Introductions

Please open the following forms link – also in Teams chat:
https://forms.office.com/r/sC6Ya1pc26

and complete the questions (all answers are anonymous):

- What is your role?
- Where do you work?
- Can you think of a chronic hazard / incident example - ideally in Yorkshire and the Humber?

The session will be recorded

- Do stay on mute
- Do put questions, observations, links in the chat
- Raise ‘hand’ if you wish to ask a verbal question

UK Health Security Agency

Environmental Public Health – Burden of Disease

Environmental Hazards and Emergencies department

Session aims

- Describe the main environmental hazards to public health (encompassing chemical and radiological exposures and natural hazards) in terms of burdens of disease
- Understand incident management arrangements for different chronic environmental hazards and public health professionals' roles
- Identify relevant sources of information and contact points for different chronic environmental hazards

Contacting UKHSA

Generally, via your local Health Protection Team:

Across England, check: https://www.gov.uk/health-protection-team

Yorkshire and the Humber HPT

yorkshirehumberhpt@phe.gov.uk

In hours: 0113 386 0300

Out of hours: 0151 9091219

Environmental Hazards and Emergencies Dept (EHED)

Specialist department - role includes support to local Health Protection Teams

- Not clinical or occupational health advice

In UKHSA:

- Radiation, Chemical and Environmental Hazards directorate
- CRCE terminology is defunct

Environmental Burden of Disease

- 24% of global deaths (and 28% of deaths among children under five) are due to modifiable environmental factors.*
- In Europe: 14% average in high income countries (inc UK)
- There are massive inequalities between and within countries.
- Age standardised deaths per 100,000:

Country	Total	Infectious, parasitic, neonatal and nutritional	Noncommunicable diseases	Injuries	Deaths attributable to the environment (%)[i] Total
United Kingdom of Great Britain and Northern Ireland	53	1	47	5	12
United Republic of Tanzania	264	107	102	56	22
United States of America	57	1	46	11	11
Uruguay	64	1	50	12	10
Uzbekistan	232	11	205	16	24

*www.who.int/publications/i/item/9789241565196

Which environmental, chemical and radiological hazards are we exposed to throughout our lifetimes?

Please open the following forms link – also in Teams chat:

https://forms.office.com/r/6qAGARYuRm

and complete the questions:

- Which environmental, chemical and radiological hazards are we exposed to throughout our lifetimes?

- Why is / might it be hazardous?

Click Submit, and you can then click submit another response to add more

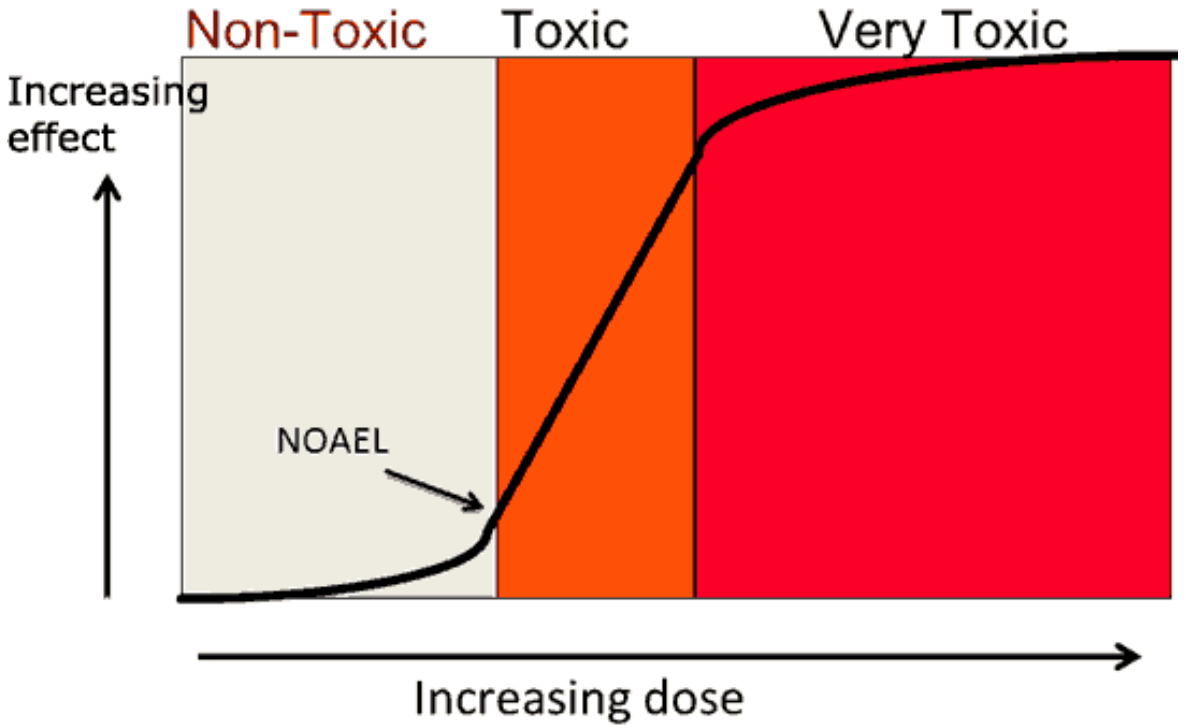
Environmental hazards

• Air pollution	Indoors and outdoors
• Water pollution	Drinking water, recreation
• Contaminated land	Historical and recent
• Chemicals in consumer products	Utensils, toys, chemical products
• Ionising radiation	Natural and man-made
• Non-ionising radiation	Power, telecommunications, light
• Climate change and Extreme Events	Adaptation and mitigation

“The dose makes the poison”

Chemicals may cause many different health effects depends on:

- How long exposed?
- Quantity exposed to?



- How exposed? e.g. inhalation, skin contact, ingestion

Key principle for risk assessment

- To understand potential public health risks need to undertake risk assessment

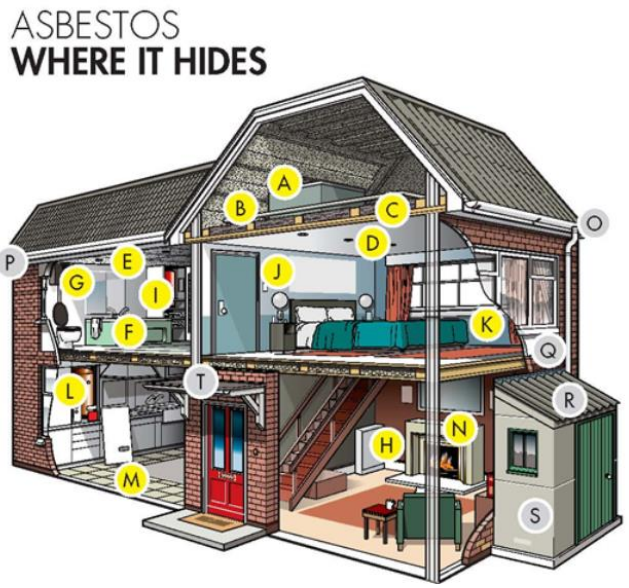
- **Source** - chemical
- **Pathway** - route by which the chemical can affect the receptor
- **Receptor** - the public
- All three have to be present for there to be a risk to the health of the public
- Applies to both acute and chronic chemical/environmental events

We all do risk management ……

- Risk assessment: the formal process of identifying hazards, identifying the probability that harm may occur from the hazard, assessing and evaluating the health and environmental risks that could be associated with a hazard.

- Risk management: managing the problem so harm is minimised or prevented taking into account political, socio-economic factors.

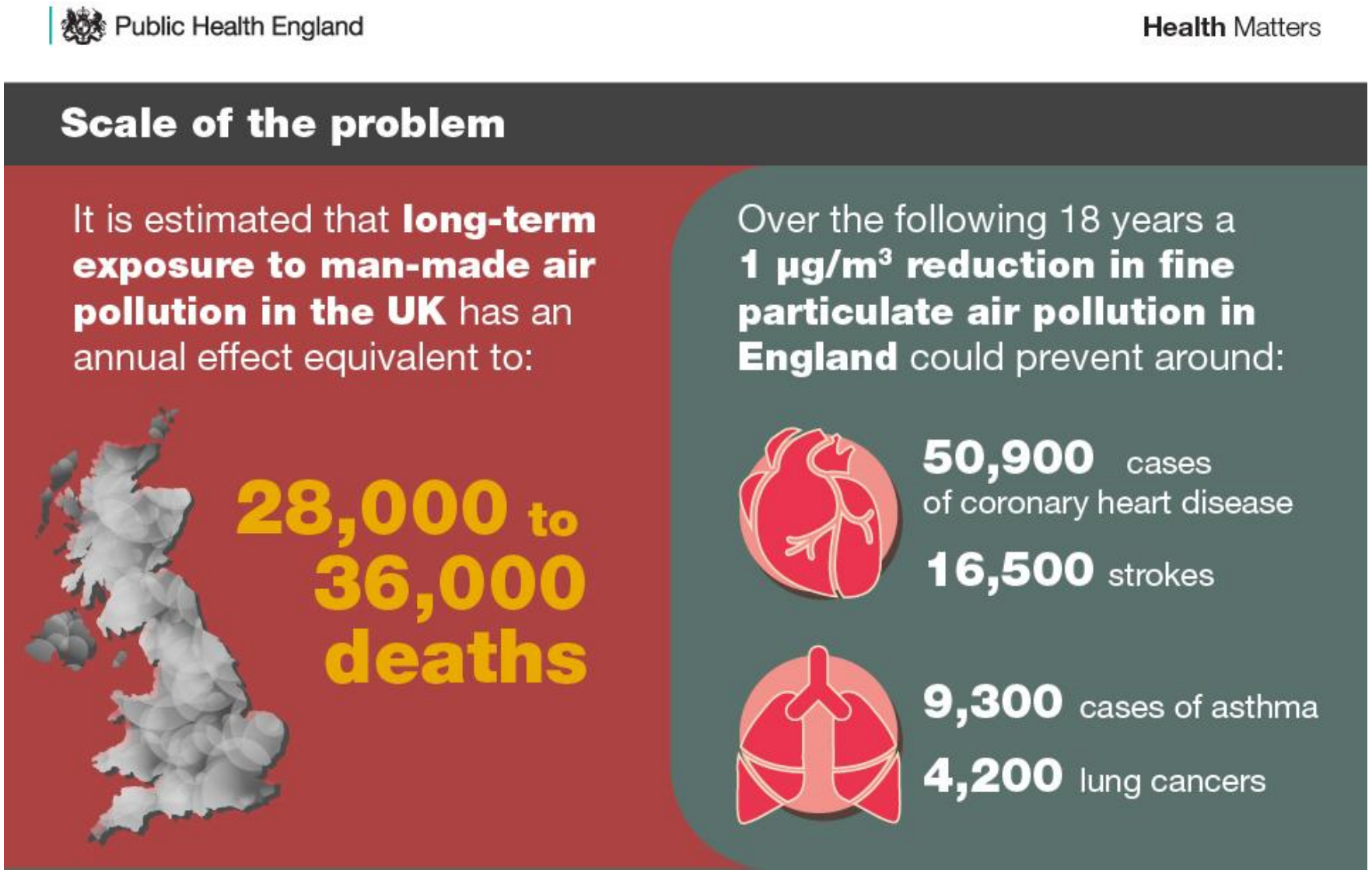
Asbestos - fibres are strong, flexible, heat resistant

Source	Pathway: Inhalation	Receptor
	**Degree of risk is dependent on type of asbestos, length of exposure.** **No immediate ill health effects – not acutely toxic**	**Public concerns are common** **Minimal risk if asbestos in good condition**

Information sources: HSE: https://www.hse.gov.uk/asbestos/
UKHSA: https://www.gov.uk/government/publications/asbestos-properties-incident-management-and-toxicology

