

East Sussex and Brighton & Hove  
Waste & Minerals Development Framework

**Information Paper 9**  
Climate Change and Waste and Minerals

October 2009

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## Information Paper 9- Climate Change and Waste and Minerals

### 1 Introduction

This 'Information Paper' on Waste Management Methods and Technologies, is one in a series that has been produced to support the preparation of the Waste and Minerals Development Framework (WMDF). The WMDF will contain planning documents ('Development Plan Documents' (DPDs)) that will help decide how and where waste should be dealt with and minerals produced in East Sussex and Brighton & Hove in the future (up to 2026). More information about them can be found on the Councils' websites:

- [www.eastsussex.gov.uk/environment/planning/development/mineralsandwaste](http://www.eastsussex.gov.uk/environment/planning/development/mineralsandwaste)
- [www.brighton-hove.gov.uk/index.cfm?request=b1148434](http://www.brighton-hove.gov.uk/index.cfm?request=b1148434)

The Information Papers are being used provide the evidence for the development of the WMDF and to support consultation and discussion with members of the public and key stakeholders who are concerned with waste and minerals in East Sussex and Brighton & Hove.

The Papers are 'living drafts' which present the evidence as it stands at this stage and they will be periodically updated with any new information that comes to light. This will ensure the Councils' knowledge and understanding of waste and minerals remains robust and the evidence base for the WMDF is 'sound'.

The Information Papers were first published and consulted upon in July 2007, and were then revised in February 2008. This third version (October 2009) brings them up to date with new information and recent changes in legislation and policy.

Details of the other Information Papers that have been produced are included in Appendix 1.

If you would like to comment on or add to the WMDF evidence base that is presented in this Information Paper, please visit the consultation website <http://consult.eastsussex.gov.uk> and follow the instructions for the Information Papers. Alternatively you can send an e-mail to [wasteandmineralsdf@eastsussex.gov.uk](mailto:wasteandmineralsdf@eastsussex.gov.uk) or write to:

Waste and Minerals Planning Policy Team, Transport & Environment, East Sussex County Council, C4 Waste and Minerals Policy (AP), FREEPOST, East Sussex County Council, County Hall, St. Anne's Crescent, Lewes BN7 1UE

Please make sure that you refer to the section and paragraph numbers that your comments relate to.

### 2 What is climate change?

**2.1** Global warming is caused by natural and by human factors. Natural causes include interactions between the oceans and the atmosphere, changes in the earth's orbit and volcanic eruptions. Humans influence global climate by releasing greenhouse

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gases like carbon dioxide and methane into the atmosphere. Other gases such as nitrous oxide and chlorofluorocarbons (CFCs) also have an impact. Greenhouse gases absorb energy that is radiated from the earth's surface, warming the atmosphere and increasing temperatures globally. The term “climate change” refers to the changes in the long-term weather conditions, such as the frequency and intensity of extreme weather, shifts in the timing of seasons, and a rise in sea level resulting from global warming.

**2.2** There is growing consensus that urgent action is needed on twin challenges - ‘mitigation’ to reduce emissions and so to help avoid climate changes in the future, and ‘adaptation’ to help us to prepare for unavoidable impacts that are already stored up in the climate system. <sup>(1)</sup> The use of fossil fuels (coal and oil) to provide energy results in the release of carbon dioxide, therefore the generation and use of energy is a key factor to be considered if climate change is to be minimised.

### 3 Climate change and the management of waste and minerals

**3.1** The Planning and Climate Change Supplement to PPS1 (Planning Policy Statement 1) sets out how spatial planning should contribute to reducing emissions and stabilising climate change and take into account the “unavoidable consequences” of climate change. There is also increasing awareness about the links between sustainable waste management and climate change. In terms of mitigation, waste management is significant in tackling greenhouse gas emissions because the treatment and disposal of waste generates carbon dioxide and methane. The other aspect of the relationship between climate change and waste management is that weather extremes (drier summers and wetter winters) are likely to impact on the form of waste and the way waste is stored, treated and disposed of. There are also links between minerals extraction/processing and climate change, related to the energy used by machinery in the extraction/processing and transport.

