

What does coal cost health in the United Kingdom?



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This briefing provides new figures on the health impact associated with exposure to air pollution from coal power plants for UK citizens.

It shows that the fumes from coal-fired power stations are responsible for the following effects on UK citizens: 1,600 premature deaths, 68,000 additional days of medication, 363,266 working days lost and more than a million incidents of lower respiratory symptoms, which is costing £1.1 to 3.1 billion (€1.3 to 3.7 billion) each year.

The breakdown of health impacts and the associated cost figure underlines the urgent need for these costs to be taken into account in any cost-benefit analysis on coal. In March 2013, the Health and Environment Alliance (HEAL) published [The Unpaid Health Bill: How Coal Power Plants Make Us Sick](#) which focussed on figures for Europe as a whole. It estimated the total health burden and costs associated with coal-fired power stations for the EU as a whole at between £13.9 and £38.6 billion (15.5-43.1 billion Euros) per year.¹

The report showed that coal's contribution to poor air quality leads to an additional burden of chronic bronchitis, heart attacks, lung cancer and premature death.

AIR POLLUTION – AN IMPORTANT HEALTH RISK

Breathing in polluted outdoor air represents one of the biggest environmental threats in Europe today, according to the European Respiratory Society (ERS),² which brings together about 10,000 doctors and respiratory disease experts.

Outdoor air pollution is a complex mixture of different substances from various sources. Pollutants can travel up to hundreds of miles in the atmosphere and cause health impacts even in neighbouring countries.³ In a recent review of state-of-the-art science, the World Health Organization (WHO) reiterated that there is no threshold below which air pollution would not cause any harm to human health, and that accordingly every reduction in air pollution will improve people's health.

Burning coal adds to poor air quality as coal has a high sulphur content and is burned at low thermal efficiency rates of 34% to 40% on average. Coal is the most emissions-intensive energy source and is associated with high sulphur dioxide as well as nitrogen oxide emissions, which react to form secondary particulate matter in the atmosphere.

HEAL's report, "The Unpaid Health Bill: How coal power plants make us sick" estimated that 18,350 premature deaths in the EU each year are linked to emissions from coal-fired power plants.

Long-term exposure to polluted air is associated with increased premature deaths, and causes chronic respiratory and heart conditions as well as lung cancer. The WHO's International Agency for Research on Cancer (IARC) has just recently acknowledged outdoor air pollution as a human carcinogen of group 1.⁴ The additional risk to citizens of London of developing lung cancer associated with exposure to outdoor air pollution - from a multitude of sources - is estimated at 7-15% - regardless whether the person smokes or not.⁵

In the UK, coal-fired power plants generate almost 30% of electricity. The consumption of coal has been increasing slightly since 2010 after years of decline, due to decreasing world market prices for coal. The power sector as a whole contributes 23% of nitrogen oxide emissions and 41% of sulphur dioxide emissions. The primary emissions of particulate matter from the UK energy sector only account for 6%

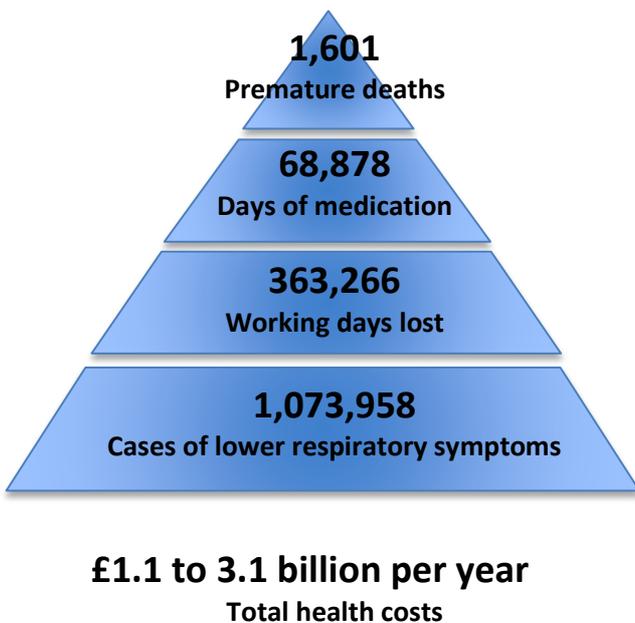
of the national total; however, this omits secondary particle pollution due to SOx and NOx emissions.

