June 2003

Briefing

Friends of the Earth

Up In Smoke

Why Friends of the Earth opposes incineration

Introduction

Most of the UK's waste is currently buried in the ground in landfill sites, which pollute the soil and water and release climate change gases. EU law means we have to dramatically reduce the amount of biodegradable waste we landfill. Landfill space is also rapidly running out, especially in the south east of England.[1]

It might be tempting to think that we can burn our way out of this problem by building incinerators to deal with our waste. But incineration is no solution. Community groups around the country are opposing incinerator proposals and local authorities are increasingly reluctant to grant planning permission. A recent report to the Government concluded that incineration is politically undeliverable[2]. Incineration wastes natural resources; it undermines recycling by demanding a steady stream of waste; it worsens climate change; and it causes pollution from air emissions and toxic ash. This briefing explores these issues in more depth.

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Moving away from landfill

Waste Strategy 2000 sets out how England and Wales should meet the targets of the EU Landfill Directive. It sets targets for reducing landfill and increasing recycling:

- By 2010 to reduce biodegradable municipal waste landfilled to 75 per cent of that produced in 1995, and increase recycling to 30 per cent.
- By 2013 to reduce biodegradable municipal waste landfilled to 50 per cent of that produced in 1995, and by 2015 to increase recycling to 33 per cent.
- By 2020 to reduce biodegradable municipal waste landfilled to 35 per cent of that produced in 1995.

Such low ambitions for recycling, coupled with an already poor performance by England and Wales (England recycled just 12 per cent of its municipal waste in 2001), means the door is left wide open for incineration. At the end of 2002, the Cabinet Office's Strategy Unit recommended further action that the Government should take, including new recycling targets of 35 per cent by 2010 and 45 per cent by 2015. But the Government has declined to review national recycling targets until the end of 2004, and has refused even to consider banning recyclable waste from incinerators until 2006-7. Until tougher measures are in place, England and Wales continue to risk relying on polluting, wasteful incinerator technology.

BOX 1: What is incineration?

Incineration is simply burning waste, but there are a number of forms of incineration. Mass burn incineration systems burn municipal solid waste with little pre-treatment, and are usually large – taking between 200,000 and 600,000 tonnes of waste a year – because large plants are more economic. Energy from waste (EFW) incinerators capture some of the heat produced by burning materials with a high calorific value (e.g. plastic and paper) to generate electricity which helps run the plant and is exported to the national grid. The waste heat can be discarded or, in combined heat and power (CHP) systems, used for community heating schemes e.g. the Nottingham incinerator. The Government has told incinerator developers that they should always consider the potential for incorporating CHP facilities[3]. Some waste treatment plants (such as mechanical biological treatment plants) produce refuse derived fuel or RDF. This is later burned to release energy, for instance in fluidised bed incinerators which pump air into a base of sand and mineral to burn the RDF.

New forms of thermal technology are being developed which heat waste at high temperatures rather than burning it. Such processes, the most common being gasification and pyrolysis, produce gas and solid emissions similar to incineration and are causing as much concern in local communities where they are proposed e.g. Derby, Canterbury. They are defined as forms of incineration under the new EU Waste Incineration Directive[4]. For further information see Friends of the Earth's briefing on gasification and pyrolysis[5].

Incineration wastes natural resources

The level of our consumption in the UK is already having a significant impact on the environment and communities across the world, and it's getting worse. If we continue as we are, we'll be producing twice as much waste by 2020[6]. Even the Government recognises that "our biggest challenge is to deliver better use of natural resources".[7]

The amount we use

The UK uses over 6 billion glass containers each year. Less than quarter (22 per cent) were recycled in 1998, yet British Glass estimates that up to 90 per cent of new glass could be made from reclaimed scrap glass.

Around 20,000 tonnes of aluminium foil packaging (worth £8 million) is wasted each year. Only 3,000 tonnes is recycled. But recycling aluminium can bring energy savings of up to 95 per cent and produce 95 per cent less greenhouse gas emissions than when it is produced from raw materials.

If we want an environmentally sustainable and equitable future, we need to reduce our consumption of wood and paper by 65 per cent by the year 2050 and of non-renewable resources – like aluminium, steel and cement – by around 80 per cent by 2050[8]. This is not because resources are about to run out in the near future (although we potentially do have this problem with oil), but because of the impacts of the sheer speed at which we consume resources (see Box 2).