### 4 The role of waste management in mitigating climate change

**4.1** Everyday waste contains biodegradable organic matter such as kitchen and garden waste, and paper. When biodegradable materials are broken down by organisms in the presence of air, carbon dioxide is released. When the material decomposes in the absence of air, methane is produced. Weight for weight, methane is 23 times more damaging than carbon dioxide as a greenhouse gas <sup>(2)</sup>. Therefore waste management has an important role in mitigating against climate change by reducing the production of greenhouse gases from waste.

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1 Stern Review 2007

2 Waste Strategy for England 2007

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**4.2** Traditionally, much biodegradable waste in the UK has been disposed of by burying it in landfill sites. However the absence of air in landfill sites means that as the biodegradable waste decomposes, methane is generated. Currently over 70% of waste in the UK is land-filled. This generates a significant proportion of UK methane emissions. Methane emissions from (biodegradable waste in) landfill now account for about 40% of all UK methane emissions, which equals about 3% of UK greenhouse gas emissions, so even with the landfill tax escalator, the cost of landfill does not include the full environmental cost of methane emissions <sup>(3)</sup>. If this source of emissions is not tackled, then it could compromise the ability of the UK to meet its commitments under the Kyoto Protocol, to reduce greenhouse gas emissions by 12.5% below 1990 levels in 2008-2012, and longer term targets as proposed under the draft Climate Change Bill. Hence, reducing the amount of biodegradable waste that is land-filled is one of the key objectives of the Landfill Directive.

**4.3** At the regional level, reducing the amount of biodegradable waste that is land-filled is one of the five key indicators in the Climate Change Mitigation and Adaptation Implementation Plan which informed the South East Plan. More locally, levels of carbon dioxide emissions from waste management in East Sussex and Brighton & Hove are being looked into as described in the Sustainability Appraisal Scoping Report.

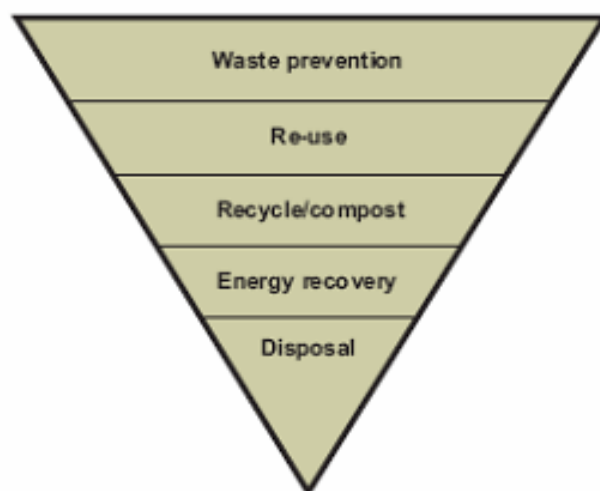
**4.4** With regards to inert waste, such as minerals or construction and demolition waste, they do not decompose to release greenhouse gases. However management of such wastes can affect climate change because if minerals, and other natural resources, are not reused or recycled then new primary resources have to be extracted and new products manufactured resulting in the use of additional energy. Reducing transport of minerals, by re-using or recycling construction and demolition waste on site where possible, is also important.

**4.5** Other aspects of waste management and minerals production that can impact greenhouse gas emissions are:

- the energy used in transporting and processing waste and minerals;
- potential reductions in industrial energy use due to re-use and recycling;
- energy recovery from waste, and energy use in extracting new primary resources.

**4.6** Therefore the movement of waste management up the waste hierarchy is a priority in order to mitigate and adapt to climate change.

## 5 Moving up the waste hierarchy to address climate change



**Figure 1 The waste hierarchy, Waste Strategy for England 2007**

**5.1** Government policy seeks to reduce waste that is disposed of to landfill, and increase the amount of waste that is reused, recycled, composted or has energy recovered, in other words moving waste management up the waste hierarchy. This is important both in terms of diverting biodegradable waste from landfill and associated methane emissions, and in terms of maximising the potential for reuse, recycling and recovery of resources which helps to minimise the demand for new resources and the greenhouse gases generated in their production.