As gas-fired power stations emit relatively fewer pollutants per kilowatt hour of electricity than coal-fired power stations, the share of coal in the total energy sector emissions is much higher than its 30% share in the electricity mix.⁶ Gas-fired power stations emit negligible amounts of particulate matter and sulphur dioxide.

The diagram below shows figures on the health impact in UK of coal-powered electricity production. The effects taken into account are from all UK coal-fired power stations and from any relevant transboundary effects from coal-fired power stations in neighbouring countries.

THE HEALTH HARM FROM COAL TRIANGLE

Annual health impacts caused in UK by coal power plants:



The health impact figures for the UK were developed as part of the technical report on which HEAL's "The unpaid health bill" is based, but were not published in the main report apart from the total cost figures for the UK. The exchange rate of £1 to €1.116 (December 2009) has been used for currency conversions.

The studied health impacts include mortality increases due to respiratory or cardiovascular conditions attributed to coal pollution; chronic health effects, such as new cases of chronic bronchitis; acute impacts, including hospital admissions, incidents of

lower respiratory symptoms, and ill-health that causes people to take medication, miss their work or at least limit their active tasks on certain days. This impact assessment methodology has been established by the Clean Air for Europe Programme (CAFE) and is used by the EU Commission in cost-benefit analyses of policy instruments. A detailed description of the methodology is given in the technical report in Annex 1 of "The Unpaid Health Bill" report.⁷

WHAT IS NOT INCLUDED?

The health impacts and costs included in the analysis reveal only a part of coal's unpaid health bill. Although the methodology covers respiratory and some heart conditions, it does not include other health conditions that have repeatedly been linked to outdoor air pollution, such as neurological damage or negative reproductive effects.

Nor do they take into account the additional impacts from the full life cycle of coal, such as heavy metal leakage from disposed coal ashes and air or water pollution resulting from coal mining, washing and transport.

Communities in the proximity of coal mines and coal waste deposits, as well as coal miners and power plant workers, are often exposed to exceptionally high concentrations of pollutants and thus have higher overall health risks.

TOP INDUSTRIAL POLLUTERS INDIRECTLY SUBSIDIZED BY BAD HEALTH

Two coal-fired power stations in the UK - Drax in Selby and Longannet in Kincardine – are likely to be significantly affecting the health of both the local communities and the total population by belching out thousands of tons of pollutants which travel in the atmosphere over distances of hundreds of miles.

Drax and Longannet are included in the European Environment Agency's (EEA) list of top industrial polluters in Europe, ranking seventh and eleventh, respectively, in a comparison of external costs to health.⁸ Drax is estimated to cause health costs in the order of £376 - £1,043 million and Longannet £310 - £858 million each year.

HOW DOES COAL HARM HEALTH?

Peak levels of pollution make the need for medication more likely and often stop child and adult asthma sufferers from venturing outside. Many people with chronic conditions find their working lives and well-being restricted. Children, older people, and those with an underlying chronic condition are more susceptible to the effects of air pollution.

