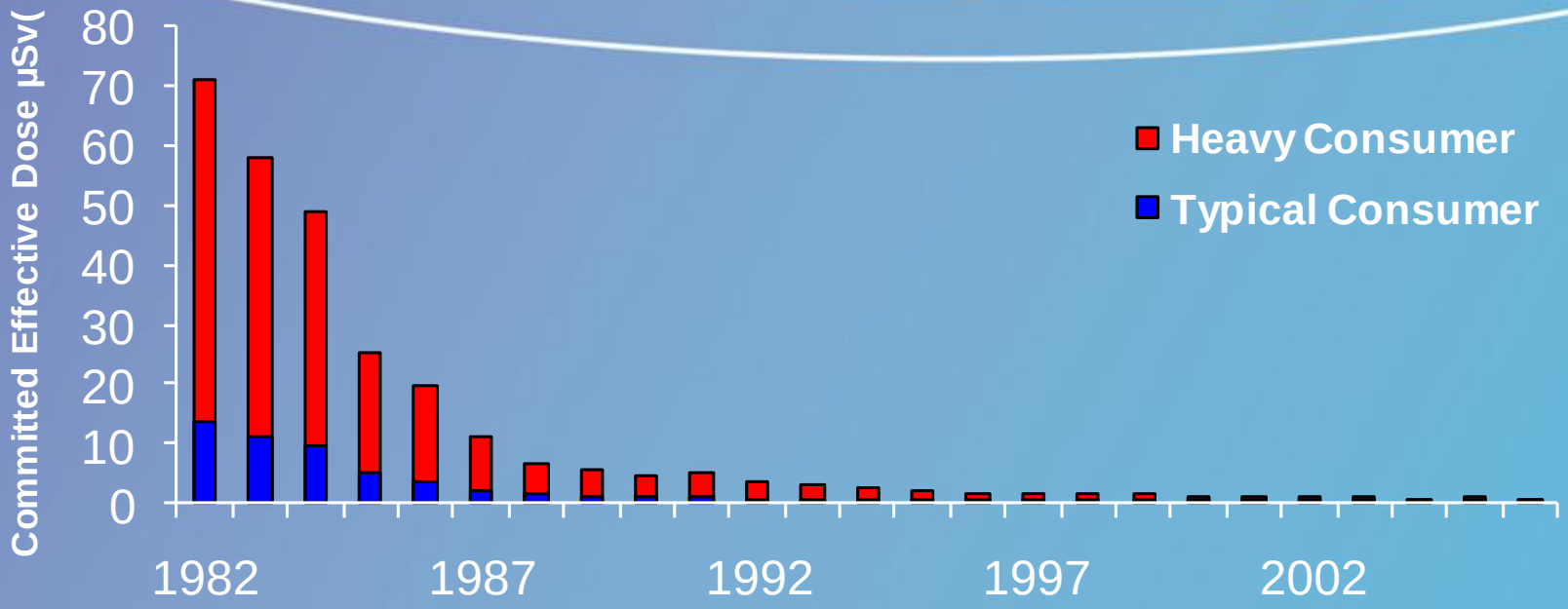
Sellafield Discharge Trends





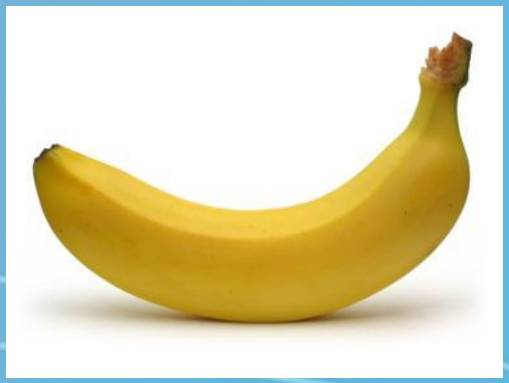


Doses to Fish and Shellfish Consumers due to Sellafield Discharges

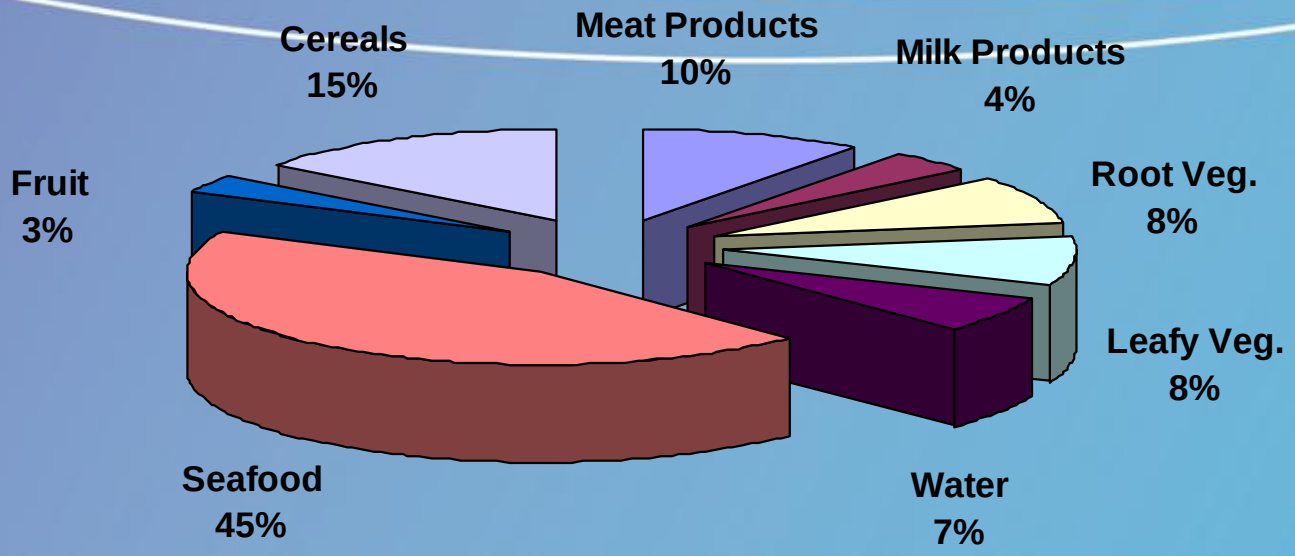


Foodstuffs: annual doses

Carbon-14 (artificial)	2.0 µSv
Caesium-137	2.5 µSv
Strontium-90	0.5 µSv
Carbon-14 (natural)	8 µSv
Potassium-40	175 µSv
Rubidium-87	2 µSv
Thorium	7 µSv
Uranium (Po-210)	45 µSv



Foodstuffs – polonium-210



Polonium-210 doses in Ireland around 45 µSv (consistent with rest of W. Europe)

Polonium-210 doses in China and Japan up to 300 µSv

Occupational exposure

- Monitored workers in medicine, industry and research
- Cosmic radiation and aircrew
- Radon in mines and show caves
- Radon in above-ground workplaces (180 μSv)

