

**Evaluation of the 4<sup>th</sup> Report of the British Society for Ecological Medicine:  
"The Health Effects of Waste Incinerators"**

1. This report was published by the British Society of Ecological Medicine in February 2006. The report discusses emissions from incinerators and the health effects of these emissions; evidence for increased ill-health around incinerators; evidence linking the incidence of disease to the presence of chemical pollutants; groups who are particularly at risk; past mistakes in dealing with chemical exposures; alternatives to incineration; the costs of incineration; ash disposal; incineration of radioactive wastes; incineration of waste in cement kilns; monitoring of emissions, environmental concentrations, and in-body levels of pollutants; risk assessment techniques; and public rights.

**Overview**

2. The report's authors show detailed familiarity with research into the health effects of chemicals. The report also provides a fair review of some of the epidemiological research into the health effects of waste incineration facilities. Where the report falls down is in a failure to appreciate the significance of the issues they are dealing with. The report makes a number of unfounded and, in some cases, incorrect assumptions about waste incineration, perhaps arising from the authors' unfamiliarity with issues relating to environmental science and waste management. The result is that the report does identify a number of important issues which need to be addressed by the waste industry, regulatory authorities and planning authorities – a number of these issues are being addressed by the relevant bodies. It is unfortunate that these issues are submerged in an array of misdirected, inappropriate and inaccurate comments, which could detract from the valid points which are made.

**Valid issues discussed in the report**

3. The report does raise some important issues with regard to incineration. Because waste incinerators burn a mix of materials, the emissions have a wider range of constituents than would occur from burning of fuels such as natural gas or fuel oil. In view of this, the report's recommendation 8 (b) and (d) for monitoring levels of emitted substances in house dust, and measuring the body burden of key pollutants are sensible. This survey should be designed to include measurements at a control location so that the incineration contribution can be evaluated. The results of a survey of this nature could be used to focus an evaluation of synergistic effects, enabling attention to be focused on any substances which are found to be significantly influenced by incinerator emissions.
4. The report discusses some of the research carried out into the prevalence of ill-health in people living near to incinerators. The findings of this body of research do indicate a need to learn the lessons of the past, and reduce emissions of potentially harmful substances. These lessons have indeed been learnt, to the extent that emissions from waste incineration are now a fraction of what they were 20 years ago, but strict control and regulation is still needed to ensure that the past emissions are not repeated.
5. The report emphasises the need to consider alternatives to waste incineration, including innovative techniques such as Mechanical Biological Treatment (MBT) and gasification/vitrification. As the economics of the waste management industry change, a wider range of techniques are becoming cost-effective and available. These need to be fully considered, and implemented as appropriate. The report also calls for a reduction in exposure to harmful chemicals: it is indeed important to use less harmful rather than more harmful chemicals and to reduce use, wastage and emissions of these chemicals.
6. The report raises important issues with regard to human toxicological response to chemicals – in particular, identifying concerns regarding exposure of the foetus and breast-feeding infants. Sections 3, 5 and 6 of the report could form the basis of a useful review of this issue. This evaluation does not set out to judge the report's findings in this area, because they are largely not applicable to incineration emissions. This is discussed in the next section.

**Critique**

**Context**

7. The study makes the common mistake of identifying incinerators as a significant source of emissions of fine particulate matter, dioxins and furans, volatile organic compounds and metals. In fact, incinerators do not make a significant contribution to emissions of these substances. This means that, while the report may make valid comments about the risks to health associated with exposure to these substances, the conclusion should be to consider what needs to be done to deal with the main sources of these emissions.

For example, emissions of PM<sub>10</sub> from MSW incineration are approximately 100 tonnes per year, compared to 22,000 tonnes per year from electricity generation.<sup>1</sup> Emissions of finer particles (e.g. PM<sub>2.5</sub> and PM<sub>1</sub>) and secondary particles would be expected to be in a similar proportion. If it is right to be concerned about fine particulate matter, then attention needs to be paid to controlling emissions from electricity generation, road transport, agriculture and domestic sources. No discernible benefit would be gained by any policy change relating to waste incineration, because the source is simply too small to be significant.

8. Similarly, incineration of MSW is estimated to result in emissions of 19 tonnes per year of volatile organic compounds, compared to 408,000 tonnes per year from road traffic, and 36,000 tonnes per year from domestic sources. And for dioxins and furans, MSW incineration is estimated to result in emissions of 1.9 grams per year, well below 1% of the UK total of approximately 360 grams per year.<sup>1</sup> Again, if it is right to be concerned about exposure to organic chemicals, and dioxins, then action should be taken to deal with emissions from road traffic and domestic sources. Any change to emissions from waste incinerators will have no discernible effect on public exposure to VOCs or dioxins and furans.
9. This conclusion is consistent with the report's findings that health outcomes such as cancer are increasing (Section 5.1). This increase in the incidence of cancer has coincided with a general decrease in emissions of substances such as dioxins and furans from waste incineration in recent years. This doesn't prove that incinerators have no influence on cancer, but does suggest that we need to look elsewhere to identify the causes of the increase in cancer incidence reported in the study.