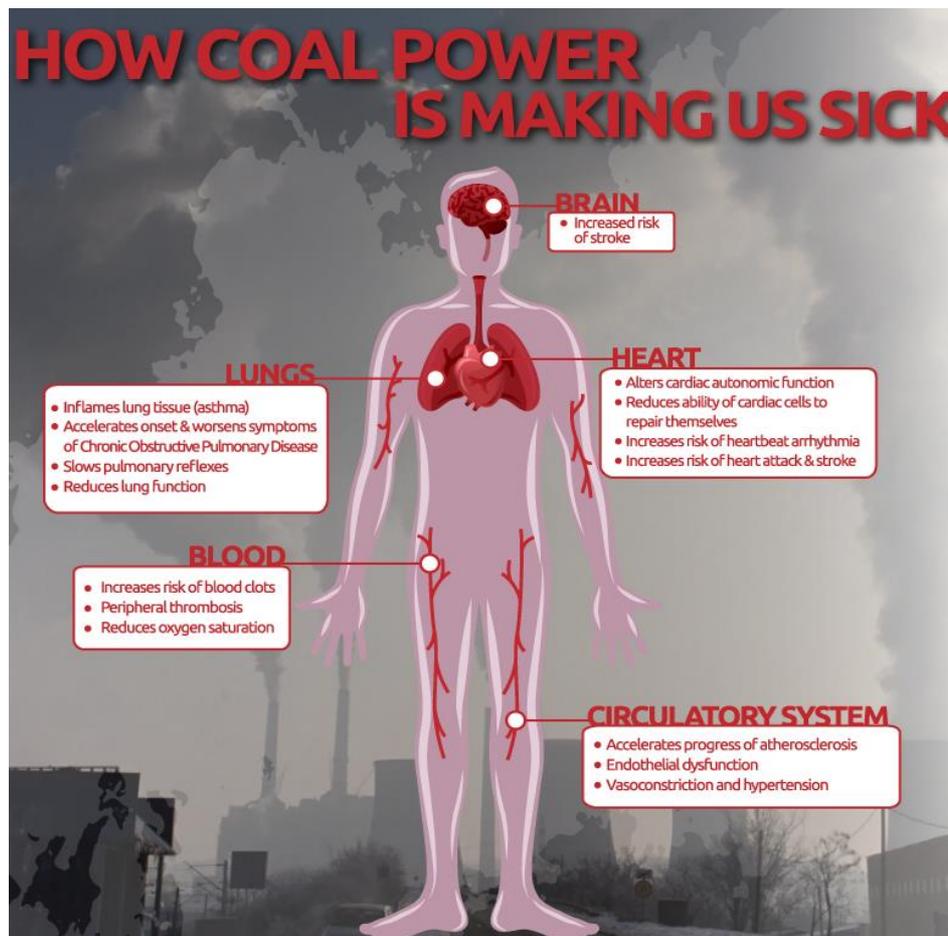
Burning coal releases a number of air pollutants that are harmful to health, among them sulphur dioxide, nitrogen oxides, polycyclic aromatic hydrocarbons (PAHs), particulate matter, and dioxins. Except for dioxins and PAHs, a typical coal-fired power station releases hundreds to thousands of tons of these pollutants every year. Because particles are extremely small (PM2.5 have a diameter smaller than 2.5 micrometres), they can penetrate the lung tissue and enter the blood stream.

EFFECTS ON EARLY LIFE AND CHILDREN

Coal-fired power plants are the second most important source of mercury emissions worldwide and thus have important implications for reproductive health. Mercury exposure is a known cause of irreversible brain damage in children, potentially harming the unborn child in the womb. Mercury emissions to air or water from coal-fired power plants eventually lead to the accumulation of mercury in the environment and food chain.

In addition, recent studies have found that maternal exposure to air pollution during pregnancy is associated low birth weight, pre-term delivery and behavioural problems in children.

A growing body of evidence shows how early-life exposure to air pollutants is contributing to higher risks of developing chronic diseases later in life, including obesity, diabetes, and hormone related cancers.



Adapted by GCCA tckctck March 2013 from source: Aphekom project (2012): Summary report of the Aphekom project 2008 - 2011

WHAT DOCTORS SAY

A recent WHO review on air quality and health has noted that every reduction in air pollution is a gain for public health, as already very low levels of air pollution cause recognisable harm to health.

The European Respiratory Society (ERS), which published “Ten principles for Clean Air”, says that compliance with current limit values for major air pollutants in Europe confers no protection for public health. “In fact, very serious health effects occur at concentrations well below current limit values, especially those for fine particles,” they say.

It is thus important to address air pollution from coal-fired power plants, which contribute a significant share to overall poor air quality. Given the long lifespan of an average plant (around 40 years), stricter emission limit values for power plants are necessary, as foreseen by the EU Industrial Emissions Directive. These need to be implemented quickly in order to bring down current levels of air pollution to WHO recommended guideline values.

CLIMATE CHANGE: MORE IMPACTS TO COME

Coal combustion also causes future health effects as it is responsible for about 20% of Europe’s CO₂ emissions. The World Health Organization’s Director-General, Dr Margaret Chan describes climate change as the major public health challenge of the 21st century.

In a changing climate, hot temperatures and certain air pollutants act in synergy to dramatically increase

the frequency of cardio-pulmonary cases, leading to an increase in hospital admissions on hot days. The European Respiratory Society has shown how people with existing respiratory problems are hit particularly hard by temperature increases during heat waves. They estimate that for every 1°C increase in temperature over a given city level, premature deaths and hospitalisations from heat stress is two to three times higher among those with existing problems compared with the average person.⁹

The heat wave of summer 2003 can be regarded as a foretaste of climate change related health impacts. England and Wales most likely experienced 2,045 additional deaths from heat stress during 4-13 August 2003.¹⁰ Projections suggest that by 2020, there will be 1,500 more deaths related to ozone levels in the UK each year as a result of climate change.¹¹