BOX 2: The global impacts of our resource use

- **Paper** – Half of Europe's forests have already disappeared and natural forests are still in decline. Logging for paper production is moving into wildlife-rich forests in places like the Carpathian Mountains, home to 481 plant species and 45 per cent of Europe's wolf population as well as Brown bear, lynx and the globally threatened Imperial eagle. These forests are seriously threatened by clear-cutting and planting of unstable forest mono-cultures[9].

- **Timber** – Sarawak, home to the indigenous Penan, has been ravaged over the past two decades by the logging of ancient forests by a number of Malaysian timber countries. They export raw logs, plywood and wood chips to Japan, South Korea, the UK, China and the US. The Penan people are plagued by frequent food shortages and poor health. Their rivers are polluted with silt, oil spills and wood preservative chemicals. The staples of their diet – game, fish, fruit and wild sago palms – are almost depleted.[10]

- **Aluminium** – The planned Alumysa project in Chile will site an aluminium plant, three hydroelectric dams and a new port in one of the most pristine areas remaining on earth. The company behind the scheme, Noranda, is a notorious environmental offender. The massive amounts of waste generated by the project (over 1 million tonnes a year) will pollute pure rivers, streams and lakes. Only 10 per cent of the jobs created will be local.[11]

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- **Plastic packaging** - plastic production accounts for 4 per cent of oil consumption; oil is a non-renewable resource. It has been estimated that, at current projected consumption rates, and allowing for likely future oil discoveries, we will run out of oil by the middle of this century[11].

Sending resources up in smoke

If we build incinerators, we are not only quite literally sending resources up in smoke, but also accepting that we do not need to reduce waste. Because building an incinerator has such high capital costs, incinerator operators typically require contracts with local authorities to supply them with a minimum amount of waste to burn over a long time: 25 - 30 years. In some cases, if the local authority does not supply the full amount of waste required, it has to pay the incinerator operator to compensate for their profit shortfall (see Box 3). This assurance of return on investment is a logical requirement from the incinerator operators' point of view, but once incineration is established as an area's mode of waste management, the incentive on the local authority will be to ensure enough waste is produced, not to ensure that it's reduced.

BOX 3: The cost of not enough waste

Cleveland

In mid-1995 Cleveland County Council (now reorganised into unitary authorities) signed a contract with a waste company to supply at least 180,000 tonnes for incineration and 80,000 tonnes for landfill each year. There was a 'shortfall' of 12,000 tonnes in the first year of the contract, and the authorities incurred penalties of £147,000. The Associate Director of Environmental Services at Stockton Borough Council has said “essentially we are into waste maximisation”, and that they are constrained by the contracts from doing even a modest amount of recycling.[12]

Nottingham

Nottingham City Councillors have admitted that long term contracts agreed in 1973 on their municipal waste incinerator are now causing serious losses. The Council is required to underwrite payment for all heat produced by the incinerator, which is used to heat 5,000 council homes and 100 businesses as well as produce electricity. The Council will have to carry on paying until 2016. But income from the heat has been seriously reduced, mainly due to energy efficiency improvements carried out by the Council to their council homes. Council taxpayers are having to meet the shortfall of £100,000 per month. Another part of the contract allows the operator (now WRG) to demand that up to 100 per cent of all municipal waste collected by the City Council is brought to the incinerator until 2032. This has seriously constrained recycling by the City Council which is now one of the worst councils in the region for recycling.[13]

Incineration ‘crowds out’ recycling

Until recently, the incineration industry and the Government argued that incineration and recycling can exist side by side. This is true only as long as the UK’s targets for reducing and recycling waste remain woefully unambitious. If paper and plastic waste were minimised and recycled as much as possible, in most areas there would not be enough left to make

incineration financially viable. Small incinerators are not economic because the costs of pollution abatement equipment tend to be the same irrespective of the size of plant to which they are fitted. Similarly, although it might appear that incinerators would not affect recycling of metals and glass, in practice there would be little incentive for separating out these materials, since they can go through the incineration process.[14]

- In Waste Strategy 2000, the Government declared that "care must be taken to ensure that contracts are sensitively designed to avoid 'crowding out' recycling".[15] In practice, this has led to some incinerator applications being refused permission:

- The Department of Trade and Industry turned down SITA's application to expand the incinerator at Edmonton, North London. Minister for Trade Brian Wilson justified the decision on the grounds that a larger incinerator would give North London Waste Authority little incentive to do more recycling over and above the statutory minimum; and meeting or bettering recycling targets would lead to a shortfall in the waste stream for the plant and therefore lead to waste being imported from other areas, in contradiction of the proximity principle.[16]
- The Kidderminster incinerator was rejected on similar grounds. Following a public inquiry, the Inspector stressed that the incinerator "would achieve little… towards meeting the recycling targets and it fares poorly on the proximity principle."[17]

In the case of the Ridham Dock incinerator, which also went to public inquiry, the Inspector concluded that if planning permission were granted, the "provision of greater incineration capacity than necessary would tend to undermine efforts to increase waste recycling and recovery locally, and encourage the transportation of waste from a more widespread catchment area".[18]

However, in many other areas, large incinerators are being planned which will jeopardise the ability of local authorities to maximise waste reduction and recycling. For instance, Riverside Resource Recovery's plans for a massive 580,000 tonne incinerator in the London Borough of Bexley, would involve transporting waste from up to nine London boroughs, many of which currently have recycling rates well below the national average.

Incineration worsens climate change

All forms of waste disposal contribute in some way towards climate change, for example through the release of methane from landfill sites, burning of fossil fuel based plastics or emissions of carbon dioxide from the transport of waste. However, recycling is better for the environment than burning or burying waste.

A waste of energy

Supporters of incineration often claim that generating energy from waste is better for climate change than landfilling waste. Some even claim that burning paper is better than recycling it. These claims do not stack up.

When waste is burnt in an incinerator, heat is produced which can be used to produce electricity. In a very small number of incinerators more energy is captured and used to provide heating through hot water to nearby offices or homes (Combined Heat and Power). This

displaces the need for an equivalent amount of electricity to be generated at a power station, saving the release of some carbon dioxide, a greenhouse gas. However, most incinerators are not very efficient at capturing energy from the waste they burn which means that they release a large amount of carbon dioxide to produce a small amount of energy. Most power stations are more efficient, producing more power with less carbon dioxide released.

Recycling also uses energy, much of it supplied by fossil fuel power generation. But recycling a material uses far less energy than the extraction and processing of virgin materials. In addition, numerous studies have shown that recycling saves far more energy than is captured by burning the materials. For instance, a Canadian study found the following figures for energy saved by recycling materials as opposed to burning them[19] (see Table 1). The savings still apply when the energy used to transport materials for recycling is taken into account as this energy is relatively insignificant.

TABLE 1: Energy saved by recycling rather than burning waste

Material	Energy saved
Paper	3 times
Plastic	5 times
Textile	6 times
Food & garden waste	None

Studies on individual materials show similar results. In ten out of eleven analyses on paper, recycling has been found to result in lower total energy use than incineration. Landfill is a better option than incineration for plastics and some papers (e.g. newspapers) because carbon in the material is trapped in the landfill rather than released into the air[20]. A study by the British Plastics Federation found that recycling of plastic cups is preferable to incineration in energy terms[21].

The importance of which energy is being replaced

A recent study for the Community Recycling Network (CRN)[22] looked at the waste remaining after good recycling has been carried out. It suggested that incineration is one of the worst options for climate change.

The analysis found that it was important to correctly identify which energy was being replaced by the energy produced by the waste disposal option. Most studies which end up favouring incineration assume that coal fired power stations are the energy source being replaced, including the Environment Agency model WISARD which is used by most local authorities. But the CRN study suggested that the current energy framework leads this to be incorrect. Given increasing consumption of energy (hence energy from waste plants replacing new energy sources, mostly gas) and the present price structure in the energy market (where coal is cheap), gas is more likely to be the energy replaced. As gas is much cleaner than coal, this gives incineration much less of an advantage over conventional energy generation.

What's more, energy from pyrolysis is likely to replace renewable energy such as wind and solar because pyrolysis is included in the Government's Renewables Obligation, which requires

energy companies to buy and sell 10 per cent renewable energy. However, it is important to note that this may change if, for example, the Government were to introduce a cap on greenhouse gas emissions on the generating sector or take pyrolysis out of the Renewables Obligation.

Incineration pollutes

The same study for the Community Recycling Network compared various waste management options and found that in terms of human toxicity, untreated waste going to landfill was by far the worst option for managing our waste, followed by 'standard' UK incineration. There are a number of health concerns associated with both the air emissions from incinerators and the solid emissions, or ash.