'Radiation Workers': 2001-2005

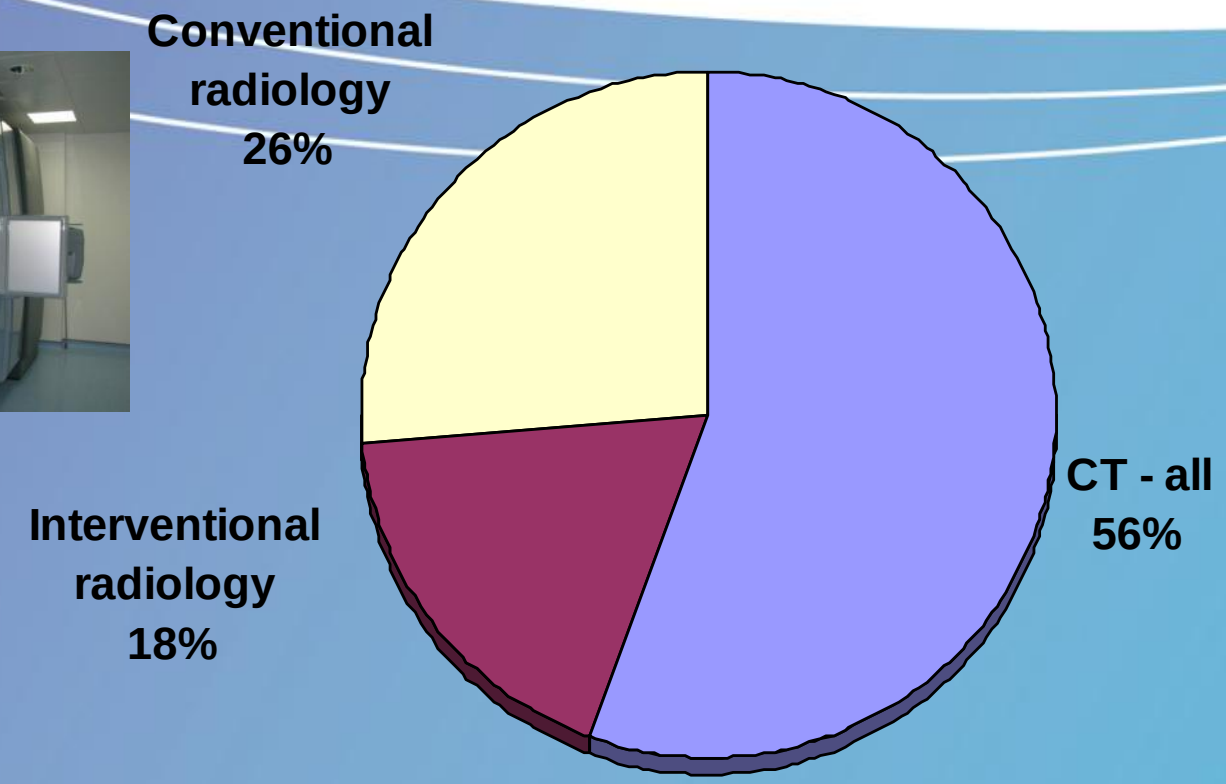
	No. Exposed	Dose (μSv)
Medical	924	320
Industrial	448	790
Research	43	240

Doses to patients