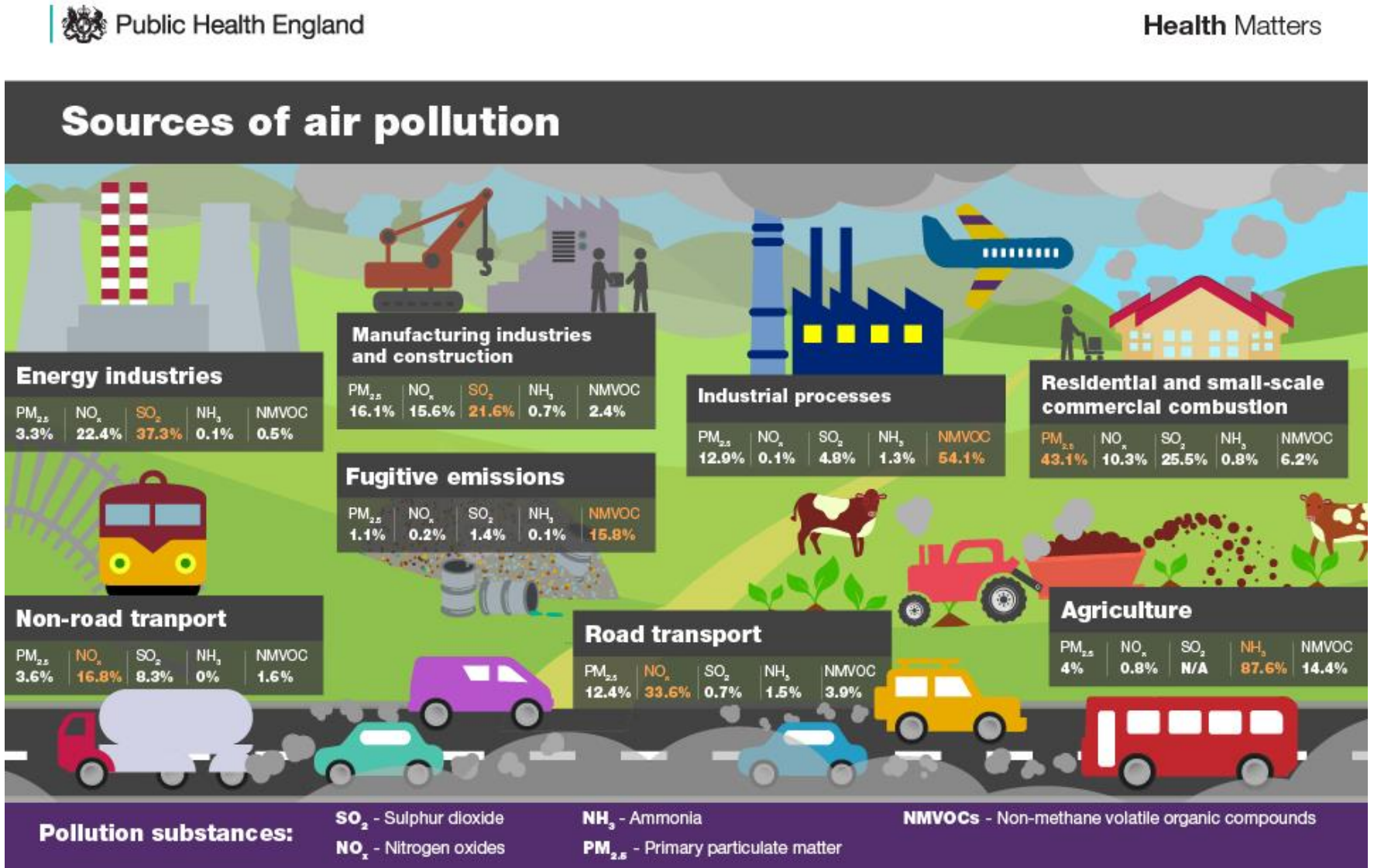
Health Matters – outdoor air pollution

www.gov.uk/government/publications/health-matters-air-pollution



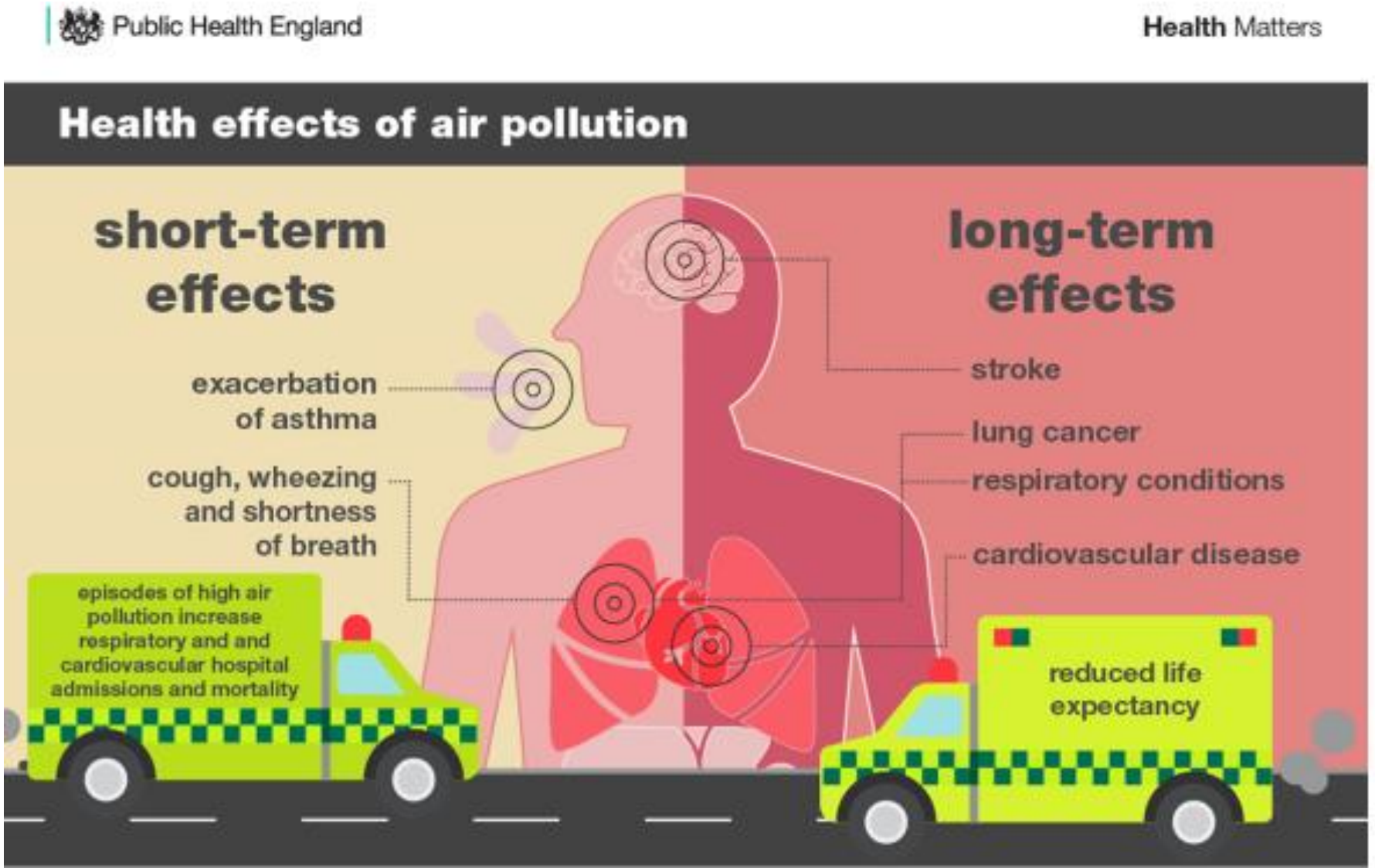
Health Matters – outdoor air pollution

www.gov.uk/government/publications/health-matters-air-pollution



Health Matters – outdoor air pollution

www.gov.uk/government/publications/health-matters-air-pollution



Health Matters – outdoor air pollution

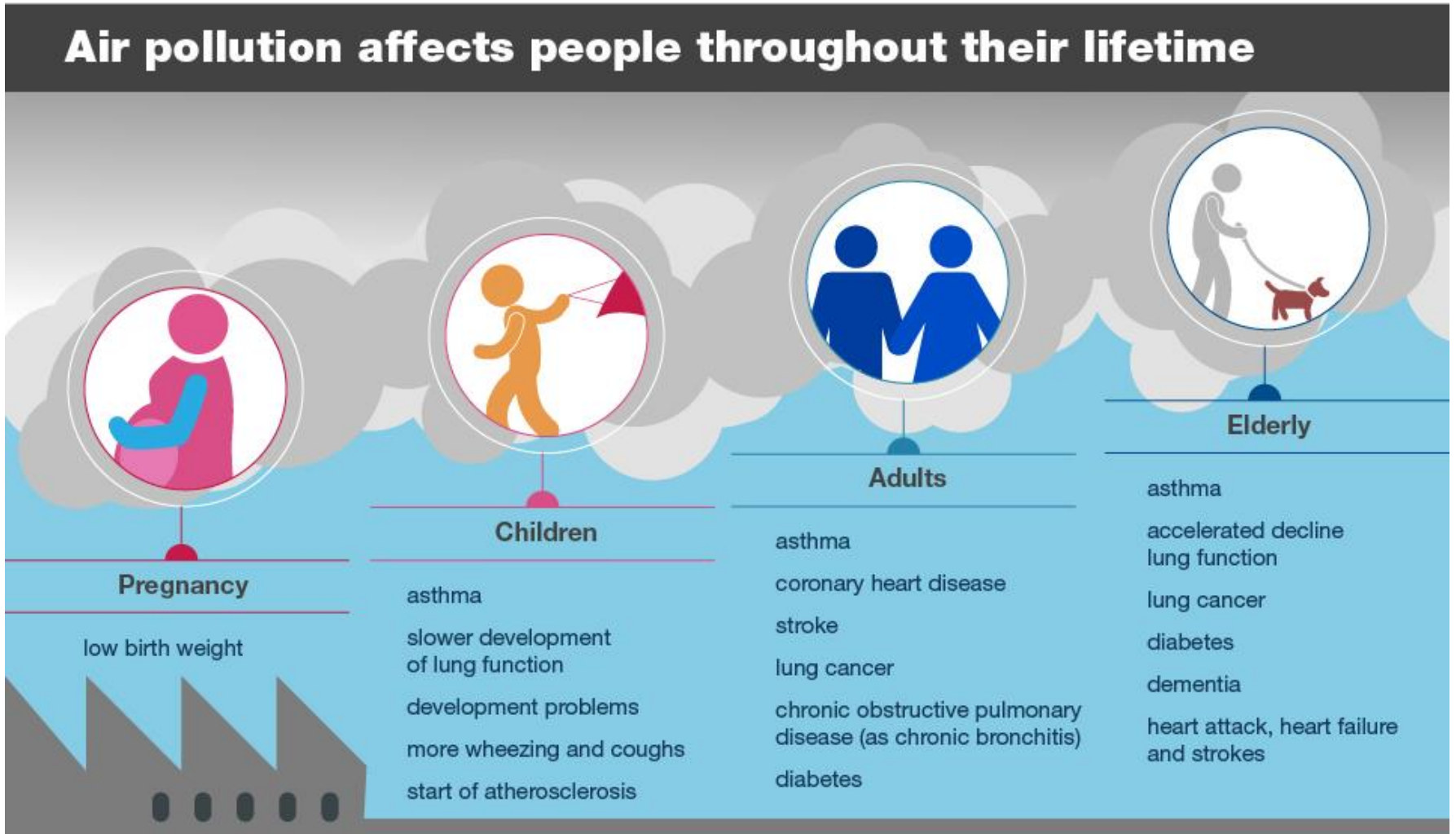
www.gov.uk/government/publications/health-matters-air-pollution

