Sustainable waste management in the UK: the public health role

R. Mohan\textsuperscript{a,b,*}, J. Spibyb, G.S. Leonardic, A. Robins\textsuperscript{a}, S. Jefferisa

\textsuperscript{a}University of Surrey, Guildford, Surrey, GU2 7XH, UK
\textsuperscript{b}Health Protection Agency, Chemical Hazards and Poisons Division (London), Health Protection Agency, 7th Floor, Holborn Gate, 330 High Holborn, London WC1 V 7PP, UK
\textsuperscript{c}Chemical Hazards and poisons Division (HQ), Didcot, Oxon OXII DRQ, UK

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Summary
This paper discusses waste management in the UK and its relationship with health. It aims to outline the role of health professionals in the promotion of waste management, and argues for a change in their role in waste management regulation to help make the process more sustainable.

The most common definition of sustainable development is that by the Brundtland commission, i.e. ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’. Managing waste sites in a manner that minimises toxic impacts on the current and future generations is obviously a crucial part of this. Although the management of waste facilities is extremely complex, the Integrated Pollution Prevention and Control regime, which requires the input of public health professionals on the regulation of such sites, means that all waste management installations should now be operating in a fashion that minimises any toxicological risks to human health.

However, the impacts upon climate change, resource use and health inequalities, as well as the effects of waste transportation, are currently not considered to be part of public health professionals’ responsibilities when dealing with these sites. There is also no requirement for public health professionals to become involved in waste management planning issues. The fact that public health professionals are not involved in any of these issues makes it unlikely that the potential impacts upon health are being considered fully, and even more unlikely that waste management will become more sustainable.

This paper aims to show that by only considering direct toxicological impacts, public health professionals are not fully addressing all the health issues and are not contributing towards sustainability. There is a need for a change in the way that health professionals deal with waste management issues.
Introduction

The UK currently sends most of its waste to landfill. There has been some concern about the potential health effects of landfill on human health. Landfilling such large amounts of waste is also thought to be unsustainable. The European Union (EU) Landfill Directive (1999) requires considerable volumes of waste to be diverted away from landfill. As a result, incineration and other waste management options may become major waste disposal routes in the future, although these are also perceived to be health hazards by some. Most applications to build any form of waste management installation in the UK have been met with some form of community opposition, which usually includes concerns about health. Scientific understanding of the health effects of waste installations is insufficient; therefore, it is difficult to determine their direct toxicological effects. This is a major reason why waste management is an important public health issue. Currently, the only area where public health professionals are involved in the regulation of waste management issues is in the Integrated Pollution Prevention and Control (IPPC) process, where they can comment on the potentially toxic impacts of waste management.

The most common definition of sustainable development is that by the Brundtland commission, i.e. 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. This paper presents an argument that impacts such as climate change, resource use, health inequalities and the effects of waste transportation also need to be considered by health professionals. It is important that what could be described as the indirect impacts of waste management upon human health are considered along with the direct toxicological impacts of these installations. Otherwise, these impacts may either be ignored or not taken as seriously as they should be, making sustainability even more difficult to achieve.

Direct toxicological impacts upon health

Health concerns around waste management sites

Defining sustainable development in terms of the quality of life of current and future generations clearly means that it is important to ensure that waste management sites pose minimum risk to health. Concern about the health effects of waste installations has resulted in many epidemiological studies around such sites. These have reached different conclusions, although several well-publicised studies have suggested the possibility of a link between landfill and adverse health effects. An investigation by Dolk et al. into the incidence of congenital anomalies around 21 hazardous waste landfill sites in Europe indicated that risks were elevated for women who lived within 3 km of these sites. Further work by Elliott et al. established a very small excess risk of congenital anomalies and low birth weights in populations living within 2 km of landfill sites in Great Britain. However, other studies have revealed no increases in adverse health outcomes close to landfill sites.