**5.2** For more further information see the background study on climate change <sup>(4)</sup> and also Information Paper 3 – Sustainable resource use and management, and Information Paper 4 - Waste management methods and technologies.

## 6 Waste reduction, re-use and climate change

**6.1** Waste reduction and prevention, at the top of the waste hierarchy, can help reduce greenhouse gas emissions in several ways. Avoiding unnecessary waste, such as excessive packaging, reduces the demand for extracting new raw materials, which reduces emissions of carbon dioxide from fossil fuels and preserves carbon stocks in trees. It also potentially reduces transportation needs and associated fuel consumption and vehicle pollution. The knock-on effect of this saving is cumulative throughout the whole cycle, saving significant emissions of greenhouse gases which would otherwise have been emitted as a result of energy used right through from the production to the disposal of the material. Waste reduction and prevention is therefore an important aspect of mitigating climate change.

4 The Potential for Planning Policies to Influence the Climate Change Impacts of Waste Management, Eunomia 2009

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**6.2** At the next level in the waste hierarchy, re-use of products and materials, such as plastic bags, glass bottles, bricks and timber, can also be effective in mitigating greenhouse gas emissions by reducing the demand for new raw materials to be extracted, transported, processed, and in turn further treated, or processed when the materials become waste.

## 7 Recycling, composting and climate change

**7.1** Recycling is the Government's next preferred waste management process in the waste hierarchy. Recycling reduces the need for raw materials and the manufacture of new materials, and keeps valuable resources from being disposed of. Recycling does require an energy input to reform the waste materials into different products (e.g. smelting old cans to produce steel), and this energy usually comes from burning of fossil fuels which generates carbon dioxide, but overall recycling can help reduce greenhouse gas emissions. See background study on Climate Change for more information including the typical carbon dioxide emissions and savings associated with recycling different materials <sup>(5)</sup>.

**7.2** The recycling of biodegradable organic wastes is important in meeting the requirements of the Landfill Directive. The composting of garden and sometimes kitchen waste produces carbon dioxide as part of the aerobic decomposition process. <sup>(6)</sup> At a commercial scale, in-vessel composting and anaerobic digestion of biodegradable waste (including sewage) produces methane and carbon dioxide, however because the digesters or vessels are sealed and enclosed, the 'biogas' (methane and carbon dioxide) can be collected, treated, and then used as a high-energy fuel. This helps to displace the need for fossil fuels to produce electricity and/or heat, and also means that only carbon dioxide, which is a less potent greenhouse gas, is released after combustion of the biogas. The National Waste Strategy also now includes greater support for anaerobic digestion <sup>(7)</sup>, and the Government, through the Renewables Obligation Certificate scheme, has recently increased the level of support for electricity generated from anaerobic digestion. The South East Plan also identifies the importance of anaerobic digestion and biomass energy <sup>(8)</sup>.

## 8 Mechanical Biological Treatment and climate change

**8.1** Mechanical Biological Treatment (MBT) plants frequently incorporate in-vessel composting or anaerobic digestion as the 'biological' treatment element of the process. The 'mechanical' sorting element of an MBT process removes some recyclable materials from the mixed waste stream, saving on the need for raw material extraction. The 'biological' part of the process however currently only has limited markets for

5 The Potential for Planning Policies to Influence the Climate Change Impacts of Waste Management, Eunomia 2009

6 Climate Change and Waste Management: The link (Defra 2006)

7 Waste Strategy for England 2007

8 Policies W11 and W12 in South East Plan

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the residues, partly to do with the way that items are eligible or not under the Renewables Obligation Order which provides support for electricity produced from the biomass content of waste treated in gasification, pyrolysis, anaerobic digestion, and combined heat and power plants. The WRAP (Waste & Resources Action Programme) programme is currently working to develop the markets for these and other products.<sup>(9)</sup> Also the Renewables Obligation Order was reviewed in April 2009 giving increased support some technologies such as anaerobic digestion, alongside this the Government committed in the budget additional funding for waste management measures to help cut carbon emissions.