Health Matters – outdoor air pollution

www.gov.uk/government/publications/health-matters-air-pollution

Public Health England

Health Matters



Public health profiles*

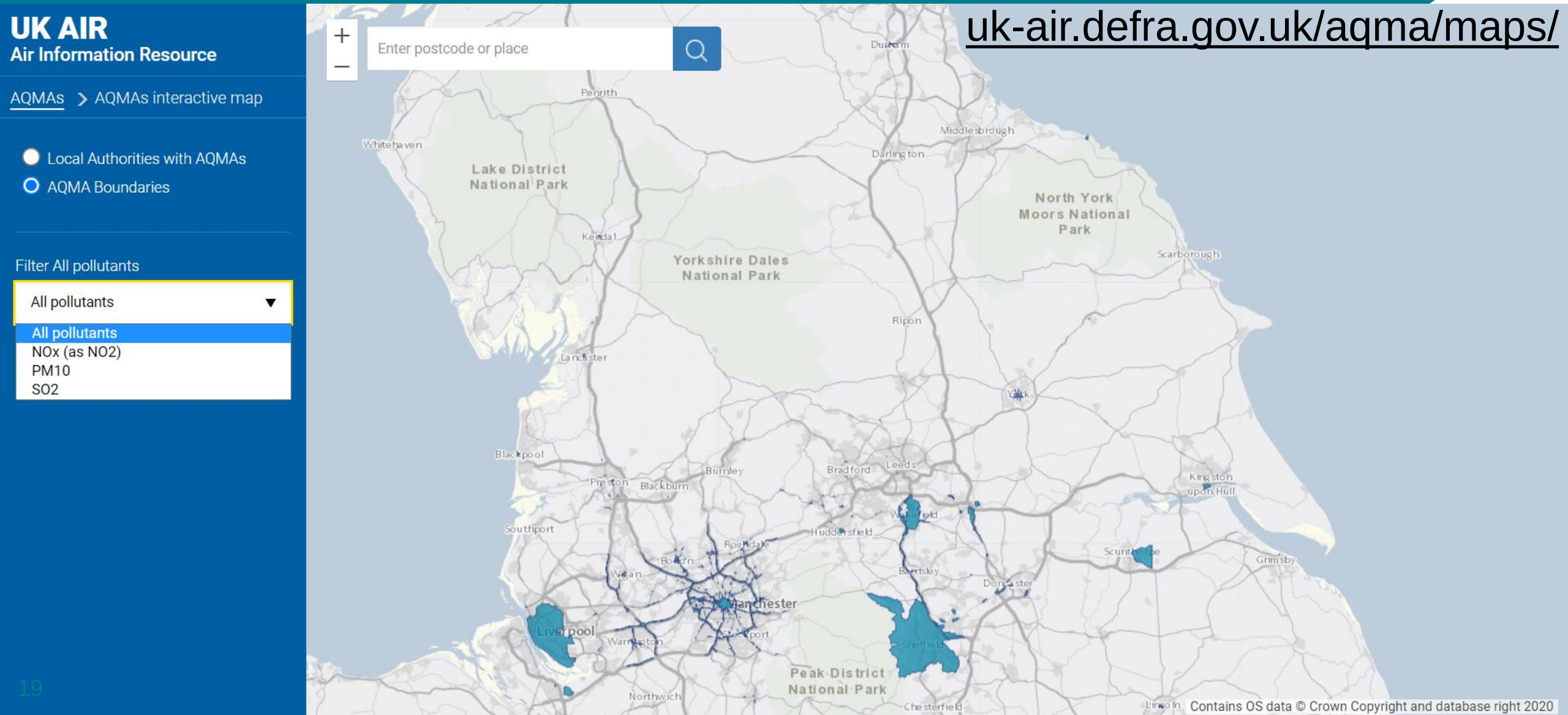
- Fraction of mortality attributable to particulate air pollution *https://fingertips.phe.org.uk/

Areas: **All in Yorkshire and the Humber region** | All in England Display: **Table** | Table and chart

Area	Recent Trend	Count	Value	95% Lower CI	95% Upper CI
England	–	-	5.1	-	-
Yorkshire and the Humber region	–	-	4.8	-	-
Kingston upon Hull	–	-	5.2	-	-
Rotherham	–	-	5.2	-	-
Doncaster	–	-	5.0	-	-
Leeds	–	-	5.0	-	-
Sheffield	–	-	5.0	-	-
North East Lincolnshire	–	-	5.0	-	-
Kirklees	–	-	4.9	-	-
North Lincolnshire	–	-	4.9	-	-
Wakefield	–	-	4.9	-	-
Barnsley	–	-	4.8	-	-
Bradford	–	-	4.7	-	-
East Riding of Yorkshire	–	-	4.6	-	-
Calderdale	–	-	4.6	-	-
York	–	-	4.5	-	-
North Yorkshire	–	-	4.0	-	-

Source: Background annual average $PM_{2.5}$ concentrations for the year of interest are modelled on a 1km x 1km grid using an air dispersion model, and calibrated using measured concentrations take n from background sites in Defra's Automatic Urban and Rural Network (http://uk-air.defra.gov.uk/interactive-map.) Data on primary emissions from different sources and a combination of measureme

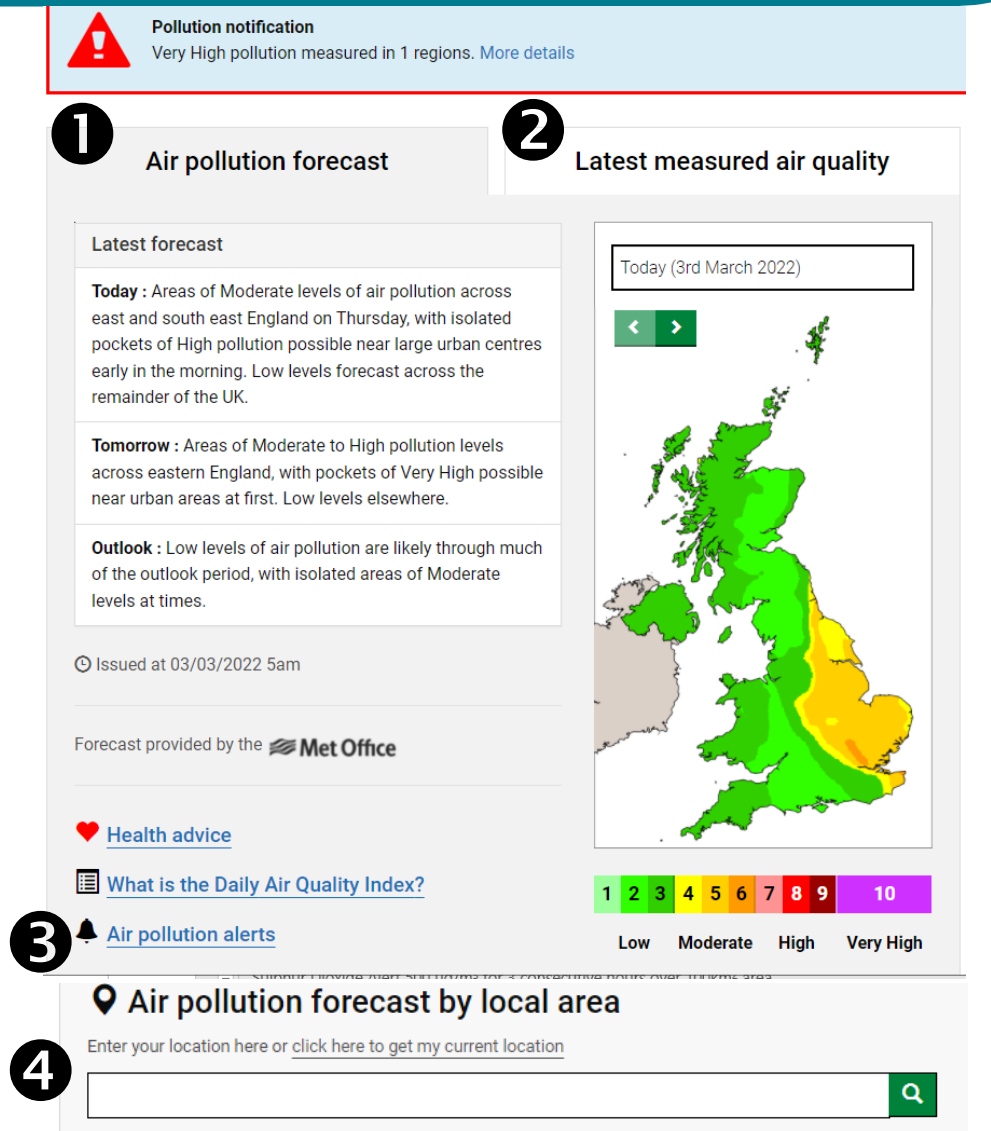
Air Quality Management Areas (AQMA)



Defra forecast, monitoring & alerts

https://uk-air.defra.gov.uk/

1. Forecast tab with today, tomorrow outlook and map view by day – selectable for +4 days.
2. Latest monitoring data tab – map view with more data selection links, e.g. from AURN network sites.
3. Air pollution alerts link – for high or very high.
4. Option to search for AQ forecast by area / city etc.



Daily Air Quality Index (DAQI) bands

https://uk-air.defra.gov.uk/air-pollution/daqi?view=more-info&pollutant=pm10#pollutant

Ozone | Nitrogen Dioxide | Sulphur Dioxide | PM2.5 Particles | PM10 Particles

PM_{10} Particles

Based on the daily mean concentration for historical data, latest 24 hour running mean for the current day.

Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
µg/m³	0-16	17-33	34-50	51-58	59-66	67-75	76-83	84-91	92-100	101 or more

$PM_{2.5}$, PM_{10} particulates	24 hour running mean
SO_2 sulphur dioxide	15 minute concentration
NO_2 nitrogen dioxide	hourly concentration
O_3 ozone	8 hour running mean

Daily Air Quality Index (DAQI)
Recommended Actions and Health Advice

Air Pollution Banding	Value	Accompanying health messages for at-risk individuals*	Accompanying health messages for the general population
Low	1-3	**Enjoy** your usual outdoor activities.	**Enjoy** your usual outdoor activities.
Moderate	4-6	Adults and children with lung problems, and adults with heart problems, **who experience symptoms**, should **consider reducing** strenuous physical activity, particularly outdoors.	**Enjoy** your usual outdoor activities.
High	7-9	Adults and children with lung problems, and adults with heart problems, should **reduce** strenuous physical exertion, particularly outdoors, and particularly if they experience symptoms. People with asthma may find they need to use their reliever inhaler more often. Older people should also **reduce** physical exertion.	Anyone experiencing discomfort such as sore eyes, cough or sore throat should **consider reducing** activity, particularly outdoors.
Very High	10	Adults and children with lung problems, adults with heart problems, and older people, should **avoid** strenuous physical activity. People with asthma may find they need to use their reliever inhaler more often.	**Reduce** physical exertion, particularly outdoors, especially if you experience symptoms such as cough or sore throat.

Air Pollution Episodes

Yorkshire & the Humber*:

DAQI band	2018	2019	2020	2021
Moderate	48	42	30	15
High	**1**	**9**	**3**	**1**
Very High	**1**	**1**	**0**	**0**

- You can subscribe for alerts etc - https://uk-air.defra.gov.uk/subscribe
- Defra tweets forecasts, updates. https://twitter.com/DefraUKAir/
- Dependent on levels other organisations will cascade. Some councils have specific alerting systems which you can subscribe to.
- Further information: See p71–75 of https://www.local.gov.uk/publications/air-quality-briefing-directors-public-health

*https://uk-air.defra.gov.uk/data/DAQI-regional-data

Fires

https://www.bbc.co.uk/news/live/uk-england-leeds-47384520

https://www.bbc.co.uk/news/uk-england-york-north-yorkshire-34812713

https://www.thetelegraphandargus.co.uk/news/18874103.live-huge-scrap-tyre-fire-breaks-bradford/

Fires – risk assessment and messaging

- Smoke plume, behaviour – thick / grounding?
- Nearby receptors – potential impacts now / with time
- Concerns for what is burning, odour, deposition (e.g. asbestos)
- Expected duration – active firefighting versus controlled burn
- Changing meteorology, plume behaviour with time
- Incident coordination and agreed messaging

Fires – risk assessment and messaging

Specimen comms paragraphs (cf DAQI):

“There is the potential for the smoke to affect people, especially those with respiratory problems.

In general, exposure to smoke is more likely to affect people who have existing breathing problems, lung or heart conditions (eg asthma, bronchitis, chronic pulmonary disease or heart disease). The very young and very old, smokers and people with flu or flu-like illnesses may also be at greater risk after exposure to smoke from fires. People who are generally fit and well are unlikely to experience long-term health problems from temporary exposure to smoke from a fire. People with asthma who may be in the vicinity of the fire should carry their inhaler.

If any symptoms persist, or you are concerned about the affects of smoke on your health, seek medical advice by calling NHS 111 or by contacting your GP. In the case of an emergency call 999.”