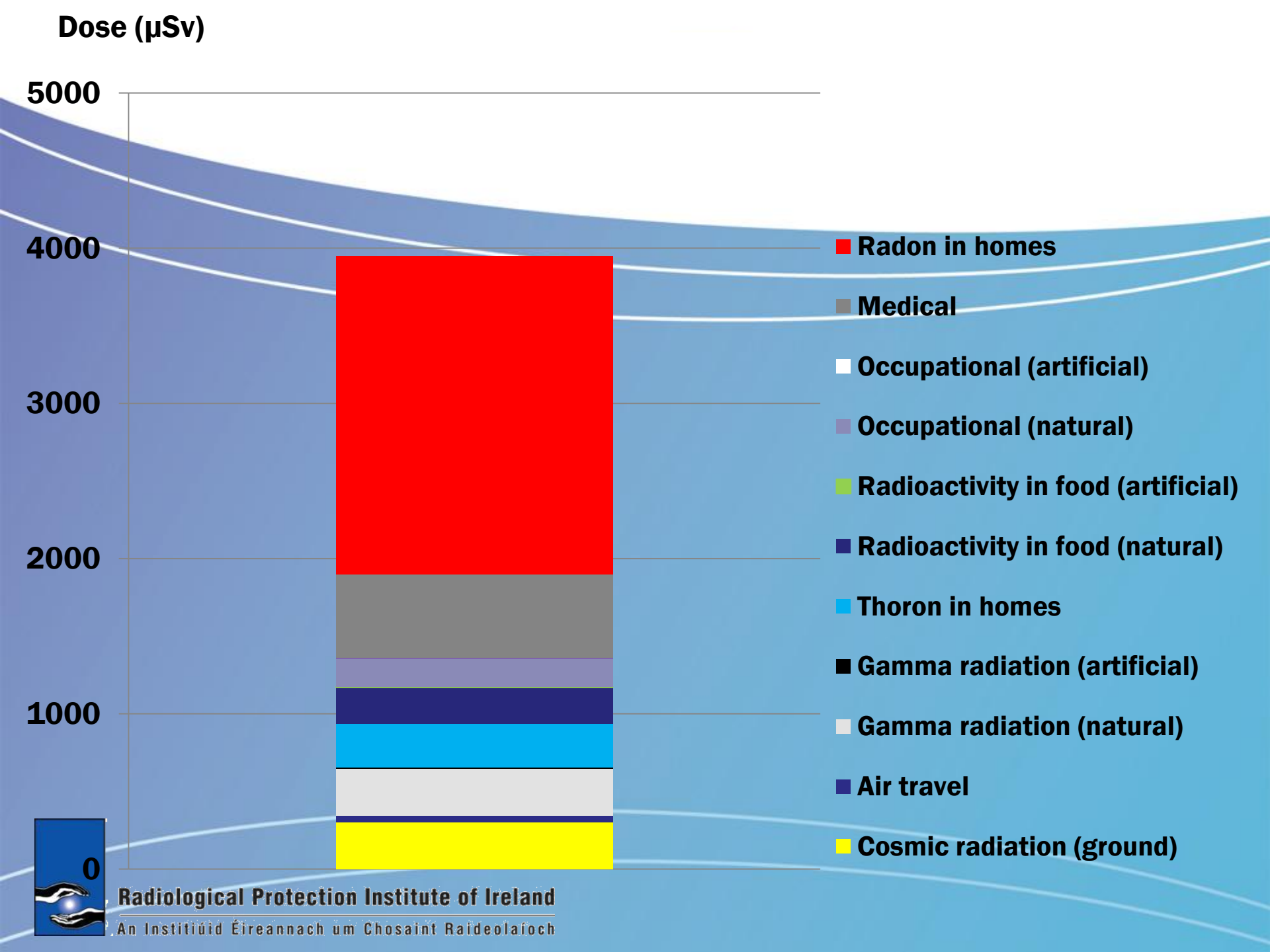
- Surveyed Irish hospitals.
- Collected data on 14 diagnostic techniques and 9 nuclear medicine procedures.

