

Pollution and health impacts of waste incinerators

Summary

The recent European Landfill Directive will force the UK to reduce the amount of organic waste it disposes of in landfill sites. This is causing panic among waste disposal authorities, which have failed for years to address the question of what to do sustainably with our household waste. Local authorities in the UK are now stampeding towards huge incineration plants, capable of burning 200,000 tonnes or more of rubbish per annum, to meet the EU targets.

There are currently 12 operating municipal waste incinerators in the UK, of which Edmonton in North London is the biggest (with proposals to increase capacity by 50%) and Sheffield the worst offender for breaching pollution levels. The others are Dudley, Wolverhampton, Cleveland, Coventry, Tyseley, Nottingham, Stoke and Lewisham (South London). Incinerators in both Newcastle and the Isle of Wight are currently closed, while plants in Dundee and Bolton have just reopened. 33 new incinerators are under construction or in various stages of planning. (1) The Environment Agency, whose duty it is to regulate the plants, are still talking in terms of a hundred or more being built. (2) If this massive expansion goes ahead it will undoubtedly affect the UK's air quality. The many toxic pollutants contained in the stack gases and ashes produced by all incinerators will threaten the health and quality of life of millions of people.

Many people would like to believe that waste disappears when it is burnt. In fact the burnt waste is transformed into ashes and gas. (A large incinerator produces the equivalent of 300 wheelie bins of exhaust gases from its chimneys every second). As this happens, chemical reactions lead to the formation of hundreds of new compounds, some of which are extremely toxic. The number of substances released from a waste incinerator may run into thousands. So far, scientists have identified a few hundred substances as hazardous.

In a House of Lords enquiry on 14th April 1999, Environment Minister Michael Meacher said,

"Incinerator plants are the source of serious toxic pollutants: dioxins; furans; acid gases; particulates; heavy metals; and they all need to be treated very seriously. There must be absolute prioritisation given to human health requirements and protection of the environment. I repeat the emissions from incinerator processes are extremely toxic. Some of the emissions are carcinogenic... We must use every reasonable instrument to eliminate them altogether".

In 1996 many incinerators were closed down because they could not meet European regulations for emissions. As scientific knowledge of the harmful effects of incinerator emissions increases, tighter regulations are imposed. But there is no technology that can take out all of the pollutants. The

incinerators currently operating in the UK, legally release into the atmosphere hundreds of kilograms of highly toxic heavy metals as well as hundreds of tonnes of acid gases and highly dangerous microscopic dust particles. This is in addition to many other pollutants that are not measured or monitored at all. The Environment Agency has admitted that emissions limits are based on what is technically achievable and not what is safe for human health. However, Greenpeace has published a report, *Incineration: Criminal Damage. A Review of Compliance by English Municipal Waste Incinerators with Legal Pollution Standards for 1999 and 2000*, showing that none of the 10 incinerators in the UK operating throughout 1999 and 2000 could stay within these legal limits (4)

Incinerators also produce around a million tonnes of contaminated ash each year. Attempts to dispose of this material have led to increasingly dangerous and irresponsible practices. In Newcastle ash was spread on allotments and footpaths, culminating in what may turn out to be some of the worst environmental contamination seen in the UK for many years.

What happens to rubbish when it is burned?

Roughly two and a half million tons of waste are incinerated in the UK every year. Of this, a third comes out as contaminated ash and the rest goes up into the air as exhaust gases.

Exhaust Gases

Each tonne of waste burnt releases around 5000 cubic metres of gases containing many pollutants. The pollutants are transported in the air and deposited in water and soil, both near and far from the incinerator. Even though the gases coming from the chimney-stack often appear clean (it may sometimes appear as if nothing is coming out), they contain very fine particles of dust. Metals in the waste vaporise and become attached to the dust particles formed by incineration. Some are caught in filters and become fly ash, others are washed out in the gas-cleaning unit and the rest are released into the air from the chimney-stacks.