Protracted fires

Some fires – e.g. wildfires, ‘controlled burns’, illegal sites may burn for some time and require significant multiagency cooperation and costs to resolve.

Sheltering is less effective for protracted fires

- Plume can be more acrid, less buoyant
- Ingress into buildings can lead to protracted exposure
- Health complaints can rise rapidly, leading to media, councillor, MP involvement, calls for health assessments, monitoring, action…

UKHSA would support multi-agency coordination, communication, health surveillance data gathering, any monitoring data assessment.

Lead (Pb)

DEATH BY PAINT Toddler killed by lead poisoning after eating flakes of paint-covered wood

A toddler died in hospital after doctors found he had ingested lethal amounts of lead in paint-covered wood flakes at home

Science of the Total Environment 644 (2018) 1346–1356

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Intake of lead (Pb) from tap water of homes with leaded and low lead plumbing systems

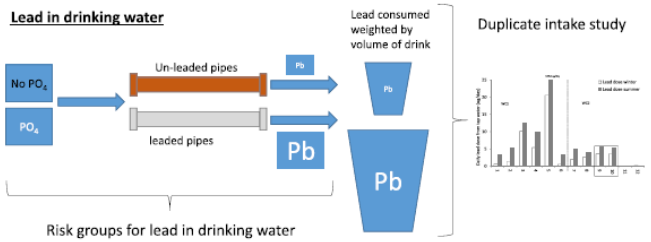
Peter Jarvis [a,*], Katie Quy [b], Jitka Macadam [a], Marc Edwards [c], Marjorie Smith [b]

[a] Cranfield Water Science Institute, Cranfield University, Cranfield, Bedfordshire MK43 0AL, UK
[b] Thomas Coram Research Unit, UCL Institute of Education, 20 Bedford Way, London WC1H 0AA, UK
[c] The Charles E. Via, Jr. Department of Civil & Environmental Engineering, Virginia Tech, Blacksburg, VA 24061, USA

HIGHLIGHTS

- Lead in tap water is an ongoing problem in many countries worldwide.
- A unique duplicate intake sampling protocol was applied to estimate lead consumption.
- Variability in lead exposure within a household was clearly demonstrated.
- Lead intake linked to property type, plumbosolvency control and water consumption

GRAPHICAL ABSTRACT



Legacy of toxic leaded petrol lingers in air in London, study finds

Most cities likely to be affected by the pollutant, which is particularly harmful to children's brains

The study found that 32-43% of the lead in the London air was originally from leaded fuels, banned 20 years ago. Photograph: Daniel Leal-Olivas/AFP/Getty

Toxic lead from petrol that was banned 20 years ago still lingers in the air in London, a study has shown, with researchers saying the legacy of leaded fuels is likely to hang over most cities.

While levels are much lower than at their peak in the 1980s, they remain far above natural background levels. Lead is extremely poisonous and there is no safe amount of exposure. It is of particular concern for children, as it damages their developing brains and ability to learn.

Lead was added to fuels in the UK from the 1930s and phased out in the decade up to 1999. The metal was deposited on urban surfaces and soils over many decades and is thought to be repeatedly thrown back up into the air by winds, traffic and building works, and levels are no longer declining.

Lead (Pb)

WHO 2016 estimated that exposure to lead accounted for 63.2% of the global burden of idiopathic developmental intellectual disability

WHO 2019 estimated worldwide there were 900,000 deaths, 8.2% of the global burden of hypotensive heart disease, 7.2% of ischaemic heart disease, 5.7% of strokes

No threshold level of effect - UK background approx. below 2 µg/dL / 0.1µmol/L

IHME estimates the number of children (0-19) in UK with Blood Lead Levels (BLLs) above 5 µg/dl = 213,072 and above 10 µg/dl = 29,036

Public Health Intervention above 5µg/dL / 0.24 µmol/L (child and foetus)

UKHSA produced Futurelearn course - Public Health Incidents Involving Lead: https://www.futurelearn.com/courses/public-health-incidents-involving-lead

Background levels & context setting

Important to put concentrations in context versus current and lifetime exposure.

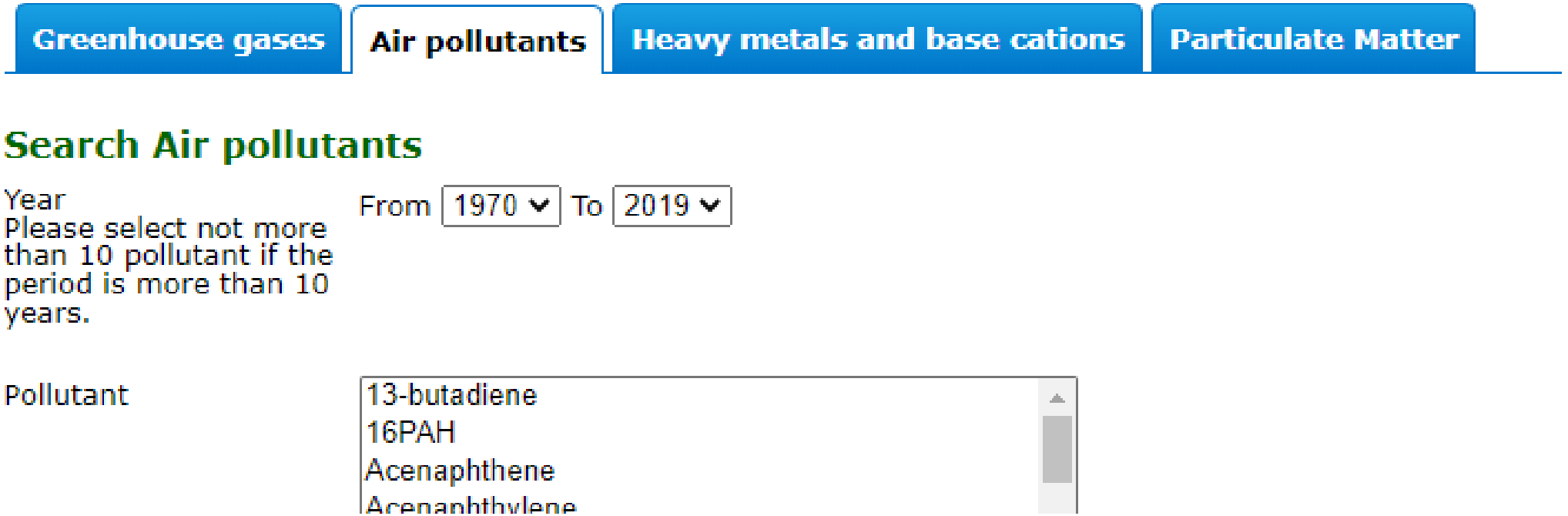
Defra provide monitoring network and background concentration maps for many pollutants. NAEI (National Atmospheric Emissions Inventory) provides emission source data.

- https://naei.beis.gov.uk/emissionsapp/
- https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-summary
- https://naei.beis.gov.uk/data/data-selector
- https://uk-air.defra.gov.uk/data/laqm-background-home
- https://naei.beis.gov.uk/overview/pollutants?pollutant_id=45

Background levels & context setting

https://naei.beis.gov.uk/data/data-selector

Data are available back to 1990 for greenhouse gases, 1980 for ammonia and 1970 for all other pollutants.



Background levels & context setting

https://naei.beis.gov.uk/data/data-selector

» View and Download Dioxins (PCDD/F) emission summary data

Time series graph

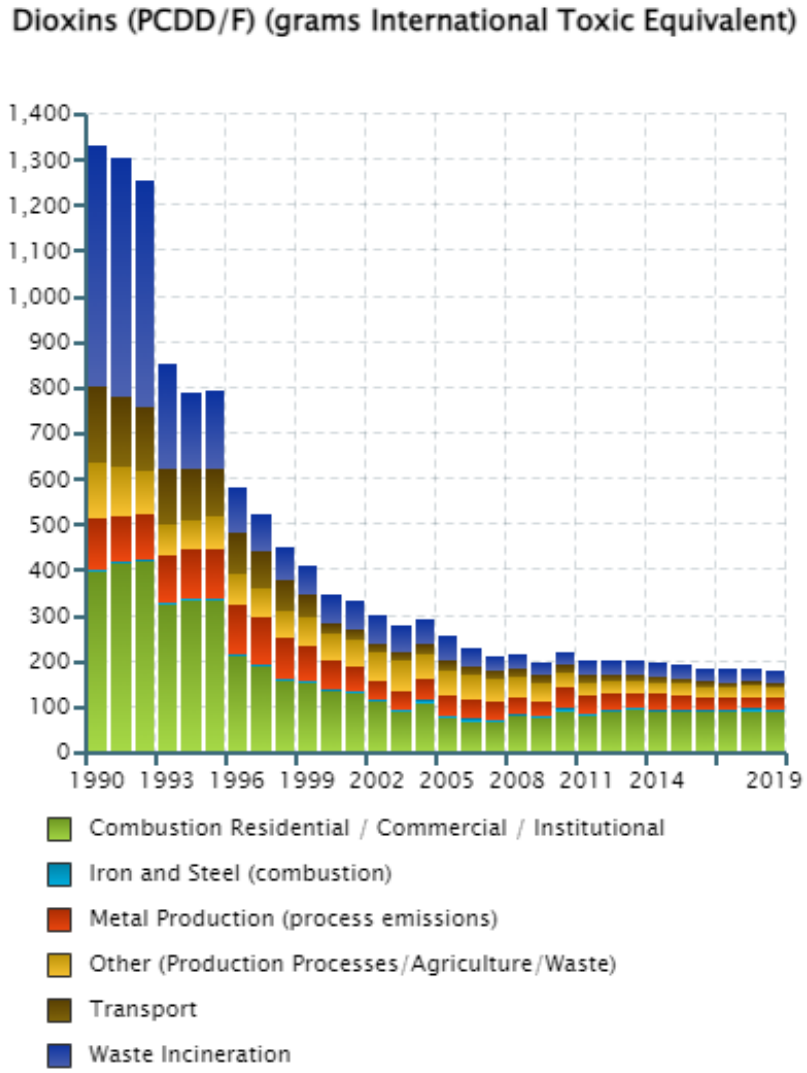
Start: 1991 End: 2019

Sources:

- All
- Combustion Residential / Commercial / Institutional
- Iron and Steel (combustion)
- Metal Production (process emissions)
- Other (Production Processes/Agriculture/Waste)
- Transport
- Waste Incineration

Update graph

Tip: you can click and drag within the chart area to zoom on the Y-Axis. Right click and select "View All" to zoom out.