X-ray Procedure	Estimated Number of Procedures per Year	Mean Dose per Procedure (μSv)
CT abdomen	60,900	8200
CT chest	39,700	5100
CT pelvis	38,000	6800
CT head	70,300	2000
CT spine	8100	7900
Barium enema	5800	4600
Angiocardiography	24,000	6000
PTCA	13,900	17100
Abdomen (plain film)	92,400	600
Lumbar spine	68,300	1000
Pelvis	61,900	1300
Mammography	60,400	500
Intravenous Urogram	1300	1900
Hip	52,700	600

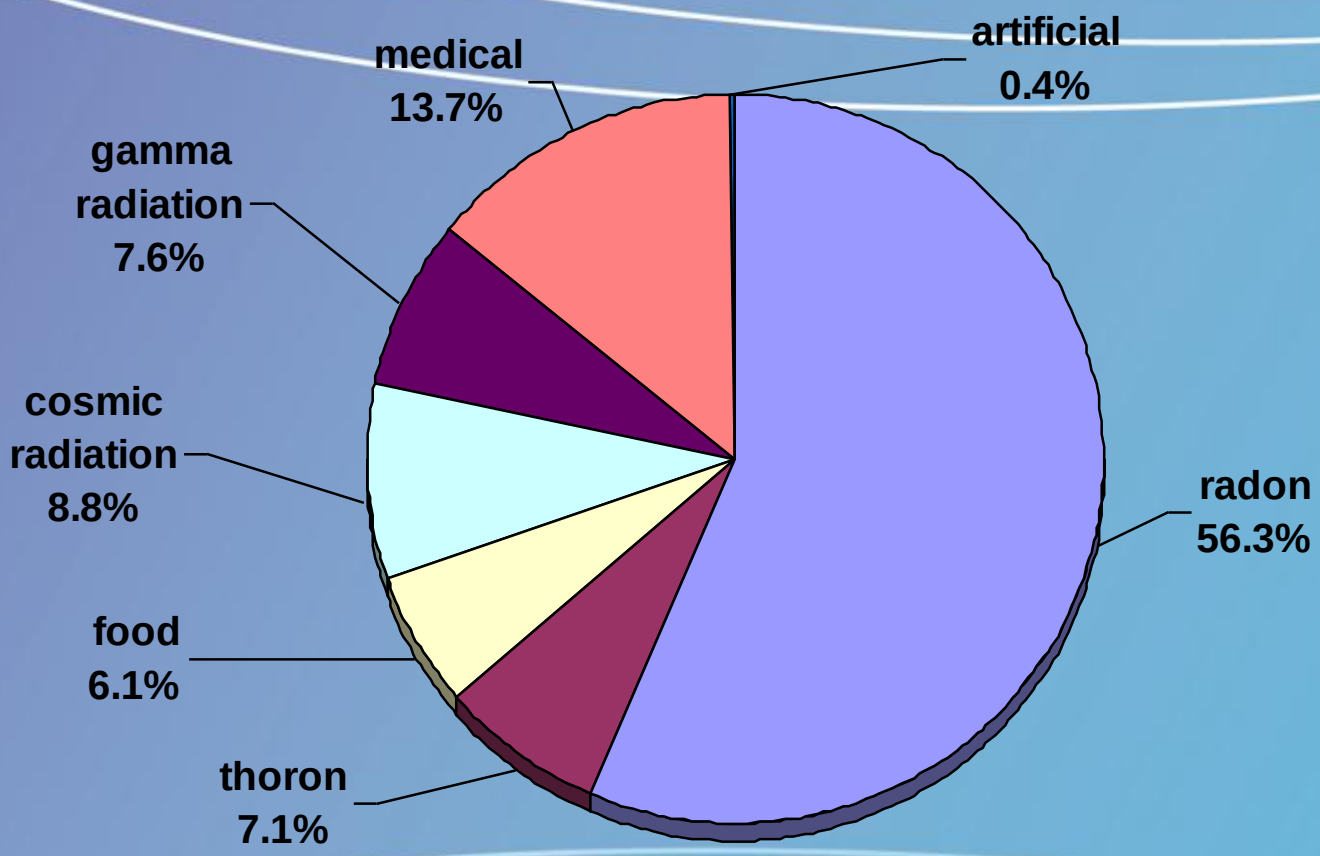
Doses to all patients



- Diagnostic X-ray examinations: 500 µSv
- Nuclear medicine: 40 µSv


Dose (µSv)
5000
4000
3000
2000
1000
0
Radon in homes
Medical
Occupational (artificial)
Occupational (natural)
Radioactivity in food (artificial)
Radioactivity in food (natural)
Thoron in homes
Gamma radiation (artificial)
Gamma radiation (natural)
Air travel
Cosmic radiation (ground)