Air emissions

Incinerator chimneys emit organic substances such as dioxins, heavy metals such as cadmium and mercury, dust particles and acid gases such as sulphur dioxide and hydrochloric acid. These can have the following health effects:

- **Dioxins** – dioxins may be associated with cancer, hormonal effects such as endometriosis in women and reduced sperm counts in men, and reduced immune system capacity. They may also affect foetal development.
- **Heavy metals** – cadmium may cause lung and kidney disease, and mercury can affect the nervous system.
- **Dust particles** – these exacerbate lung diseases such as asthma or chronic bronchitis, and heart disease.
- **Acid gases** – these also exacerbate lung disease.

The permissible limits for emission of these substances (apart from dioxins – see below) have been tightened by the European Waste Incineration Directive which came into force in the UK on 28 December 2002. The Directive aims to prevent and limit negative environmental effects by emissions into air, soil, surface and ground-water, and the resulting risks to human health, from the incineration and co-incineration of waste. Monitoring requirements include the reporting of dioxins and dioxin-like PCBs. Any new incinerators built will have to meet the new standards, and existing incinerators in the UK will have to operate to the standards by 2005.

Dioxins

Dioxins are produced when chlorine-containing materials, such as PVC plastic, are burned. They are extremely toxic with a wide range of possible effects. They are also extremely long-lived and can be deposited over a wide geographical area. They move through the food chain and have been detected for example at the extreme ends of the earth and in sea fish. The effects of dioxins are not confined to local impacts.

Everyone is now unavoidably carrying a certain amount of dioxin in their bodies as a consequence of living in the industrialised world. The unborn and infants are the most susceptible groups. The bulk of our exposure to dioxins is through the food chain (around 98 per cent) rather than through breathing[23]. There has been considerable debate over just how much

risk to health dioxins pose. A Tolerable Daily Intake (TDI) standard, which includes dioxins ingested with food, has been proposed. One third of the population is already exposed to levels which exceed this daily intake. Given the extreme toxicity of dioxins, any extra burden on human health would be unacceptable, so the 'precautionary principle' should be applied and no more avoidable dioxin should be added to the environment.

Monitoring for dioxins (and also for heavy metals) is done at intervals e.g. twice a year. The amount of each pollutant will vary depending on the particular composition of the material going into the incinerator at any given time and the temperature of the incinerator. To get the most favourable results it is likely that the operators will ensure that ideal conditions are present at the times of the tests. This may not always be the case at other times the incinerator is operating.

For a fuller discussion of dioxins see Friends of the Earth's briefing on incineration and health issues[24].

BOX 4: Problems with measuring health risks

- Unfortunately, assessing health risks is not easy and there are many uncertainties:
- The true impact of most chemicals and the impacts of mixtures of chemicals are very poorly understood
- It is important to take into consideration the local impacts and the effect on nearby vulnerable populations e.g. schools and hospitals
- Pollutants may already exist at high levels in some local areas e.g. nitrogen oxides emitted by high levels of traffic
- Releases from waste plants vary hugely depending on the quality of the operator

The question of ash

One of the main arguments put forward for incineration is that it saves on landfill space. But a significant amount of ash is produced which still has to be landfilled and typically occupies 40-50 per cent of the space that compacted unburnt waste would.[25] Incinerator ash contains toxic heavy metals and dioxins. This particularly applies to ash which is caught by pollution abatement equipment and prevented from going up the chimney, known as 'fly ash'. However, the main volume of the ash - 'bottom ash' - also contains some toxins, including heavy metals which are present in ash in a form more liable to leach than if they were in unburnt waste.[25]

In May 2002, the Environment Agency published a report on the safety of incinerator ash[26]. It followed well-publicised problems about the use of ash from incinerators at Edmonton in North London and Byker on Tyneside. The report concluded that handling of fly ash is enough to keep risks within permitted limits. It also reported that bottom ash can be safely used in construction materials, although bottom ash and fly ash should no longer be mixed, as occurred at Edmonton. Friends of the Earth had a number of concerns with the report including the fact that it did not consider heavy metals, organic carbon and other toxic materials apart from dioxins. It did not consider the variability of ash, nor did it acknowledge our already high intake of dioxins.

A full briefing on the report is available [27].

The costs of incineration

Friends of the Earth is calling for economic measures which remove the temptation to burn waste and support reducing waste and recycling. At present, subsidies and tax breaks are lavished on incineration mainly through energy policy. The Climate Levy provides the option of tax breaks on the electricity sold, business rates and on the purchase of some components. The Renewables Obligation excludes incineration, but does allow subsidies for the biodegradable fraction of waste dealt with by pyrolysis and gasification plants. Meanwhile, recycling receives no tax break or support for the energy it saves even though this is far greater than the amount recovered by incineration.