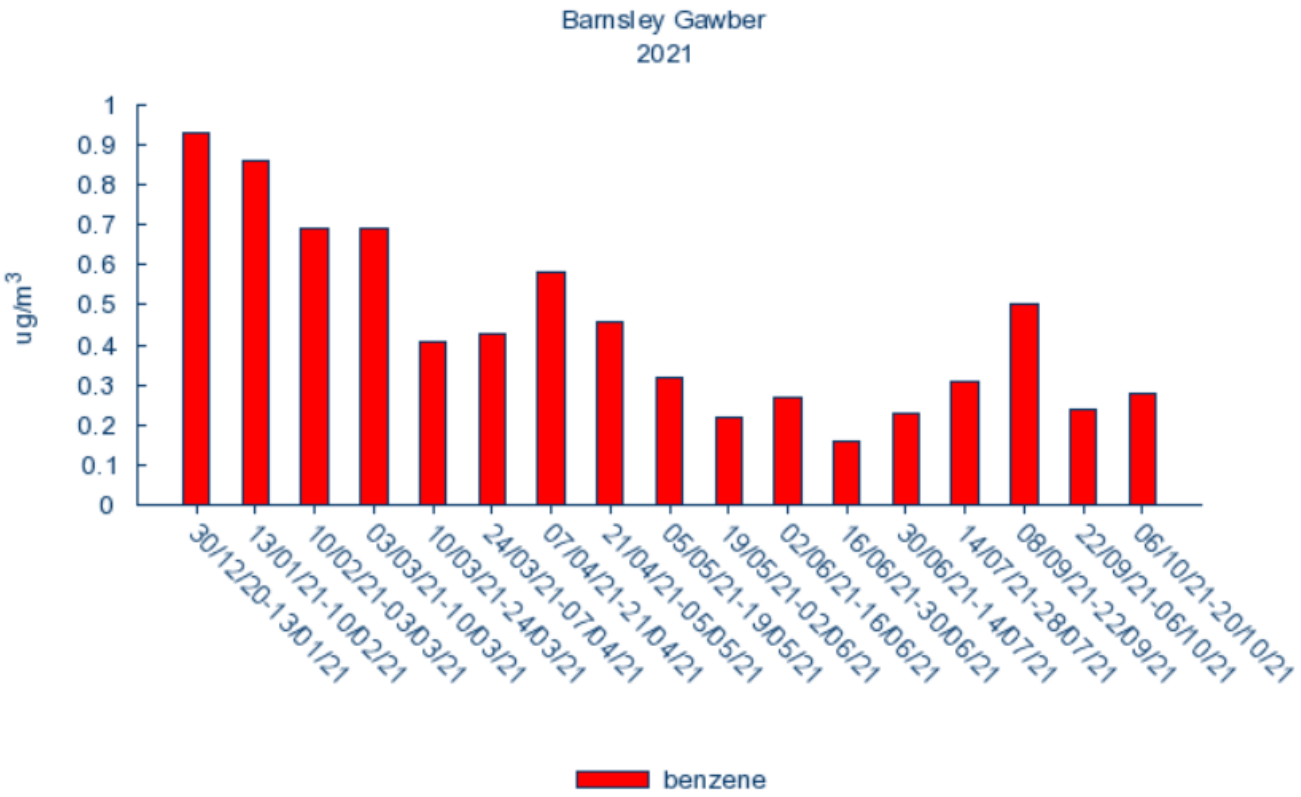
Background levels & context setting

5	Sheffield Devonshire Green UK-AIR ID: UKA00575 Location: 53.378622,-1.478096	Show 3 networks ▼ Automatic Urban and Rural Monitoring Network (AURN) Heavy Metals Non-Automatic Hydrocarbon Network	Urban Background	26.90	View site networks and parameters
6	Dewsbury Ashworth Grove UK-AIR ID: UKA00654 Location: 53.693104,-1.637111	Automatic Urban and Rural Monitoring Network (AURN)	Urban Background	35.33	View site networks and parameters
7	Scunthorpe Town UK-AIR ID: UKA00381 Location: 53.586340,-0.636811	Show 4 networks ▲ Automatic Urban and Rural Monitoring Network (AURN) Heavy Metals Non-Automatic Hydrocarbon Network PAH Digitel (solid phase)	Urban Industrial	35.87	View site networks and parameters

Background levels & context setting

Graph for 2021 for benzene

The graph below shows data from the current selected year.



View data for sites for Non-Automatic Hydrocarbon Network network

Use the dropdown list below to view data for a particular monitoring site.

Barnsley Gawber

We spend 90% of our time inside

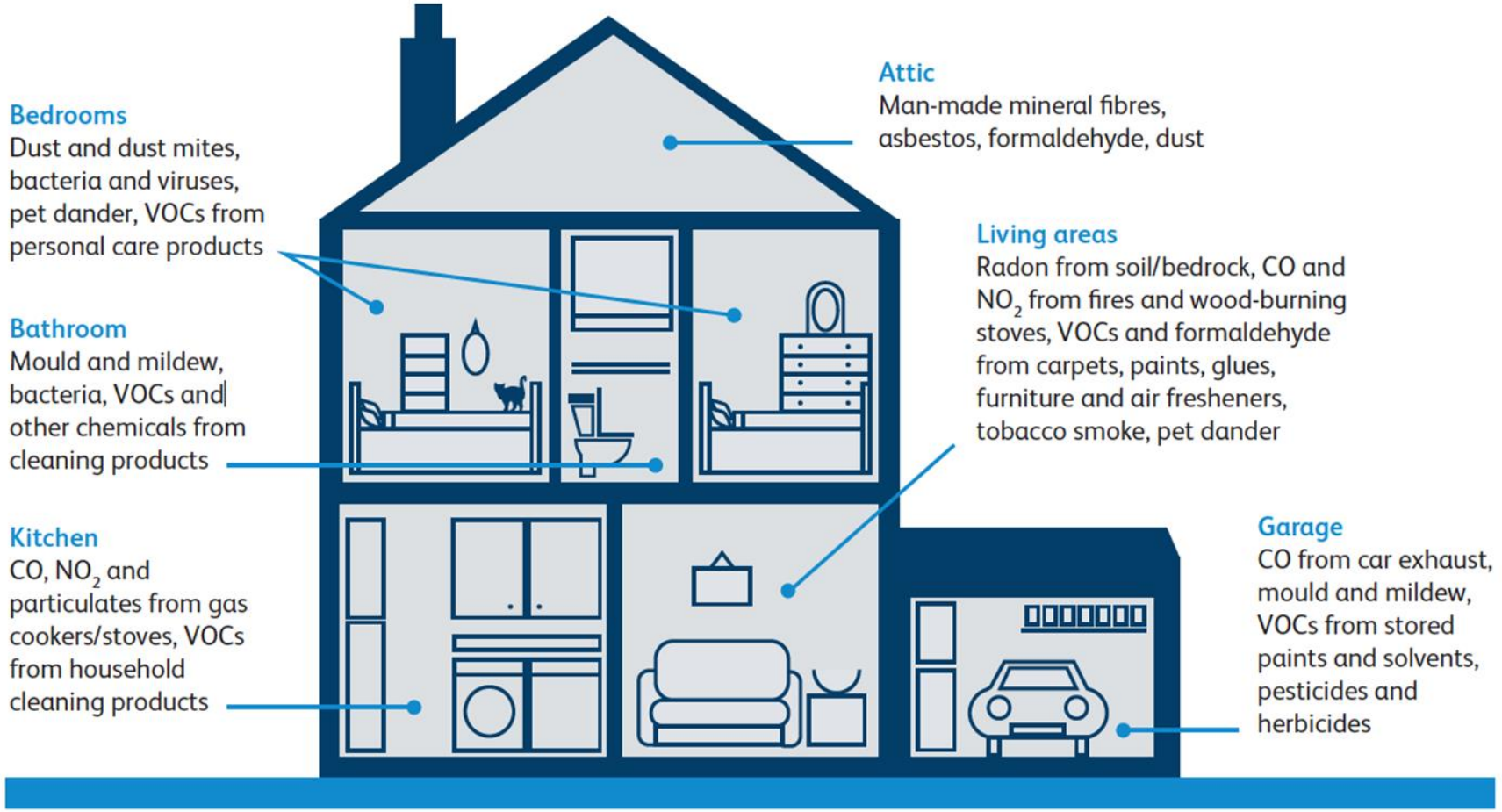


Fig 3. Sources and types of indoor pollution encountered in homes. VOCs = volatile organic compounds. Please note that these lists are not exhaustive and that the actual pollutants present, and their amounts, will vary from household to household.

Selected resource links for reference (1):

- khub.net/group/phe-air-quality-and-public-health (UKHSA AQ Knowledge Hub)
- www.gov.uk/government/publications/health-matters-air-pollution
- www.gov.uk/government/publications/air-pollution-applying-all-our-health/air-pollution-applying-all-our-health
- www.gov.uk/government/publications/improving-outdoor-air-quality-and-health-review-of-interventions
- portal.e-lfh.org.uk/Component/Details/603166 (bite-sized AQ training)
- uk-air.defra.gov.uk/
- airqualityhub.co.uk/ (Defra funded AQ hub with local authority case studies and resources)
- www.local.gov.uk/publications/air-quality-briefing-directors-public-health
- www.nice.org.uk/guidance/ng149 (Indoor air quality at home)
- https://www.rcpch.ac.uk/resources/inside-story-health-effects-indoor-air-quality-children-young-people

Selected resource links for reference (2):

- https://www.gov.uk/government/collections/chemical-hazards-and-poisons-reports (many articles with case studies)
- https://www.gov.uk/government/collections/chemical-hazards-compendium
- https://www.futurelearn.com/courses/public-health-incidents-involving-lead
- PHE chemical compendium https://www.gov.uk/health-and-social-care/health-protection-chemical-and-environmental-hazards
- https://collaborate.resilience.gov.uk/RDService/home/109280/LRF-Information-about-AQC-Response
- Toxbase https://www.toxbase.org/ (free with requires NHS email)
- https://www.gov.uk/government/collections/flooding-health-guidance-and-advice
- https://www.gov.uk/government/publications/non-infectious-disease-clusters-investigation-guidelines

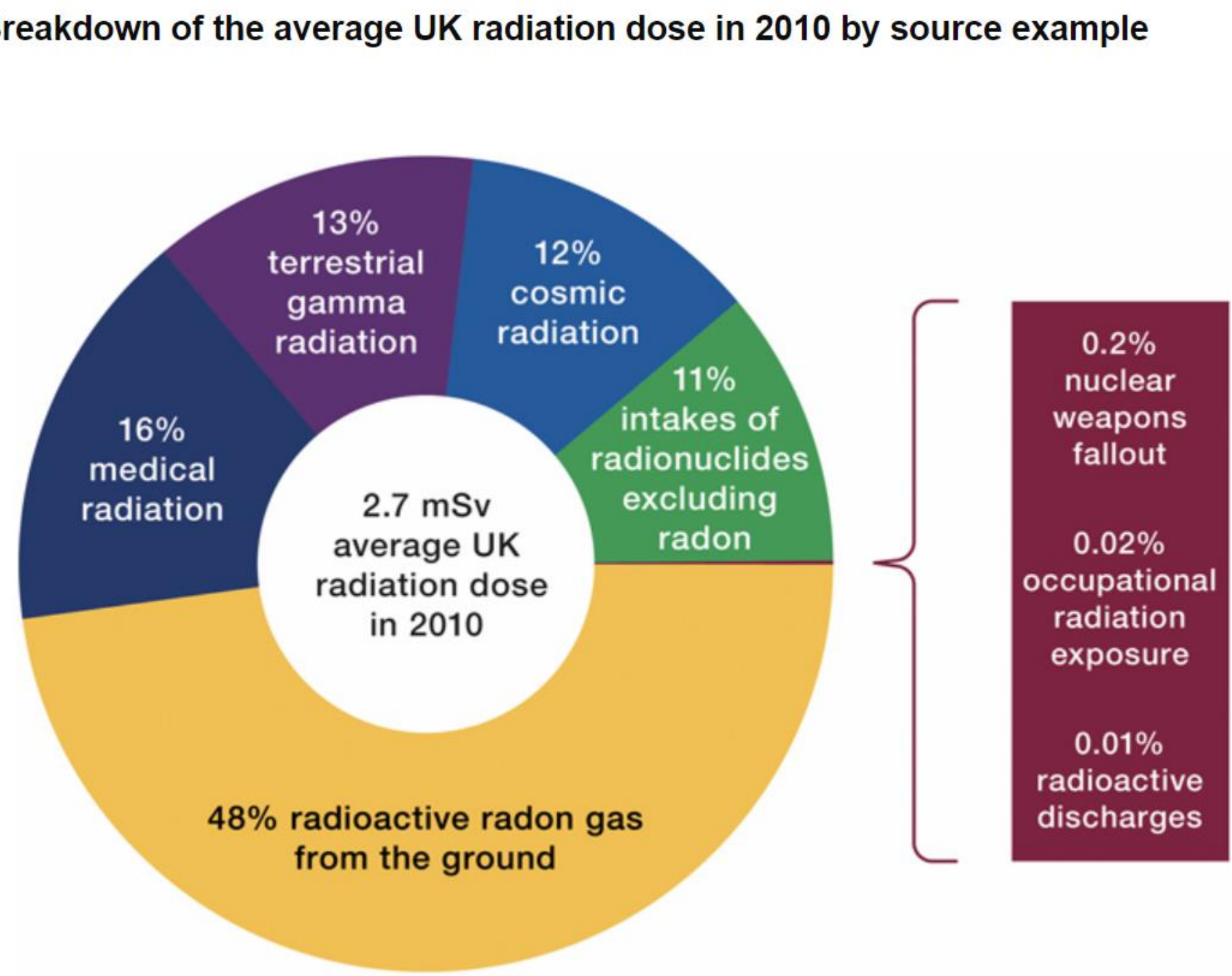
Selected resource links for reference (3):