Conclusions are limited by a lack of accurate exposure assessment, the influence of confounding factors and reporting bias. Risk assessments using exposure and toxicological data have indicated that well-managed landfill sites are unlikely to cause adverse health effects. These risk assessments are, however, limited by insufficient knowledge about the health effects of low doses of chemical mixtures over long time periods, and because most risk assessments only adequately consider the risks from inhaling atmospheric pollutants, as other exposure pathways such as soil, water and food are poorly understood. The uncertainties and limitations of epidemiological studies and risk assessments mean that the relationship between landfill site operation and adverse health outcomes is not yet clear. Despite the fact that there is even less evidence of adverse health impacts with other types of waste disposal (e.g. incineration and composting), these still appear to be a concern for the public.

A frequent request from the local community around individual waste sites is for an epidemiological study. However, this is unlikely to be helpful because of problems with statistical power due to the small populations living close to waste sites. In these particular cases, it may be more helpful to undertake a health risk assessment of the installation, based on exposure and toxicology data. Another option is to carry out a health impact assessment (HIA), detailing all the potential impacts (either quantitatively or qualitatively) that the waste management site could have upon the health of the local community, and then consider possible mitigation measures. For a detailed description of HIA and waste issues, readers should consult Matthews.

In some previous waste management incidents, health professionals have successfully involved the local community in decision making by creating steering groups in which community representatives are involved with the other relevant agencies in
taking decisions regarding any health study.15 This allows for the difficulties in assessing the impacts of waste management installations to be explained first hand, and means that the local community know that their concerns are being taken seriously and that they are involved in decision making.

**Regulation of waste management sites**

Regulation of waste management sites has improved significantly in recent years. By 2006, all landfill sites and incinerators are required to have IPPC permits. IPPC is enforced by the Environment Agency in England and Wales, the Scottish Environmental Protection Agency in Scotland, and the Environment and Heritage Service in Northern Ireland. These agencies grant permits based on emissions to all environmental media. The IPPC applicant needs to show that they are using the best-available techniques, balancing the costs to the operator against the benefits to the environment.16 Protecting human health is a core part of IPPC, reflected by the fact that primary care trusts are now statutory consultees to the process. For the first time, health professionals have the opportunity to become involved in the regulation of waste management installations. However, their role is limited. There are no specific references to human health in IPPC applications, meaning that health professionals must often base their decisions on emissions data. IPPC only considers the direct effects of any process upon health and does not allow for consideration of broader issues, e.g. the effects upon traffic, resource use, climate change and health inequalities.16

Despite these limitations, IPPC is an important tool for protecting public health. Health professionals should ensure that waste management installations operate to the highest standards possible to protect public health. This could be done by discussing the IPPC application with the regulator, ensuring that the techniques used are appropriate, and ensuring that there is appropriate environmental monitoring carried out around the site. Importantly, they should also consult with the Chemical Hazards and Poisons Division of the Health Protection Agency.16

**Indirect impacts upon health**

**The impact of waste management on resource use and climate change**

Waste disposal is a direct result of resource use. Current populations are using resources (including the ability of the earth’s ecosystems to absorb pollution) at an unsustainable rate. The UK’s current resource use is such that its ecological footprint (the area of the earth’s surface needed to provide the materials and energy used without drawing on non-renewable resources) is currently about eight times the area of the country.17 Studies of ecological footprints of the UK population have put material use and waste management as one of the most important factors influencing this conclusion (Fig. 1).4 Understanding the exact implication of the measure of the ecological footprint is quite complex, although the predominant view is that the current pattern of material use and waste production is unsustainable.17–20

Inequitable resource use (which includes the ability of nature’s ecosystems to deal with the waste that humans produce) has serious adverse impacts upon health.21 According to the majority of the world’s leading scientists, global climate change poses a major threat to society.19 Current patterns of resource consumption and subsequent waste disposal are exacerbating global climate change.22 Gaseous emissions from landfill sites and incinerators contribute directly to the problem. The use of landfill and incineration as waste management options may also indirectly encourage
more resource use, as they give little incentive to either recycle or minimise waste. Manufacturing goods from recycled materials can often require less energy (and therefore produce less greenhouse gases) than producing goods from virgin materials.\textsuperscript{22} Waste prevention is obviously even more effective at reducing emissions. Climate change is expected to have a major impact upon health, including increases in heat strokes, respiratory and cardiovascular problems, vector-borne diseases and health problems caused by extreme weather events.\textsuperscript{23–25}

Since the 1970s, a plethora of environmental legislation concerning waste management has been established both at EU and UK level (Table 1).