Contaminated Ashes

Incinerators in the UK create almost a million tonnes of ash every year. The ashes, which are contaminated with heavy metals like lead and cadmium as well as toxic compounds like dioxins, are usually deposited in landfills leaving a toxic heritage for future generations. These pollutants can leach out posing a more immediate threat to ground water and rivers. The highest concentrations of pollutants are in residues from the pollution control devices. These residues are supposed to be sent to "special waste" landfills but it has recently emerged that the Byker incinerator in Newcastle has been illegally mixing this "fly" ash with other ashes. This toxic mixture was spread on allotments and paths in Newcastle. Mixed fly and bottom ash from Edmonton incinerator has also been used to build roads in London and a car park in Peterborough. The practice of mixing ash with aggregate or asphalt for use in construction is increasing. It

allows incinerator operators to avoid disposal costs as well as generating extra income, but even when used in 'bound applications', erosion will eventually release the heavy metals and dioxins into the environment and workers may be at risk of exposure to dioxins and metals in dust particles.

Ash residues from the gas cleaning filters of incinerators are classified as hazardous waste and should be disposed of in special landfills. According to the European Environment Agency "the disposal of filter dust/ fly ash from waste incineration plants is a serious problem". Filter ash contains very high concentrations of heavy metals and chlorinated organic compounds, which can cause cancer and other health problems.

Health Effects of Incinerators

Numerous studies confirm that a typical incinerator releases a cocktail of toxic chemicals, including dioxins, lead, cadmium, mercury and fine particles, into the atmosphere. However, there has been little follow up investigation into the effects of these poisons on people near incinerators. Greenpeace has compiled a comprehensive review of all the scientific studies carried out on people living near to or working in incinerators (5). The report *Incineration and Human Health* contains some worrying findings, for example:

- A study conducted on 70 municipal waste incinerators in the UK operating between 1974 and 1987, and 307 hospital waste incinerators from 1953 to 1980, identified a 2-fold increase in the cancer deaths in children living nearby. These results were consistent with a second study showing increased child cancers for hospital incinerators and large scale, high temperature combustion industries (study dates 1998 and 2000).
- In 1996, a study on residents living in an urban area near an incinerator in Italy found a 6.7-fold increase in deaths from lung cancer.
- A study in 1989 on people working at a Swedish incinerator between 1920 and 1985 found a 3.5-fold increase in deaths from lung cancer, and a 1.5-fold increase in deaths from cancer of the oesophagus. The same study also found an excess of ischemic heart disease, especially in workers with more than 40 years exposure.

Dioxins

The most notorious of incineration by-products are dioxins. These are long-lived organic compounds, which form when chlorinated substances in the waste, such as PVC plastic, are burnt. While dioxin emissions to air from incinerators are thought to have decreased significantly in recent years, the amounts in ash may well have increased. Moreover official figures of dioxin emissions are unreliable and are probably significantly under-estimated(6). Point measurements are taken only twice a year, a method that is likely to miss peaks of dioxin production.

Dioxins are persistent, toxic, and accumulate in the food chain. Because they are transported for long distances on air currents they are now a global contaminant and are thought to be present in the body tissues of every human being on the planet at levels that may already be affecting our health. The most toxic of these dioxins has been shown to cause cancer and has been described as the most toxic chemical known to human society.

The intake of dioxins in the diet of people in Europe often exceeds the tolerable daily intake (TDI) set by the World Health Organisation (WHO). Intake by breast-fed infants is very high compared with the TDI. WHO experts acknowledge that subtle effects on health may already be occurring in the general population (7). At, or near, the concentrations found in the populations of industrialised countries, dioxins can affect the levels of certain hormones, enzymes and immune system cells.

In addition to the chlorinated dioxins, brominated dioxins are also known to be formed and emitted by municipal solid waste incinerators. These have a similar toxicity to the chlorinated dioxins but at present are entirely unregulated.

Along with dioxins, numerous organic compounds are known to be emitted from incinerators, including polychlorinated biphenyls (PCBs), chlorinated benzenes and other volatile organic compounds (VOCs). Many of these are persistent, toxic and accumulate in the food chain. Some cause similar effects to dioxins and some are known to cause cancer.

Heavy Metals

Heavy metals, including lead, cadmium and mercury are also emitted. Heavy metals cannot be destroyed by incineration. Improvements in pollution control technology mean that a large proportion of heavy metals remain in the fly ash and bottom ash and end up in landfill tips or increasingly are used as aggregate in roads and paths. One exception is mercury, which is the most volatile and difficult to control and tends to be emitted with the flue gases. Many heavy metals are persistent, toxic at low concentrations and exert a wide range of adverse impacts on health.