- https://uk-air.defra.gov.uk/data/laqm-background-home
- https://naei.beis.gov.uk/emissionsapp/
- https://naei.beis.gov.uk/data/data-selector
- https://naei.beis.gov.uk/overview/pollutants?pollutant_id=45
- https://uk-air.defra.gov.uk/networks/find-sites.php?group_id=4&postcode=DN5+&radius=100000&latitude=53.537000&longitude=-1.172000&action=results&view=location&search=Search+Network
- https://uk-air.defra.gov.uk/data/non-auto-data?uka_id=UKA00353&view=data&network=nahc&year=2021&pollutant=default#view
- https://www.bbc.co.uk/news/uk-england-london-57564953
- https://www.imperial.ac.uk/news/224474/lead-from-leaded-petrol-persists-london/

Ionising radiation

https://www.ukradon.org/information/whatisradon

www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons



Ionising radiation

https://www.ukradon.org/information/whatisradon

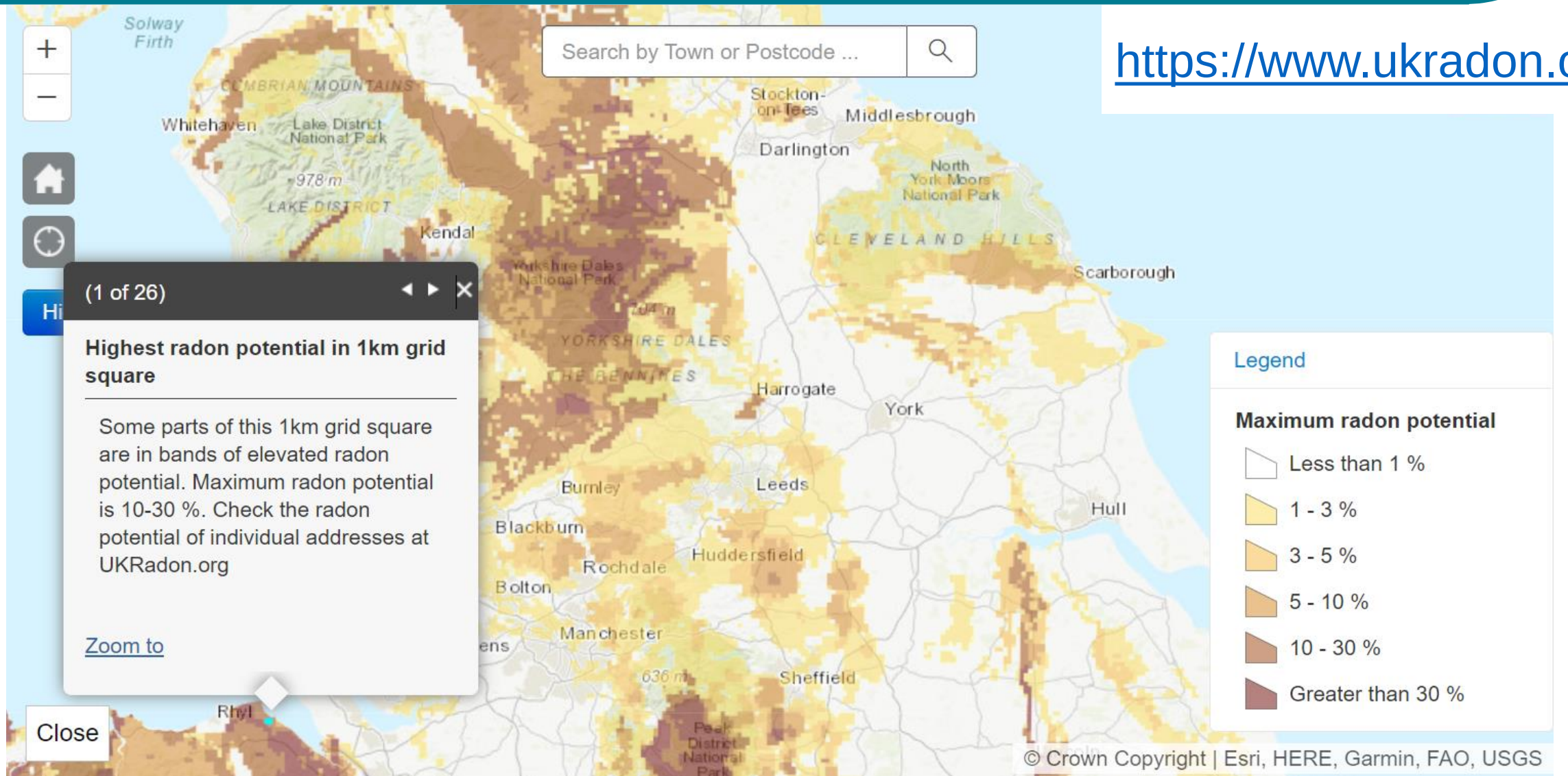
www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons

Comparison of doses from sources of exposure

Source of exposure	Dose
Dental x-ray	0.005 mSv
100g of Brazil nuts	0.01 mSv
Chest x-ray	0.014 mSv
Transatlantic flight	0.08 mSv
Nuclear power station worker average annual occupational exposure (2010)	0.18 mSv
UK annual average radon dose	1.3 mSv
CT scan of the head	1.4 mSv
UK average annual radiation dose	2.7 mSv
USA average annual radiation dose	6.2 mSv
CT scan of the chest	6.6 mSv
Average annual radon dose to people in Cornwall	6.9 mSv
CT scan of the whole spine	10 mSv
Annual exposure limit for nuclear industry employees	20 mSv
Level at which changes in blood cells can be readily observed	100 mSv
Acute radiation effects including nausea and a reduction in white blood cell	1000 mSv
Dose of radiation which would kill about half of those receiving it in a month	5000 mSv

Radon

https://www.ukradon.org/

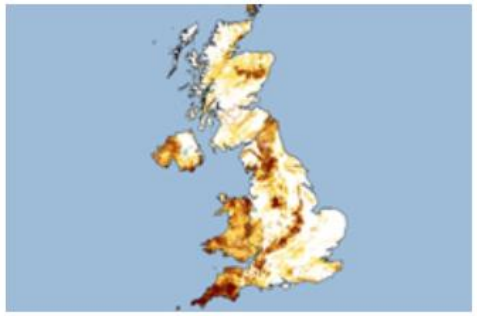


Radon

Three steps to manage radon in buildings - check, measure, act

Every building has radon and in most areas the levels are low. Some buildings in "radon Affected Areas" have higher levels. Buildings in these areas should be tested for radon. High levels can be reduced by simple building works. There are three simple steps you can follow:

https://www.ukradon.org/



1. Check

Is your property in a radon Affected Area?

Find out more

2. Measure

If you are in a radon Affected Area you should order a radon measurement pack for your home or workplace

3. Act

If the radon level is high you should reduce it using simple building works

Find out more

A report will tell you the estimated probability above the Action Level.

Order a report

Radon measurement pack

Find out the yearly average radon level for a property and if it is above or below the Action Level.

Order a domestic pack

Order a workplace pack

Noise pollution…

"… not only an environmental nuisance but also a threat to public health" WHO 2011

http://www.euro.who.int/en/health-topics/environment-and-health/noise/environmental-noise-guidelines-for-the-european-region

Burden of disease

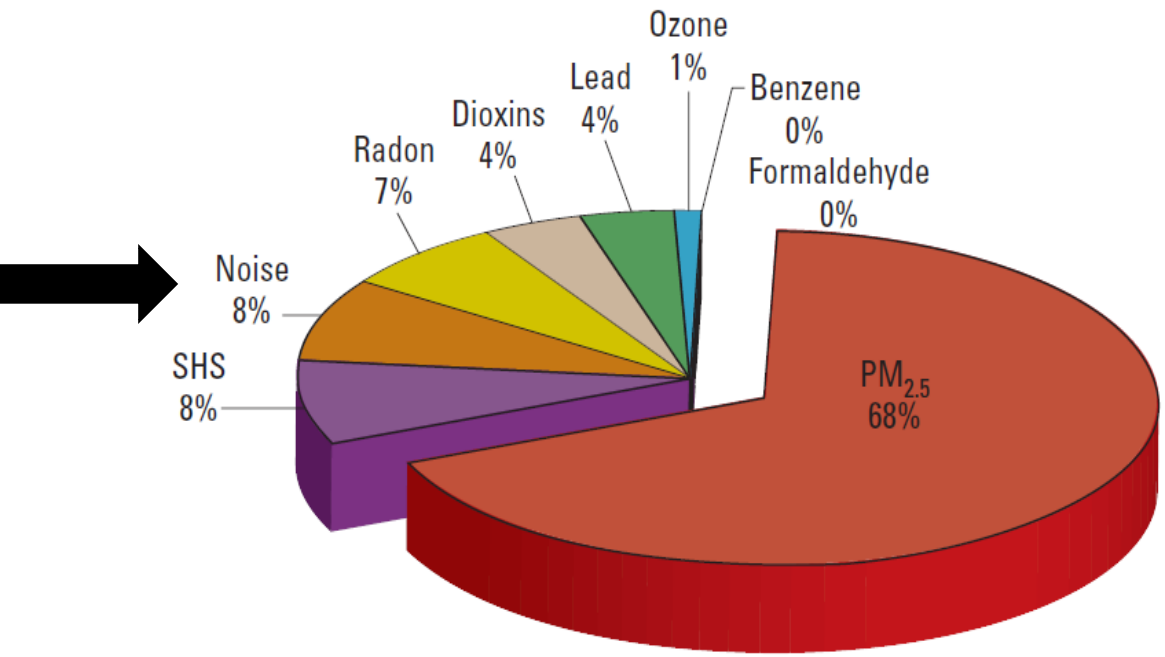


Figure 1. Relative contributions of the nine targeted risk factors to the estimated burden of disease attributed to these risk factors, averaged over the six participating countries. The figure is adapted from Hänninen and Knol (2011) with permission from the copyright holders.

Hanninen et al. (2014), Environmental Burden of Disease in Europe – Assessing nine risk factors in six countries, *Environmental Health Perspectives*, 122(5)

11.5M

Number of people in England exposed to road traffic noise levels exceeding WHO Guidelines

https://www.gov.uk/government/publications/noise-action-plans-large-urban-areas-roads-and-railways-2019

£7-10bn

The annual social cost of road traffic noise in England

https://www.gov.uk/guidance/noise-pollution-economic-analysis

£6bn*

The annual social cost of neighbour noise in England

PHE estimates (*see below for assumptions)

Health impacts – transportation noise

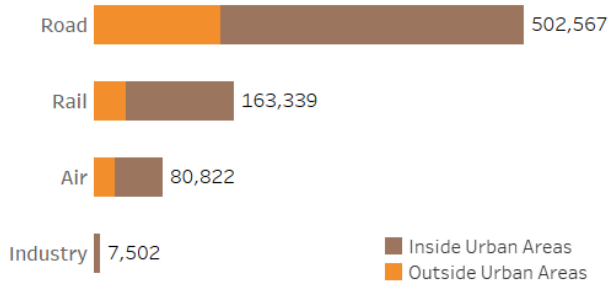
Introduction | Data | Completeness | Overview | Noise in urban areas | Noise outside urban areas | Trends | Noise impacts on health

Estimating the health impacts of noise 2017 - United Kingdom

Select health effect

- Annoyance
- Sleep disturbance
- Ischemic heart disease
- Cognitive impairment (children)
- Premature mortality

Exposure to prolonged noise pollution can cause a range of health problems including annoyance, sleep disturbance, cardiovascular disease as well as decreased cognitive abilities in children. The effects on the cardiovascular system can lead to premature mortality. It is important to note that health effects may start to occur below the reporting levels established by the Environmental Noise Directive.



	YLD/yr	YLL/yr	DALYs/yr	DALYs/yr per 100000 inhabitants
Road	76,396	10,669	87,065	132
Rail	17,317	1,335	18,652	28
Air	11,550	524	12,074	18
Industry	860	82	942	1

Years of life lost (YLL), years lived with disability (YLD) and disability adjusted life years (DALYs) attributable to noise exposure. The disability weights used here are described in the WHO Environmental Noise Guidelines for the European Region (2018).

