Scrutiny Standing Panel Agenda

Environmental and Planning Services Standing Scrutiny Panel
Wednesday, 23rd April, 2008

Place: Committee Room 1, Civic Offices, High Street, Epping

Time: 7.00 pm

Democratic Services Officer: A Hendry - The Office of the Chief Executive
Email: ahendry@eppingforestdc.gov.uk

Members:

Councillors Mrs P Smith (Chairman), D Bateman (Vice-Chairman), Mrs A Cooper, R Bassett, R Frankel, J Knapman, G Pritchard, Mrs P Richardson, H Ulkun, Mrs L Wagland and M Woollard

1. APOLOGIES FOR ABSENCE

2. SUBSITUTE MEMBERS (COUNCIL MINUTE 39 - 23.7.02)

(Head of Research and Democratic Services) To report the appointment of any substitute members for the meeting.

3. DECLARATION OF INTERESTS

(Head of Research and Democratic Services). To declare interests in any items on the agenda.

In considering whether to declare a personal or a prejudicial interest under the Code of Conduct, Overview & Scrutiny members are asked pay particular attention to paragraph 11 of the Code in addition to the more familiar requirements.

This requires the declaration of a personal and prejudicial interest in any matter before an OS Committee which relates to a decision of or action by another Committee or Sub Committee of the Council, a Joint Committee or Joint Sub Committee in which the Council is involved and of which the Councillor is also a member.

Paragraph 11 does not refer to Cabinet decisions or attendance at an OS meeting purely for the purpose of answering questions or providing information on such a matter.

4. NOTES OF THE LAST MEETING (Pages 3 - 8)

To consider and agree the notes of the meeting the Panel held on 28 February 2008.

5. WORK PROGRAMME (Pages 9 - 10)

Work Programme attached.

6. THE FUTURE OF WASTE IN ESSEX (Pages 11 - 38)

(Director of Environment and Street Scene) To consider the attached report and attachments.

7. REPORTS TO BE MADE TO THE NEXT MEETING OF THE OVERVIEW AND SCRUTINY COMMITTEE

To consider which reports are ready to be submitted to the Overview and Scrutiny Committee at its next meeting.

8. FUTURE MEETINGS

EPPING FOREST DISTRICT COUNCIL
NOTES OF A MEETING OF ENVIRONMENTAL AND PLANNING SERVICES STANDING SCRUTINY PANEL
HELD ON THURSDAY, 28 FEBRUARY 2008
IN COMMITTEE ROOM 1, CIVIC OFFICES, HIGH STREET, EPPING
AT 7.30 - 9.40 PM

Members Present:	Mrs P Smith (Chairman), , Mrs A Cooper, R Frankel, P House, Mrs P Richardson, H Ulkun, Mrs J H Whitehouse and B Rolfe
Other members present:	Mrs A Grigg and Mrs M Sartin
Apologies for Absence:	R Bassett, G Pritchard, Mrs L Wagland and M Woollard
Officers Present	J Gilbert (Director of Environment and Street Scene), J Preston (Director of Planning and Economic Development), Ian White (Senior Planning Officer) and A Hendry (Democratic Services Officer)

48. SUBSTITUTE MEMBERS (COUNCIL MINUTE 39 - 23.7.02)

It was noted that Councillor Mrs J H Whitehouse was substituting for Councillor M Woollard and that Councillor B Rolfe was substituting for Councillor G Pritchard.

49. DECLARATION OF INTERESTS

None were reported.

50. NOTES OF THE LAST MEETING

The notes from the last meeting, held on 6 December 2007, were agreed subject to minute item 44 being amended under the Nazeing Focus Day item to say that it was the Lorry Analysis that was not completed and not the County Freight Strategy.

51. VOSA PRESENTATION

The Panel received a short presentation from Paul Hartley, the Senior Team Leader for the Environmental Team, from the Vehicle and Operator Services Agency (VOSA). He took the Panel through an overview of what VOSA does and what powers they have, or lack.

Operators have to have a licence for any vehicle over 3.5 tonnes (i.e. the maximum permitted total weight when loaded) for use in a business capacity. VOSA aims to promote a safe, fair and environmentally friendly industry, overseen by a Traffic Commissioner.

An operator must show that they are fit to hold a licence, have the financial resources available for and arrangements in place, to maintain their vehicles and where appropriate, professional competence.

An applicant need only advertise in a single newspaper if they wish to operate a site. There is no guidance as to how big a circulation or readership that newspaper must

have, just that it must be local to the proposed operating centre. This has raised and continues to raise, problems with local residents who can reasonably claim that they were unaware of the application.

All applications are published in the appropriate area publication called "Applications and Decisions". This district is covered under the South Eastern and Metropolitan Traffic Area. Currently only three members received this publication. If any members would like to receive a copy they would only need to email Paul Hartley on paul.hartley@vosa.gov.uk . There is a subscription fee.

Once published, the public have three weeks to make any objections. They have to be local to the proposed site, living roughly within a 500 yards radius. They can only make objections based on environmental grounds (noise, dust, smell, vibration, visual impact etc.).

It should be noted that the Traffic Commissioner does not have absolute power over the vehicles, except in terms of maintenance. He does not have the authority to take into consideration environmental suitability or road safety aspects of an application.

The Council as a 'statutory' objector can object on environmental grounds and on 'road safety' grounds. This only applies at the point where vehicles enter or leave the site. Traffic Commissioners are not bound by locally adopted specific measures such as sight lines. Cases are investigated by Traffic Examiners, who will visit the site in question.

It should be noted that Councils have a statutory right to object, non-neighbouring public do not, although council objections must be made by its 'administrative arm' and not by individual Councillors.