Particulates

Pollution control devices can do little to prevent ultra-fine particles from being released, which are the most dangerous particles for human health. Furthermore, the new EC Directive on incineration sets no limits for fine particles. Health effects from fine particles are thought to range from premature deaths from respiratory and cardiovascular diseases to exacerbation of mild and severe asthma attacks in children and adults. Many studies have associated these impacts on health with particulate air pollution.

Inorganic acidic gases

Inorganic acidic gases such as hydrogen chloride, hydrogen fluoride, hydrogen bromide, sulphur oxides and nitrogen oxides are also formed and emitted by incinerators. Exposure to nitrogen and sulphur oxides has also been linked to adverse impacts on respiratory health.

“Waste to Energy”

Incinerators are now often called “waste to energy” facilities or “combined heat and power stations”. Although incinerators can use some of their heat to produce electricity it is an inefficient way of generating power. To replace the materials burnt as rubbish in an incinerator uses much more electricity than can be produced by burning it.

Building new incinerators actually works against targets to reduce and recycle our rubbish. Contracts with incinerator operators currently lock local authorities into long-term commitments to provide guaranteed amounts of waste to avoid incurring financial penalties. The option to incinerate reduces the incentive to collect, recycle and compost.

Solutions

The European Landfill Directive requires the UK to reduce landfill of organic waste by 25% by 2010 and 65% by 2020. This is not a difficult task. Several cities and regions around the world have achieved close to 70% diversion of municipal waste from landfill in time frames of 5 years or less, without using incineration.

Edmonton in Canada, (population 636,000) recycles and composts 70% of household waste. This is a recent achievement made possible by:

- Separate doorstep collection of dry recyclables, and hazardous wastes from all households (recycling rate achieved 15 – 18%)
- Mechanical separation and composting of the remainder

In comparison the London borough of Edmonton, home to the UK’s biggest incinerator recycles a mere 6% and incinerates the rest. The recycling rate in Sheffield, which has the worst incinerator in England, is even more abysmal -- less than 5%.

Levels of recycling in the UK are the lowest in Europe. As the Government has recognised, waste must be separated at source at both the household and commercial level. 80% or more could then be recycled or composted. Materials that cannot be safely recycled or composted, like PVC plastic, must be phased out and replaced with sustainable alternatives. Producer responsibility legislation, already proposed by the EU for electronic equipment and end of life vehicles, must be brought in for all goods. Longer-term, products and packaging needs to be rethought and redesigned. This will force companies to think about disposal when

designing products and packaging. It could offer British industry an opportunity to be at the leading edge of green product design.

Incinerators must be replaced immediately with recycling and composting facilities. The UK must immediately draw up and implement a zero waste policy. Zero waste can be achieved by:

- minimising waste creation
- maximising product and packaging re-use
- separate collection and recycling of dry recyclables
- separation and composting of organic waste
- producer responsibility for hazardous products
- phase out of non-reusable, non-recyclable materials

Notes

1. Energy from Waste Association figures (<http://www.efw.org.uk>)
2. "The number of incinerators in England and Wales may have to rise from 11 to over 100 (depending on their size; capacity may have to quadruple)" Environment 2000 and Beyond, Dec 2000.
3. Knox E.G. (2000). Childhood cancers, birthplaces, incinerators and landfill sites. *International Journal of Epidemiology* 29:391-397
4. *Incineration: Criminal Damage. A Review of Compliance by English Municipal Waste Incinerators with Legal Pollution Standards for 1999 and 2000*, is available from the Greenpeace Press Office or at <http://www.greenpeace.org.uk>
5. *Incineration and Human Health* is available from the Greenpeace Press Office or at <http://www.greenpeace.org.uk>
6. De Fre R. and Wevers M. (1998). Underestimation in dioxin inventories. *Organohalogen Compounds* 36: 17-20
7. World Health Organisation (1998): WHO experts re-evaluate health risks from dioxins. WHO/45 3 June 1998