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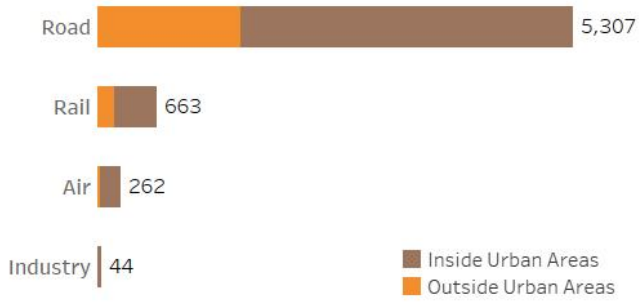
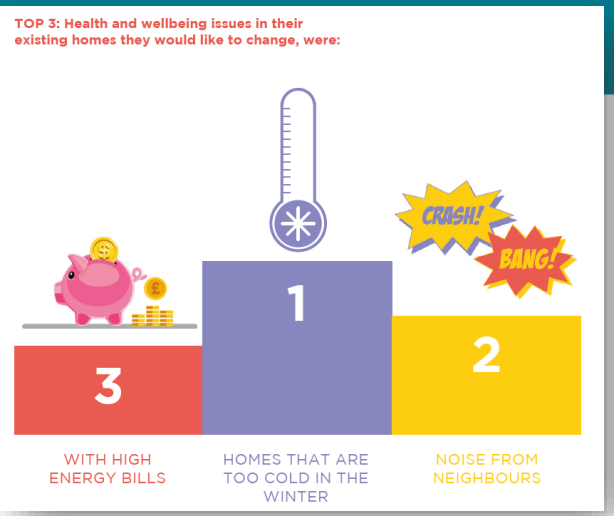
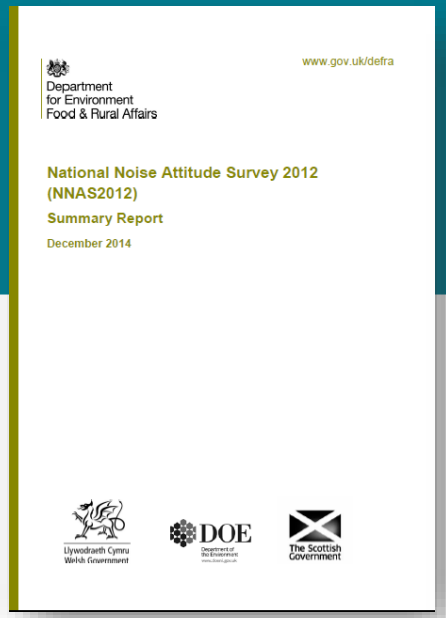


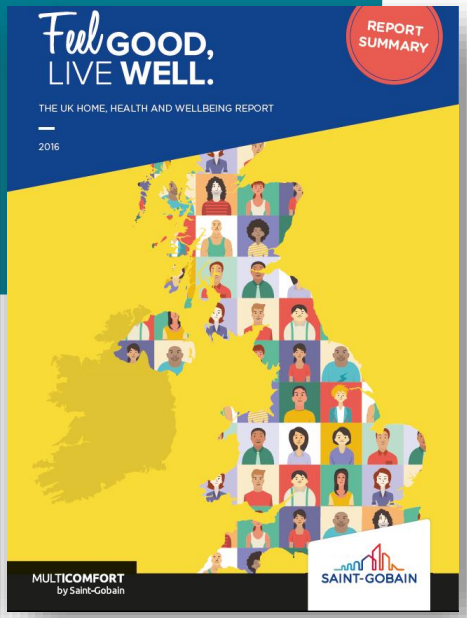
https://www.eea.europa.eu/themes/human/noise/noise-fact-sheets/noise-country-fact-sheets-2021/united-kingdom

These are estimates by the EEA using noise exposure data from Defra and the WHO 2018 evidence base

Housing







- 11% of UK population highly bothered, annoyed or disturbed by noise from neighbours and other people nearby
- Noise levels from outside/neighbours and noise privacy consistently rank in top three most important aspects of a healthy home for occupants
- Analysis of data from the British Household Panel Survey found that neighbour noise has the largest negative effect on both life satisfaction and happiness and is the second most important determinant of people's desire to move house.

Selected resource links for reference (3):

- Radon https://www.gov.uk/government/collections/radon
- https://www.ukradon.org/
- www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons
- WHO 2011 Burden of disease from environmental noise. Quantification of healthy life years lost in Europe https://www.euro.who.int/__data/assets/pdf_file/0008/136466/e94888.pdf
- WHO 2018 Environmental noise guidelines for the European region https://www.euro.who.int/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-2018
- Hanninen et al. (2014), Environmental Burden of Disease in Europe – Assessing nine risk factors in six countries, *Environmental Health Perspectives*, 122(5) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4014759/

Drinking water
DWI annual report 2020:

Public supplies		Private supplies	
Population supplied	**56,822,463**	Population supplied	**828,257**
Water supplied (l/day)	**14,225 million**	Water supplied (l/day)	**235 million**
Abstraction points	**1,924**	Approximate number of private water supplies*	**36,913**
Treatment works	**1,090**		
Service reservoirs	**3,791**	Total number of local authorities	**321**
Water supply zones	**1,590**		
Length of mains pipe (km)	**318,073**	Number of local authorities with private supplies	**253**
Water composition:		**Water composition:**	
Surface sources	**65.39%**	Surface influenced supplies	**23.11%**
Groundwater sources	**26.76%**	Groundwater sources	**61.74%**
Mixed sources	**7.85%**	Mains water	**11.15%**
		Unknown	**4.00%**

Who’s who & Responsibilities

- **Local Authorities**: responsible for Regulation of private water supplies & lead the investigation into public health risk.
- **Water companies (public supply):** responsible for public supplies & lead on carrying out agreed actions to investigate and remediate.
- **Environment Agency (EA)**: protecting aquifers, licencing abstractions, protecting water courses and hydrogeological investigation e.g. fish kills.
- **UK Health Security Agency (UKHSA)**: expert support and independent health advice, and co-ordinating role.
- **Drinking Water Inspectorate (DWI)**: check that the water companies supply safe drinking water that is acceptable to consumers and meets the standards set down in law. Co-ordinate relevant research

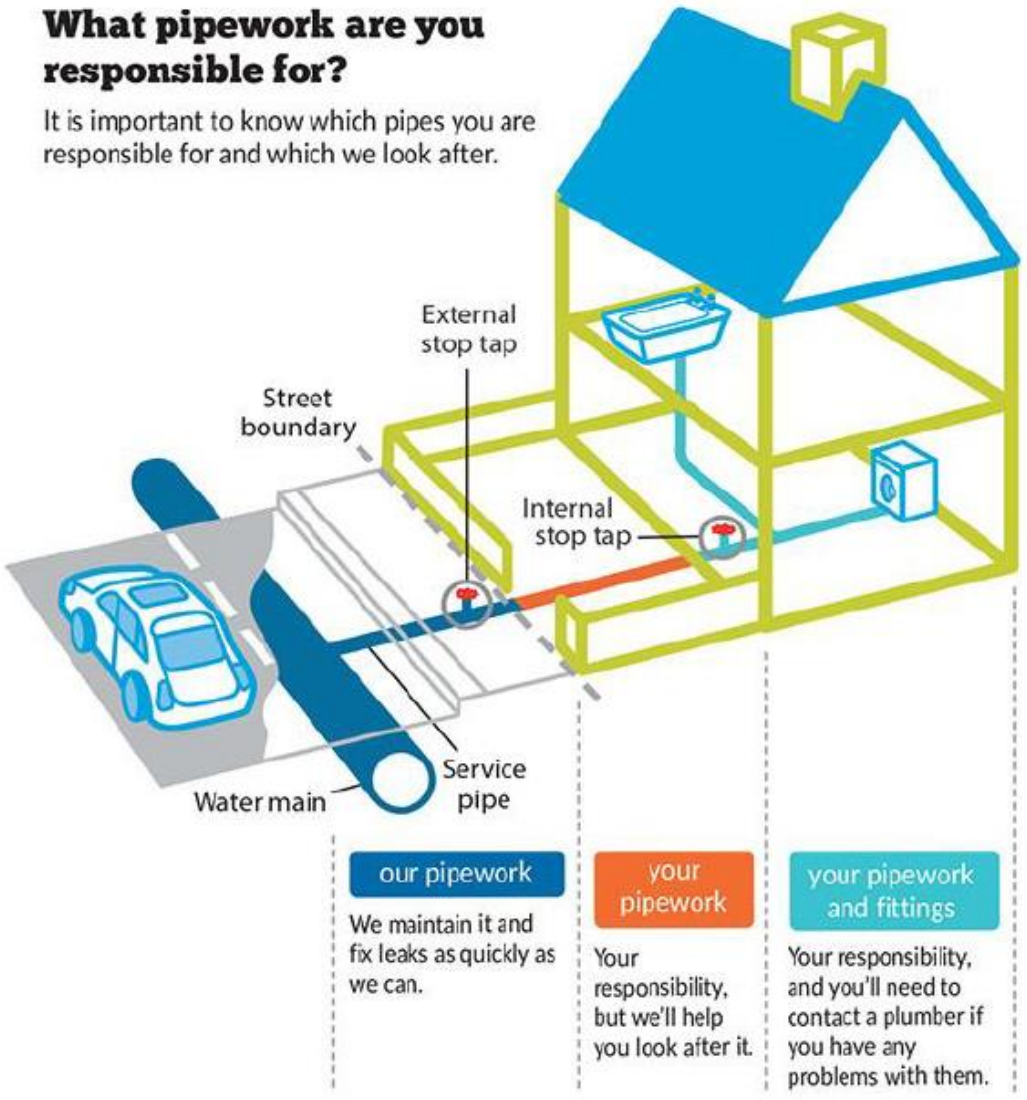
Drinking Water Quality

- Chemical and radiological parameters – Majority are health based and normally based on life time's consumption, taking into account intake from food and other sources. Other chemical and physical parameters are based on aesthetics.

1,2- dichloroethane	Conductivity	Radioactivity-Tritium
Acrylamide	Cyanide	Radioactivity- total indicative dose
Aluminium	Epichlorohydrin	Selenium
Ammonium	Fluoride	Sodium
Antimony	Iron	Sulphate
Arsenic	Lead	Taste & odour
Benzene	Manganese	Tetrachloroethane & trichloroethane
Benzo(a)pyrene	Mercury	Tetrachloromethane
Boron	Nickel	Trihalomethanes total
Bromate	Nitrate	Turbidity
Cadmium	Nitrite	Vinyl chloride
Chloride	Nitrate/Nitrite	
Chromium	Pesticides	
Colour		

Public Water Supply

- Served water may be compliant but…
- Contamination may arise at the property.
- Supplier responsibility ends at property boundary.
- Property owner responsible beyond boundary.
- Usual suspects can include:
  - Petrochemical spills (heating oil, diesel, kerosene, petrol…)
  - Old lead pipe and solder and illegal solder



Private Water Supplies

Detection of chemical parameters failures

Detection:

- Public taste/odour
- Contaminated land/spill e.g. hydrocarbons, solvents, mining
- Natural Geochemistry of bedrock
- Routine testing (generally water companies)
- Environmental investigation following illness

Most common failures:

- Iron (Fe)
- Manganese (Mn)
- Arsenic (As)
- Lead (Pb)
- Other metals – copper, aluminium, nickel, boron

Failures - types of restrictions

- **Boil** all water for drinking, cleaning teeth, food preparation, and cooking (when there is a microbiological risk or sample failure).
- **Run off the water standing in the pipework** to waste before drawing water until the pipework or fittings within the premises contributing to the failure have been replaced; (lead, copper, nickel or antimony).
- **Do not drink:** significant failure of a chemical parameter that represents an immediate risk to human health, consumers will require an alternative supply in tankers etc.
- **Do not to use water (including bathing and showering):** significant failure of a chemical parameter that represents a potential danger to human health, if inhaled or is absorbed/can penetrate the skin through an open cut or wounds. Consumers should be advised to use an alternative supply.

UKHSA's role: Failures

- **No statutory duties** or powers under the PWS Regulations (2018).
- **Can provide** advice on whether any exceedance of the regulatory value poses a risk to human health to inform the LA decision.
- Should be **contacted if an acute public health threat** is suspected, including any outbreak of illness linked to a private water supply.
- UKHSA is **not legally responsible** for determining whether a particular private water supply is a potential danger to human health.