#### **Consideration of dose**

10. Linked to this fundamental problem with the study is the lack of proper reference in the report to the dose of pollutants resulting from waste incineration emissions. For example, the report states "*As incinerators are effectively particulate generators and produce predominately the smaller particulates that have the biggest effect on mortality it is clear that incinerators have considerable lethal potential*" (page 11). The study repeatedly discusses emissions from incineration in this way, with no reference to dose, in a way which would not be expected of a responsible medical body. Vehicle exhaust emissions emit more than one hundred times as much particulate matter as waste incineration facilities, predominantly the smaller particles, and deliver a higher dose because emissions tend to take place at ground level, closer to where people are located. Proper consideration of dose would lead to very different conclusions to those drawn in the report.

#### **Alternatives**

11. As noted above, the study refers to some alternatives to waste incineration (Section 8). While it is important to consider alternatives to incineration (waste reduction; increased recycling; alternative treatment and disposal techniques), it is also important to be aware of the potential environmental effects of these alternatives. Considering the options discussed in the report in turn:
  - Mechanical Biological Treatment (MBT) requires waste to be shredded, which is subject to reliability problems. It is incorrect to say that MBT is "*virtually pollution free.*" Dust and micro-organisms can be generated during the pre-treatment of waste, and no ready controls are available for these emissions, in the way that they are available with a waste incinerator. These emissions can be enhanced during the composting process, depending on the controls applied.
  - Gasification/vitrification processes such as the Thermoselect process are subject to reliability problems, and come with a high energy cost. Burning syngas generates combustion products such as oxides of nitrogen and dioxins and furans. The measured emissions concentrations of dioxins and furans from the Thermoselect process reported on the company's website are 0.005 – 0.01 ng/Nm<sup>3</sup>. This is similar to the levels achieved by modern waste incinerators.
  - Recycling brings benefits in terms of reductions in the use of natural resources, but can also have impacts on worker health and the use of resources such as energy and water in reprocessing.
12. The benefits and drawbacks of MBT, gasification, recycling and incineration need to be considered in a fair way alongside those of other waste management options, and the report fails to do this.

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<sup>1</sup> Department for Environment, Food and Rural Affairs, "Review of Environmental and Health Effects of Waste Management: Municipal Solid Waste and Similar Wastes", Report prepared by Enviro Consulting Ltd and others

### **Accidental releases**

13. The report reproduces inaccurate information relating to the numbers of pollution incidents associated with incinerators (section 11). More up to date information is that *"56 incidents of emissions outside permitted limits occurred at the 14 incinerators accepting MSW in the UK in 2003 ... Three quarters of the incidents related to increased emissions of carbon monoxide and hydrogen chloride, which would not be expected to result in any significant environmental effects. There were four incidents of dioxins and furans above permitted levels, and one incident of cadmium emissions above permitted levels."*<sup>1</sup>

### **Other matters**

14. There are a number of other matters of concern in the report. For example, no consideration is given to the re-use of incinerator ash, although some 80% of ash is re-used.<sup>1</sup> The report incorrectly states that no studies of key issues have been carried out – for example, *"no official attempts have been made to assess the effects of emissions on long-term health."* In fact, these issues have been studied. In section 12, the report reproduces a basic misunderstanding of model uncertainty.
15. The report indicates that incineration is a "violation" of the Stockholm convention, suggesting that the convention commits signatories to the elimination of pollutants including dioxins, furans and PCBs. In fact, the convention requires signatories to *"at a minimum take the following measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C, with the goal of their continuing minimization and, where feasible, ultimate elimination."* A number of steps are then listed. The UK is rightly focusing on the reduction of sources of dioxins such as domestic combustion sources, and to suggest that incineration is a violation of this treaty is incorrect. The report makes sweeping assertions about the risks to health associated with the landfill of incineration residues which are not supported by evidence – for example, that *"no adequate methods exist for the disposal of this ash"* [air pollution control residues]. The Environmental Protection Act 1990 is also misquoted.
16. The report cites the Precautionary Principle. This states that *"where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation"*.<sup>2</sup> The application of this principle does not necessarily mean that incineration should be stopped, but that, if there are concerns regarding environmental degradation, it should be evaluated and measures taken to deal with the problem. This evaluation currently takes place via the waste planning, land use planning and IPPC processes. The evidence presented in the report by no means demonstrates that *"building municipal waste incinerators violates the Precautionary Principle."*
17. The report authors have been contacted with a view to discussing these concerns.

### **Conclusions**

18. The report contains some useful insights from the perspective of the British Institute for Ecological Medicine. The Institute's concerns regarding exposure to chemicals (especially of infants) are set out clearly (these are not reviewed in this evaluation). Some helpful suggestions regarding consideration of alternative waste management options and monitoring strategies are made.
19. The report falls down badly in its understanding of incineration processes. It fails to consider the significance of incineration as a source of the substances of concern. It does not consider the possible significance of the dose of pollutants that could result from incinerators. It does not fairly consider the adverse effects that could be associated with alternatives to incineration. It relies on inaccurate and outdated material. In view of these shortcomings, the report's conclusions with regard to the health effects of incineration are not reliable.

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<sup>2</sup> Office for the Deputy Prime Minister, Planning Policy Statement 23, "Planning and Pollution Control," 2004