In response to EU legislation, the UK Government has produced a national waste strategy.\textsuperscript{2} This sets out policies for waste management, and re-affirms the commitment to meeting the standards set by the EU Landfill Directive by imposing statutory targets on local authorities that force them to increase recycling/composting rates significantly.

Public health professionals can make a significant contribution at regional, county council and district level, where local authorities are required to produce waste strategies detailing how they will manage their waste over the next 10 years. This requirement provides health professionals with an opportunity to ensure that waste management plans consider health issues such as climate change and impacts upon resource use.

When determining waste management policies, decision makers currently consider two principles. The first of these is the waste management hierarchy. This is a conceptual framework used by some for identifying the most (and least) sustainable ways of dealing with waste, which regards waste prevention as the most desirable option and disposal by landfill as the least desirable option (Fig. 2).

The other important consideration is the proximity principle, requiring waste to be dealt with as close as possible to its point of production. This avoids transporting waste to other communities that did not produce it, and reduces the impacts of waste transport, such as vehicle pollution and traffic accidents.

There is a general consensus that reduced waste production should always be the first objective of any waste management policy, and that waste should be dealt with as close as possible to its source of production. It is, however, oversimplistic to think that all waste management problems can be dealt with by adhering to the waste management hierarchy and the proximity principle.\textsuperscript{26} In the first instance, there will always be some waste

<table>
<thead>
<tr>
<th>Date of initial introduction</th>
<th>Driver</th>
<th>Principal effect</th>
<th>Source of legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>Packaging Directive and Packaging Waste Regulations</td>
<td>Sets targets for the recovery of packaging waste</td>
<td>EU</td>
</tr>
<tr>
<td>1996</td>
<td>Integrated Pollution Prevention and Control</td>
<td>Industrial waste producers are subject to duties regarding the waste that they produce. Waste management utilities are also themselves subject to control</td>
<td>EU</td>
</tr>
<tr>
<td>1999</td>
<td>UK Sustainable Development Strategy</td>
<td>Use of waste as a headline indicator</td>
<td>UK</td>
</tr>
<tr>
<td>1999</td>
<td>Landfill Directive</td>
<td>Reduce volume of waste produced, ban on the disposal of some types of waste</td>
<td>EU</td>
</tr>
<tr>
<td>2000</td>
<td>End of Life Vehicles Directive</td>
<td>Requires producers and manufacturers to fund take back schemes</td>
<td>EU</td>
</tr>
<tr>
<td>2000</td>
<td>Waste Incineration Directives</td>
<td>Imposes stringent controls on incinerator emissions</td>
<td>EU</td>
</tr>
<tr>
<td>2002</td>
<td>Waste Electrical and Electronic Equipment Directive</td>
<td>Applies producer responsibility to all such equipment</td>
<td>EU</td>
</tr>
<tr>
<td>2002</td>
<td>Ozone Depleting Substances Regulations</td>
<td>All units containing CFCs have to be disposed of through special plants</td>
<td>EU</td>
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</tbody>
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EU, European Union; CFCs, chlorofluorocarbons.
produced from every industrial process no matter how efficient it is; therefore, complete waste prevention is impossible. In addition, the high-energy requirements of recycling mean that, on occasions, it may make more sense to recover energy by incineration. The decision about the most sustainable means of waste management depends on a variety of factors, e.g. the type of waste being disposed, transport distances and the availability of raw materials. Integrated waste management is a system of waste management whereby rather than simply trying to move up the waste management hierarchy, waste is used in the most effective way in resource and environmental terms. This requires life cycle assessment (LCA) to be carried out on waste management policies in order to determine the most sustainable approach. LCA is the study of the environmental impacts of a product or service over its entire life cycle, e.g. from the extraction of raw materials through to the consumption and final disposal of the product. When dealing with waste management strategies, LCA has the ability to consider impacts such as energy use and energy recovery. As such, it offers an evidence-based approach to waste management planning and is crucial if waste is to be managed in the most sustainable way.