The role of coal power generation in accelerating climate change demands that Europe ultimately phases out coal in power generation. In October 2011, over 500 health and security experts signed a statement calling for urgent action on climate change and health, demanding a ban on the building of unabated coal power plants and a phase-out of coal starting with lignite-fired power plants “as most harmful to health.”¹²

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The Health and Environment Alliance (HEAL) is a leading European not-for-profit organisation addressing how the environment affects health in the European Union (EU). With the support of more than 65 member organisations, HEAL brings independent expertise and evidence from the health community to different decision-making processes. Our broad alliance represents health professionals, not-for-profit health insurers, doctors, nurses, cancer and asthma groups, citizens, women’s groups, youth groups, environmental NGOs, scientists and public health research institutes. Members include international and Europe-wide organisations, as well as national and local groups.

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Promoting environmental policy that contributes to good health

NOTES

¹ Total for 27 EU Member States

² Brunekreef et al (2012): 10 principles for Clean Air, European Respiratory Journal 39(3):525-528. <http://erj.ersjournals.com/content/39/3/525.full?ijkey=gqhjOKJ7deCFQ&keytype=ref&siteid=ersjnls>

³ An example for cross-border air pollution originating from coal-fired power plants has been documented by researchers of Technical University of Berlin. Especially during winter and spring, air masses that travelled over large coal-fired power stations in Czech Republic, Slovakia and Poland were the dominant reason for air pollution levels in Berlin overshooting EU limit values. See Pesch M, Frenzel W and Kanitz T (2008): Ursachenanalyse von PM_{2,5} Feinstaub-Immissionen in Berlin, Berlin Senate. <http://www.stadtentwicklung.berlin.de/umwelt/luftqualitaet/de/luftreinhalteplan/download/ursachenanalyse/pm25.pdf>

⁴ Group 1 refers to substances for which sufficient evidence for carcinogenicity exists from both human and animal studies, i.e. that a causal relationship has been established between exposure to the agent and human cancer and that this positive relationship cannot be explained by chance, bias or confounding factors.

⁵ Calculations based on exposure-response functions contained in the Global Burden of Disease report: Lim et al 2012, A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010, The Lancet; and data for the levels of air pollution in London from the European Environment Agency's Air Base database, base year 2011. The EEA data from different monitoring stations in London give a range for annual mean value of PM₁₀ particulate matter between 13 and 24 µg/m³ air. http://www.who.int/phe/health_topics/outdoorair/databases/en/

⁶ The approximate contribution of coal to the energy sector emissions is around 87% of SO_x as well as 87% of

PM emissions and 54% of NO_x emissions of the sector, applying a relative emission factor for NO_x emissions from gas as 0.38 of NO_x emissions of coal.

⁷ http://www.env-health.org/IMG/pdf/heal_report_the_unpaid_health_bill_-_how_coal_power_plants_make_us_sick_finalpdf.pdf

⁸ The ranking excludes health costs associated with CO₂ emissions and climate change. Source: EEA datasheet accompanying the 2011 report Revealing the costs of air pollution from industrial facilities in Europe.

<http://www.eea.europa.eu/publications/cost-of-air-pollution>

⁹ Stafoggia M, Forastiere F, Agostini D, et al. (2008): Factors affecting inhospital heat-related mortality: a multi-city case–crossover analysis. Journal of Epidemiology and Community Health, BMJ Journals, 2008, 62:209–215.

<http://jech.bmj.com/content/62/3/209.full> as well as Michelozzi P, Accetta G, De Sario M, et al., and on behalf of the PHEWE Collaborative Group (2009): High temperature and hospitalizations for cardiovascular and respiratory causes in 12 European cities. American Journal of Respiratory and Critical Care Medicine, 2009, 179:383–389

<http://ajrccm.atsjournals.org/content/179/5/383.long>
¹⁰ Kovats, S., Wolf, T. and Menne, B. (2004): Heat wave of August 2003 in Europe: provisional estimates of the impact of mortality. Eurosurveillance Weekly, 8(11) <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=2409>

¹¹ Ayres JG, Forsberg B, Annesi-Maesano I, et al., and on behalf of the Environment and Health Committee of the European Respiratory Society (2009): Climate change and respiratory disease: European Respiratory Society position statement. European Respiratory Journal 34(2):295-302

<http://erj.ersjournals.com/content/34/2/295.full>

¹² Statement calling for urgent action on climate change. <http://climatechange.bmj.com/statement>