### 9 Energy recovery, thermal heat treatments and climate change

**9.1** Further down the waste hierarchy, and therefore a less preferred waste management option, are thermal heat treatments and energy recovery facilities. These broad headings include incineration (with energy recovery), pyrolysis and gasification.

**9.2** Incineration of mixed waste with energy recovery represents a proven technology and there are a number of existing and planned plants in the UK and across Europe. Incineration with energy recovery converts energy stored within the waste materials to energy, which can displace energy generated from fossil fuels, for example to power local homes or businesses. Incineration also helps to prevent biodegradable materials decomposing in a landfill, and generating methane<sup>(10)</sup>, although there is a disadvantage to incineration in terms of greenhouse gas emissions, in that carbon dioxide is emitted from the facility as part of the incineration process. Incineration without energy recovery is generally not allowed in the UK and the South East Plan identifies that waste planning documents should only include energy from waste as part of an integrated approach to management.

**9.3** Advanced thermal treatment technologies, including pyrolysis and gasification, are seen in other European countries as an efficient means of recovering energy by combustion other than incineration, however these are currently not proven on a large scale in the UK. Whilst carbon dioxide will be released from both pyrolysis and gasification processes upon combustion of the fuel gas, the emissions of carbon dioxide from burning of biomass and fuels derived from biomass are considered to be part of the carbon cycle, unlike emissions from the burning of fossil fuels, which produce net additions to atmospheric carbon and as a result are counted differently in terms of overall UK greenhouse gas emissions.

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9 Waste Strategy for England 2007

10 Waste Strategy for England 2007

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**9.4** Another emerging method of recovering energy from waste materials, is the manufacture of biodiesel from waste vegetable oil. Biodiesel derived from waste vegetable oil can be considered carbon neutral because it reduces waste and increases resource efficiency, so the Environment Agency is considering ways to facilitate recovering it from places like take-aways and restaurants <sup>(11)</sup>.

### 10 Landfill and climate change

**10.1** Landfill is generally the least favourable environmental option in terms of greenhouse gas emissions. Landfill sites produce methane due to the anaerobic decomposition of wastes. There are many basic un-engineered landfill sites around the world today which have no system for collecting this harmful greenhouse gas, and emissions remain uncontrolled to the atmosphere. However modern landfills, such as those currently operating in East Sussex, which accept biodegradable wastes are engineered to capture some of the methane produced, so that it can be burned to produce energy. Burning the methane in energy production does produce carbon dioxide, but this has a much lower global warming potential than methane, so on balance the impacts on climate are reduced. In recognition of the impact of landfill on the production of greenhouse gases, the Landfill Directive is requiring an increasing amount of biodegradable waste to be diverted from landfill. These targets are challenging and meeting them will need joined-up action from many stakeholders. The Government has recently confirmed that landfill tax would continue to increase by £8/year up to 2013 to encourage investment in sustainable waste management.

**10.2** Land-filling of inert materials, such as construction waste and aggregates, does not result in the generation of greenhouse gases as those wastes do not decompose in the same way as biodegradable materials. However, disposal of inert material means that new raw materials will then need to be extracted and processed which will involve the use of energy.

### 11 Transportation of waste and minerals

**11.1** The relationship between waste and minerals and climate change is wider than just the use of different technologies or management methods. The transportation of waste and minerals, which tend to be bulky and relatively low value, can also generate greenhouse gases. Until recently, it has been difficult to compare the environmental impacts of different stages of collection, sorting, transportation, recycling and disposal, however the Environment Agency has introduced an assessment tool WRATE (waste and resources assessment tool for the environment) to help weigh up the environmental impacts of different waste management systems for municipal waste, for example the impacts of transporting household waste 50 miles to be composted, compared to transporting it only a few miles to a local energy recovery facility.