The Private Water Supplies (England) Regulations 2016
https://www.legislation.gov.uk/uksi/2016/618/contents/made
The Private Water Supplies (England) (Amendment) Regulations 2018
https://www.legislation.gov.uk/uksi/2018/707/regulation/2/made

Contaminated land

Problem

- Little thought given to waste management and prevention of pollution
- Post Victorian tradition of burying waste (pits /landfills) without considering impacts and no records
- Estimated 300,000 hectares potentially affected by contamination
- 80% of the UK population lives within 2 km of a landfill site (historic or active)
- Chemicals in land can result in human exposure
  - therefore potential for harm exists
- Contaminated land is usually about chronic risks i.e. long term exposure to chemicals in the land
- This can be from living on contaminated land or visiting a site regularly

Historical Contamination

- Evidence of health effects limited:
  - Love Canal USA (200 families re-housed – birth defects noted)
  - Weston village, Cheshire – kidney function improved on being removed from homes affected by contamination.
  - Corby judgement 2009 – considered that there was an association between poorly controlled site clean up and limb defects in 16 children
- Proving causality very difficult
- Doesn't mean no effects – just difficult to measure

Legislation & definitions

Part 2A Environmental Protection Act 1990 - “Contaminated land” is any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that

a) significant harm is being caused or there is a significant possibility of such harm being caused; or

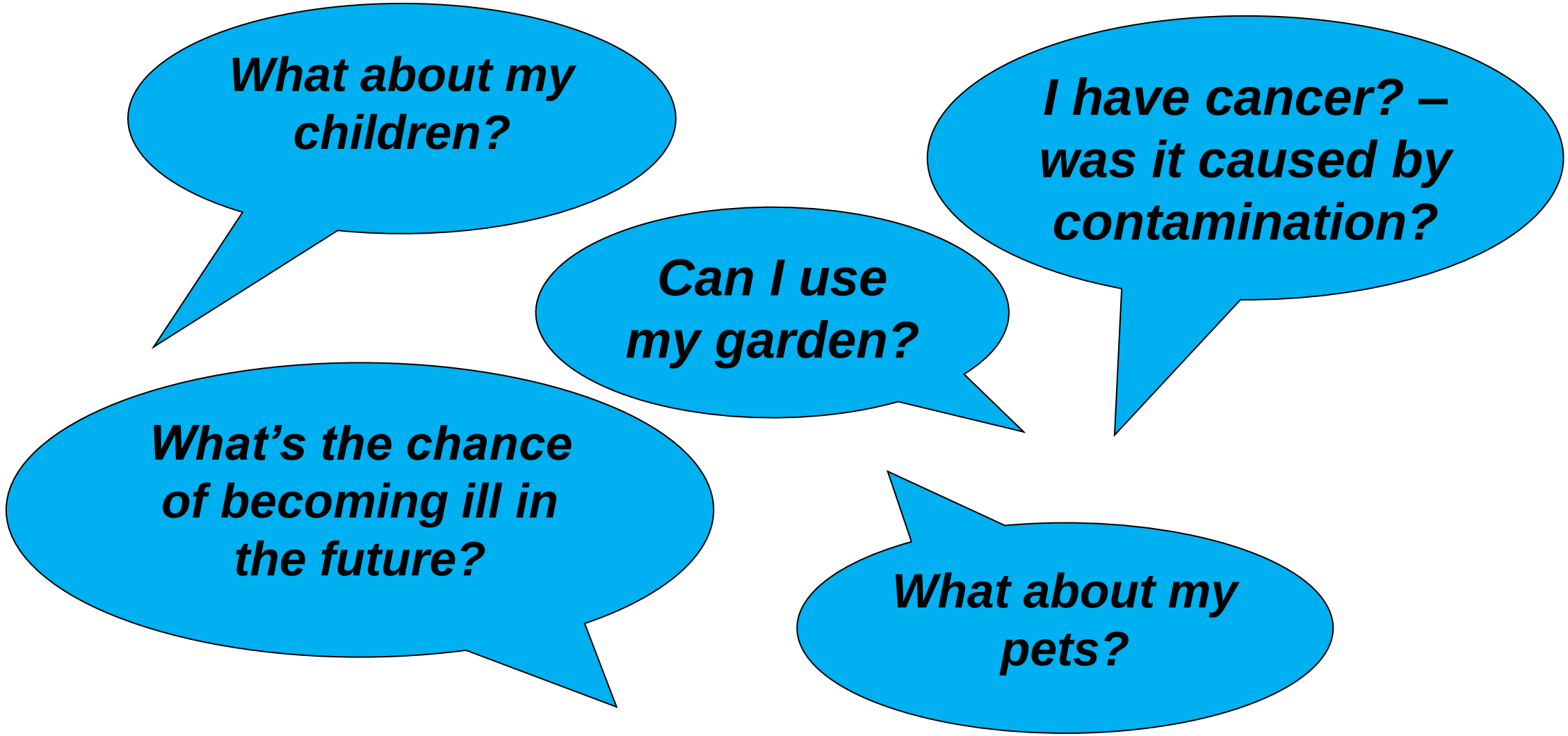
b) significant pollution of controlled waters is being caused or there is a significant possibility of such pollution being caused

Significant harm is defined as: Death, life threatening diseases (e.g. cancers), other diseases that are likely to have serious impacts on health, serious injury, birth defects and impairment of reproductive functions.

Town and Country Planning Act, 1990

- Deals with land being re-developed and which does meet the definition of contaminated land under Part 2a. The developer is responsible for ensuring that the development is safe and suitable for intended use. Such land may require investigation and remediation.

Common health concerns



Risk Assessment

Information about source

- Primary source – e.g. drums, tank farm
- Secondary source – e.g. chemical in soil or groundwater
- Amount/spatial extent/concentration
- Chemical properties, persistence, degradation, phase
- Toxicology

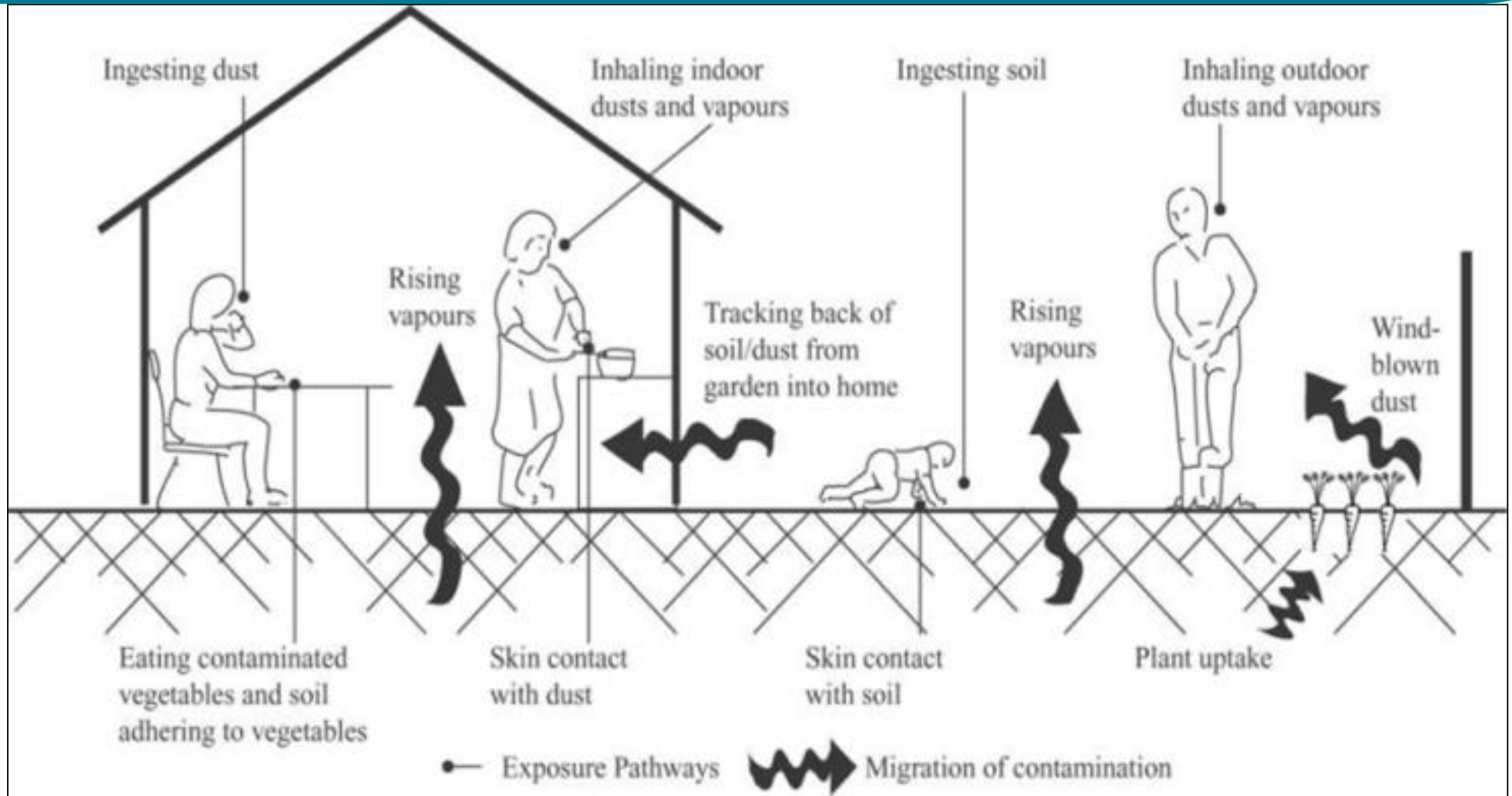
Information about pathways

- Transport – topography, water table, geology, hardstanding, climate
- Exposure – ingestion, dermal, inhalation

Information about receptors

- Living above the contamination/adjacent
- Vulnerable receptors
- Proposed or current – depends on legislation using

Conceptual Site Model (CSM)



Regulators and Stakeholders

- Local Authorities are the principal regulators for contaminated land
- The Environment Agency (EA) is responsible for the regulation of special sites. They also provide site specific advice on the pollution of controlled waters from contaminated land.
- Defra devises land contamination policy and funds research
- Specialist environmental consultants are commissioned by the LA to conduct risk assessment and remediation for planning and part 2a
- UKHSA provide additional technical advice on the human health risk assessment and assist with risk communication
- The Food Standards Agency (FSA) provide advice where produce from contaminated land may be consumed e.g. allotments
- Animal and Plant Health Agency (APHA) formerly Animal Health and Veterinary Laboratories Agency, advise on livestock issues

Selected resource links for reference (4):

- https://www.dwi.gov.uk/what-we-do/annual-report/
- https://www.dwi.gov.uk/consumers/learn-more-about-your-water/#drinking-water-standards-regulations
- https://www.dwi.gov.uk/water-companies/guidance-and-codes-of-practice/guidance-on-implementing-the-water-supply-water-quality-regulations/
- https://www.legislation.gov.uk/uksi/2018/707/made (Private Water Supply Regulations 2018)
- https://www.who.int/publications/i/item/9789241549950 (WHO drinking water guidelines)
- https://www.gov.uk/government/publications/non-infectious-disease-clusters-investigation-guidelines
- https://www.gov.uk/government/publications/contaminated-land-exposure-assessment-clea-tool
- https://www.claire.co.uk/projects-and-initiatives/category-4-screening-levels

Plenary

- Reflections on this training
- Any Q&A
- Closing survey / feedback https://forms.office.com/r/CJqCphe2Ug

For reference – MS Forms links

Starting / introduction slide 1

https://forms.office.com/r/sC6Ya1pc26

- What is your role?
- Where do you work?
- Can you think of a chronic hazard / incident example - ideally in Yorkshire and the Humber?

Chronic Sources – slide 7

https://forms.office.com/r/6qAGARYuRm

- Which environmental, chemical and radiological hazards are we exposed to throughout our lifetimes?
- Why is / might it be hazardous?

Feedback – plenary slide

Please complete the evaluation feedback: https://forms.office.com/r/CJqCphe2Ug