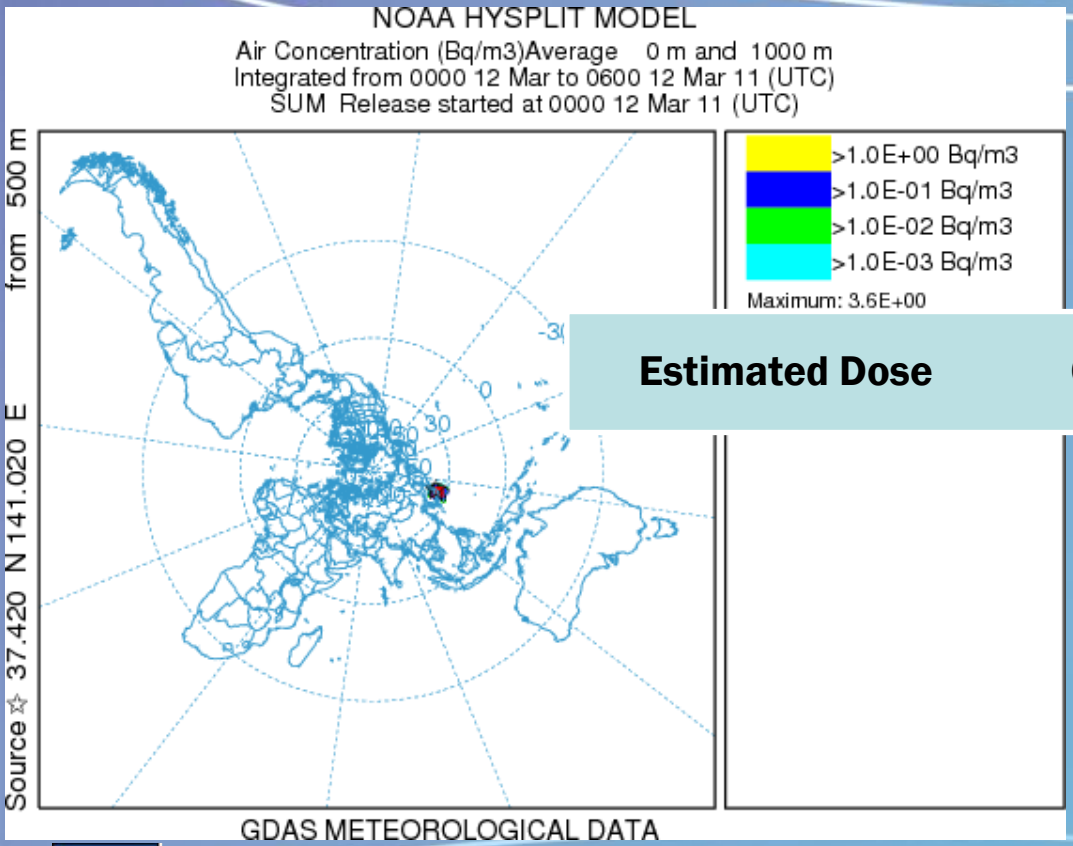
Dose Distribution in Ireland



Total per caput dose = 3950 µSv per year

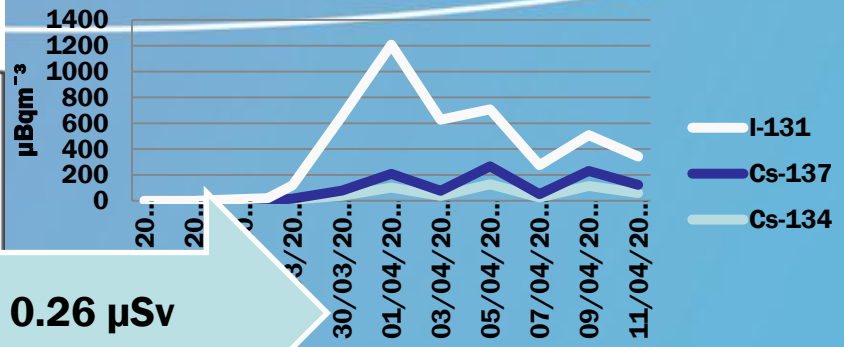
Fukushima Accident: March 2011

Transfer of radioactivity from Japan to Ireland

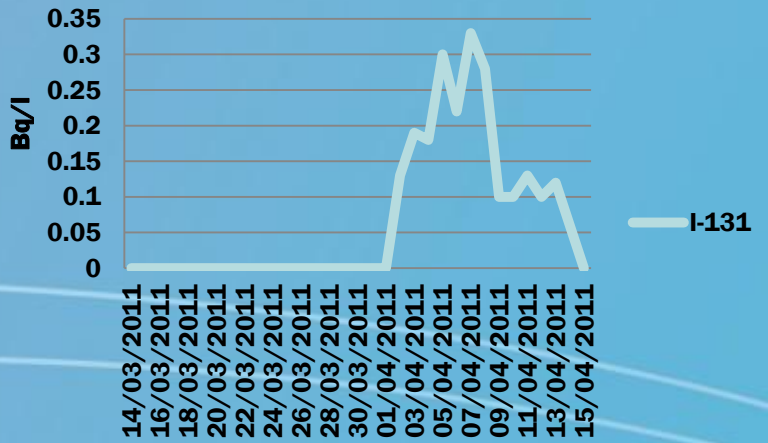


Estimated Dose **0.26 µSv**

Airborne Particulates - High Volume System



I-131 in Milk



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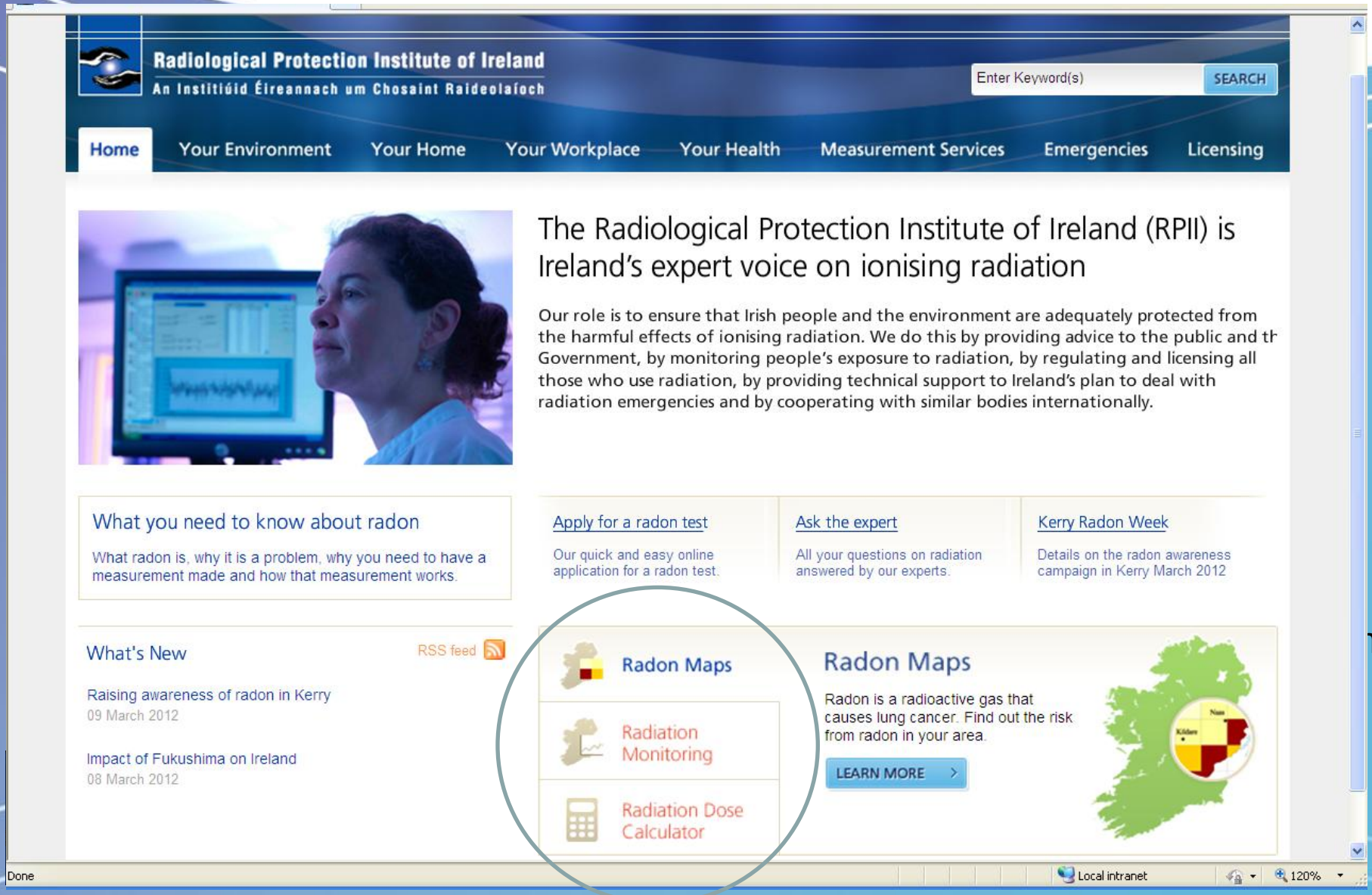
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Our role is to ensure that Irish people and the environment are adequately protected from the harmful effects of ionising radiation. We do this by providing advice to the public and th Government, by monitoring people's exposure to radiation, by regulating and licensing all those who use radiation, by providing technical support to Ireland's plan to deal with radiation emergencies and by cooperating with similar bodies internationally.
What you need to know about radon
What radon is, why it is a problem, why you need to have a measurement made and how that measurement works.
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Our quick and easy online application for a radon test.
Ask the expert
All your questions on radiation answered by our experts.
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Details on the radon awareness campaign in Kerry March 2012
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RSS feed
Raising awareness of radon in Kerry
09 March 2012
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