Incinerators could still end up being expensive white elephants however:

- As emissions standards continue to improve, costs will increase. Waste Strategy 2000 warned that "around 30 per cent of the capital costs of a conventional incineration facility is attributable to the flue gas clean-up system. This is likely to increase significantly as tighter discharge limits require the installation of additional treatments."[28]
- If local authorities are locked into long-term incinerator contracts which make it difficult to increase their recycling rates, they run the risk of not meeting their statutory recycling targets. This could occur them a penalty either way – from the incinerator company for not delivering the waste through-put agreed, or from the Government for failing to meet statutory targets.
- There is growing support for an incineration tax, to ensure that the UK does not rely on incineration as a way to meet its targets under the Landfill Directive.

Regardless of the current financial situation, local authorities do not have to go for the cheapest option for waste disposal. Government planning guidance urges local authorities to ensure that their waste management approach represents "the best balance of social, environmental and economic costs and benefits, after full consideration of the BPEO and the principles of sustainable development."[29]

Creating jobs

Once they have been built, incinerators create few jobs compared with recycling (see Table 2). The British Newsprint Manufacturers Association found that recycling of newspapers would create three times as many jobs as incinerating them. In addition, a higher proportion of the jobs created by incineration were associated with building the incinerator, so they were not permanent jobs.[30]

TABLE 2 Jobs per one million tons of waste processed[31]

Type of waste disposal	Number of Jobs
Landfill	40 - 60
Incineration	100 - 290
Composting	200 - 300
Recycling	400 - 590

A report for London ReMade suggests that 9 new jobs per 1000 tonnes recycled could be created by a kerbside collection and sorting scheme which recycles materials such as glass, paper, cans, and possibly plastics and textiles. Even more jobs per tonne of waste can be created by schemes recycling white goods and furniture (and to a lesser extent aluminium) than for the familiar local authority 'box' schemes.[32] The London ReMade SRB programme in the Thames Gateway area, which aims to increase the marketability of recyclates, predicts it will create 1850-2000 jobs.[33]

Conclusion

Friends of the Earth believes that we can avoid incineration and still deal effectively with waste if we:

Reduce resource use – world leaders at the World Summit on Sustainable Development in Johannesburg in 2002 gave a very strong signal that waste should be minimised as far as possible. They signed up to "prevent and minimize waste and maximize reuse, recycling and the use of environmentally friendly alternative materials…" and to "…encourage production for reusable consumer goods and biodegradable products." We can design products to carry out the same functions using fewer materials, and to be durable, repairable and have reusable parts. We also need to replace products with services - for example nappy washing services and tool hire. And we all need to start asking ourselves how much we really need. All of this would mean less in the dustbin.

Recycle more - nine out of ten people in England and Wales would recycle more waste if it was made easier according to an Environment Agency survey. Friends of the Earth believes that recycling should be as easy as putting the rubbish out, and is calling for every household to have a doorstep recycling collection.

Reflect the true costs of waste and resource use - we need an economic framework which moves us away from incineration and towards waste reduction and re-use. For instance, taxes on virgin materials would help reflect the true costs to people and the environment of extracting raw materials. Reduced taxes on recycled materials would improve their take-up; and removing the perverse subsidies for incineration would take away the temptation to burn waste that would be better re-used and recycled.

Further reading

'Pyrolysis and gasification' – this Friends of the Earth briefing explains how pyrolysis and gasification processes work and what their benefits and disadvantages are. It also looks at which companies are involved in developing this technology in the UK.
http://www.foe.co.uk/resource/briefings/gasification_pyrolysis.pdf

'Incineration and health issues' – this Friends of the Earth briefing is aimed at helping campaigners ensure that health issues are fully considered in any assessment of incineration.
http://www.foe.co.uk/resource/briefings/incineration_health_issues.pdf

'Incinerator inquiries' – a Friends of the Earth review of three recent public inquiries and a judicial hearing all considering planning permission for municipal waste incinerators.
http://www.foe.co.uk/resource/briefings/incinerator_inquiries.pdf

'Cool Waste Management' – a Greenpeace study assessing the possibilities for a system for managing residual waste which does not include any thermal treatment process.
http://www.greenpeace.org.uk/MultimediaFiles/Live/FullReport/5574.pdf

Endnotes

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