Where possible, public health professionals should ensure that LCAs are carried out on waste management strategies, so that the most sustainable option is chosen considering all of the environmental impacts. This would also widen the debate about waste management and give health professionals the opportunity to comment on all the impacts, rather than concentrating solely on the direct toxicological health effects. Although LCA is a crucial tool for developing waste management strategies, it cannot be used to assess local site-specific issues, e.g. it cannot determine if placing an incinerator in an area might exacerbate a local air quality problem without additional detailed assessment of the impacts of transport and disposal of waste. LCA can only help to identify the most efficient waste management strategies.

It cannot answer questions about the health effects of an individual installation. Public health professionals need to ensure that, where appropriate, risk assessments or HIA approaches are also carried out on waste management installations or strategies. An HIA of a waste management strategy is not a simple task; however, there are some excellent general guidelines available for conducting HIAs. A good HIA of a waste management strategy should highlight all of the impacts upon health (both positive and negative) and suggest possible ways to improve the strategy.

Waste and health inequalities

Equity and justice are key parts of sustainable development. The perceived health effects, along with the extra noise, traffic, visual impacts and the potential for vermin and odour, mean that waste installations, like some other environmental hazards, may be more likely to be found in less affluent areas. A study in Great Britain found that there was an average reduction of about £5500 in the value of houses within 0.25 miles of operational landfill sites. In total, there is an average disamenity cost to the local community of £334 350 and £478 990 per landfill, and the average reduction in house prices near each landfill site equated to £1.52–2.18 per tonne of landfill waste. These studies, coupled with evidence from other studies that have investigated inequalities and environmental hazards, suggest that poor communities may suffer from the impacts of waste management installations.

Public health professionals should ensure that waste management installations are located in the most appropriate locations according to economic, environmental and social criteria; hence, poorer communities should not suffer disproportionately from their adverse impact. This cannot be done through their responsibility as IPPC consultees; currently, the only opportunity that health professionals have to comment on these issues is when waste management strategies are being developed. Health inequalities should be one of the key considerations when developing waste management strategies or when conducting HIAs of waste sites. If waste management installations are to be located in an area, every effort should be made to mitigate any potential adverse health effects. This might include measures such as traffic calming or ensuring that the site is managed in the most efficient manner to reduce nuisances such as noise and odour. Every effort should also be made to
ensure that the local community enjoys any potential benefits from waste management. These might include district heating, compost for gardening, educational opportunities or employment. Both waste regulators and waste management companies are aware of the adverse publicity that surrounds the waste industry, and so may be responsive to implementing ideas that could improve the quality of life of local residents. Health professionals could have a role in facilitating such meetings, giving the local community an opportunity to raise their concerns and the site operators a chance to mitigate adverse impacts.

**Leading by example: managing health sector waste**

It is only in the last few years that the concept of the National Health Service (NHS) as a corporate citizen has been accepted as a viable notion. The NHS produces 600,000 tonnes of waste which has a significant environmental and economic effect. However, several NHS trusts have successfully implemented effective waste management policies, resulting in environmental and financial benefits.

Other examples of good practice include a waste minimization project undertaken by the NHS Purchasing and Supply Agency (PASA). This encouraged buyers within PASA to consult with suppliers to reduce waste at the manufacturing phase, and also to consider what will happen to goods at the end of their life. Carrying out LCAs on the goods purchased by the NHS would mean that there would be evidence to make decisions considering all the economic, social and environmental impacts. Both PASA and NHS Estates have developed waste management strategies, setting good examples that could be followed by other health agencies. Other approaches, such as the recently published NHS corporate citizenship tool, which promote more sustainable resource use are also to be commended. More research needs to be undertaken to attempt to reduce health sector waste. This could be done by conducting more LCAs of the goods used and by determining which products and policies are most sustainable.

**Conclusions**

Most people now realize, at least in principle, that sustainable development is necessary. Waste management is an issue in which health professionals can play a more active role and can potentially make a positive difference. Public health professionals should be aware that unless their voice is heard in the sustainability debate, it may remain focused on technical and economic issues.

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