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11 Environment Agency press release 24 October 2007: Waste vegetable oil to stimulate biodiesel industry

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### 12 Adaptations to climate change by the waste management industry

**12.1** Much of the focus on climate change is often about the waste or mineral industry's role in reducing emissions rather than the physical impacts of the changing climate on waste or minerals management operations and how it may need to be adapted to cope with changing weather patterns.

**12.2** In 2003, an Environment Agency research report titled *The Potential Impacts of Climate Change on Waste Management* found that there is the potential for significant impacts. The pace and impact of climate change may be subject to uncertainty, but the report's central conclusion is clear that steps should be taken to assess the risk of climate change to individual sites and processes. The report identifies how waste managers, regulators and policy-makers will need to make plans without knowing fully what lies ahead in terms of the exact impacts of climate change on waste management and the potential adaptation options. Landfill sites are the best example of the sector's vulnerability, being operational for decades and remaining active for many years following their closure, so decisions made now will affect these sites far into the future when the climate could have changed quite significantly. The study indicates that impacts of climate change on future waste management processes could include:

- disruption to infrastructure from flooding;
- changes in site hydrology and temperature could affect degradation processes such as landfill and leachate production and composition;
- increased impacts on amenity such as odour and vermin; and
- influences on the flora and fauna used to restore sites after use.

**12.3** More specifically in the Plan area, the likely impacts of climate change on waste management could include sea level rise, increased tidal and fluvial flood risk, impacts on water resources and quality, and on biodiversity.

### Appendix 1 List of other Information Papers prepared

1. The Future Need for Waste Management
2. The Future Need for Minerals Production and Management
3. Sustainable Resource Use and Management
4. Waste Management Methods and Technologies
5. Residual Waste Disposal
6. Spatial Portrait of East Sussex and Brighton & Hove
7. Hazardous Waste
8. Transportation of Waste and Minerals
9. Climate Change and Waste and Minerals
10. Wastewater and Sewage Sludge Treatment

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### Appendix 2 International and national legislation in relation to this Information Paper

- EU Landfill Directive (1999/31/EC)
- Renewables Obligation Order (2006)
- Draft Climate Change Bill, consultation document (March 2007)
- Command Paper: Taking forward the UK Climate Change Bill (October 2007)
- Energy White Paper (2003)
- National Energy Review, consultation document (2006)
- Waste Strategy for England (Defra 2007)

### Appendix 3 Planning policy framework in relation to this Information Paper

- Draft Planning and Climate Change Supplement to Planning Policy Statement 1 (PPS1) (2007)
- Planning Policy Statement 10 (PPS10) Planning for Sustainable Waste Management (2005)
- Planning Policy Statement 25 (PPS25) Development and Flood Risk (2006)
- Planning Policy Statement 22 (PPS22) Renewable Energy (2004)
- South East Plan (2009)
- East Sussex and Brighton & Hove Waste Local Plan (2006)

### Appendix 4 Further references and information sources

- The Potential for Planning Policies to Influence the Climate Change Impacts of Waste Management: Report for East Sussex and Brighton & Hove, Eunomia 2009
- ESCC and BHCC (2007) East Sussex and Brighton & Hove Waste and Minerals Core Strategy and Minerals Sites DPD Sustainability Appraisal Scoping Report, March 2007
- Environment Agency (2007) Business environmental news item -*What affect will climate change have on the waste management industry?*  
<http://www.environment-agency.gov.uk/business/969893/1709353/1709362/1709411/>
- Environment Agency press release (24 October 2007) Waste vegetable oil to stimulate biodiesel industry
- Stern Review (2006) The Economics of Climate Change

#### Other useful websites:

- Business Resource Efficiency and Waste Programme (BREW)  
[www.defra.gov.uk/Environment/waste/brew/index.htm](http://www.defra.gov.uk/Environment/waste/brew/index.htm)
- South East Climate Change Partnership [www.climatesoutheast.org.uk](http://www.climatesoutheast.org.uk)
- UK Climate Impacts Programme (UKCIP) [www.ukcip.org.uk](http://www.ukcip.org.uk)

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