Traffic Commissioners have a quasi-judicial role and try and find a middle ground between objector and the applicant and try and impose conditions acceptable to both sides. If there is no agreement then they can be offered a Public Inquiry, where the Traffic Commissioner will formally hear both sides. There is a further appeal option of a High Court Judicial review.

A Traffic Commissioner can only indirectly consider planning matters, if it impinges on the operators repute. This is taken to mean that there is no current enforcement action against activities on the site. Once there is an enforcement notice on the land then it is deemed unavailable. It was suggested that when Councils lodge objections to licence applications, they should give the reasons behind the planning restrictions rather than the restrictions themselves – it is factors like location in mainly residential areas that Traffic Commissioners are more likely to be sympathetic to.

Once granted a licence is valid for five years and Traffic Commissioner cannot look at that licence for five years. Once the five years have been reached, the application process starts again.

Goods vehicles being used under licence cannot be parked in residential areas – they must have licensed off street parking. Exceptions will be made for the odd occasion, but if on-street parking occurs regularly, the operator must apply for a specific area as an operating site to be licensed. The legislation theoretically permits operators to have any number of such sites. A licence can be revoked if parking becomes a problem.

A particular problem for this area is that Traffic Commissioners have no jurisdiction over non-UK registered vehicles (the same applies to ECC's Trading Standards) – issues raised by continental HGVs serving e.g. glasshouses and packhouses will therefore require other solutions.

Operators who wish to increase the number of vehicles on a licensed site need to go through the same procedures as for the original licence. This does not change the 5 –year review period for the original licence.

Mr Hartley assured members that there is regular checking and monitoring of sites and vehicles, although there is something like 2,000 trained staff, at least 25,000 licensed sites with an overall average of 10 vehicles per site.

He agreed to consider re-drafting a standard letter from the Traffic Commissioners which, in particular circumstances can be taken as inferring that Councils, by not making objections to applications, are not fully carrying out their duties especially in terms of environmental health.

The Chairman thanked Mr Hartley for his very interesting presentation and opened the up the discussion to members of the Panel. The following questions were asked:

Q: When will primary legislation be re-examined?
A: The initial newspaper advert that an applicant is obliged to make is currently being examined. They are also looking the Planning Process.

Q: London has different ideas on controlling the movement of large lorries, such as the congestion charge, is there any reason why we can't do anything similar?
A: The Traffic Commissioners encourage low emissions, but cannot enforce it. The Environmental side of the Council may have some say on this.
The Director of the Environment and Street Scene commented that there was very little that the Council could do. From time to time they can combine with the Police to stop and test vehicles. As for environmental issues generally, it boils down to a statutory nuisance, is there a nuisance or not. As long as the operator is doing all that they can, then they have a defence. Highways do have some control but not much.

Q: Is it right that that goods vehicles should not be parked on the highway overnight?
A: That's right they are not allowed to do so. This is one area where the Traffic Commissioners have some teeth, we can write to the operators.

Q: What about foreign operators?
A: Here we have no jurisdiction.

Q: Is there a public register of licence holding operators.
A: No, there is not, but you can ask for a list of operators in a particular area, as we can search postcodes.

Q: Are unlicensed operators a big problem and is there a statute of limitations on their operating without a licence?
A: It used to be a big problem, when we had small fines, but nowadays we can impound their vehicles. There is no statute of limitations on unlicensed operators, when we find out, they get a warning and must apply for a licence within a month.

Q: When were the rules first drawn up?
A: The current rules go back to 1995, before that from 1968.

Q: They are complex and do not join up.
A: Yes and are not very robust. Traffic Commissioners are impotent in many ways. The rules need to be completely rewritten, but it needs the political will.

Q: Can not the 'applications and decisions' document be brought out in post code order?
A: Yes, we should be able to do this. We will speak to our publishers.

Q: Over a five year period, a site is at risk to ground contamination. Who would be responsible for this?
A: It may be the Council or the Environment Agency. It would depend on the type of pollution and where it ends up.

Q: If a site has been granted a licence for two vehicles, what happens if the applicant wants more vehicles? Is it treated as a new application?
A: Yes, each increase is treated as a new application and has to be advertised again.

Q: Is there any monitoring of a site once a licence has been granted?
A: Yes, we do carry out site visits, check records etc. and also check up on any complaints made.

Q: An application for variation, does it sit within the original five year period?
A: Yes.

The Head of Planning and Economic Development commented that London was a well resourced body when it came to enforcing low emission charges. He was not sure that a District Council could do this. It should come within the purview of the County Council.
It was a lot of work for officers to go through the regional list and narrow it down to Epping and then check the Planning backgrounds for each application. Planning Enforcement do now actively check the application list and follow them up.

The Director for the Environment and Street Scene commented that Local Authorities were in some difficulties in cases where we had not objected. This is usually because we do not have sufficient grounds on which to object. We may not have cause for objections at the time but that is not to say that we would not have one in the future. It would be helpful if the Traffic Commissioners took a different view. Mr Hartley agreed, but as VOSA as well as the Local Authorities were under resourced, it was difficult to take every possibility into account. He was happy to consider changing the standard letter sent out to residents to reflect this.

The Panel agreed to put Mr Hartley's contact details in the Members Bulletin.

The Chairman thanked Mr Hartley for his interesting presentation and for answering the Panel's questions.

52. WORK PROGRAMME

The Panel considered the updated work plan.

Item 1: Essex County Joint Waste Procurement Process – another meeting is scheduled for next Tuesday 4th March. A Joint Waste Strategy questionnaire to be put in the members Bulletin.

Item2: New Local Development Scheme and East of England Plan – this will be progressed, hopefully, after Easter.

Item 3: Reuse of buildings in Green belt / Traffic issues in Roydon and Nazeing – Ian White reported that was progress on a traffic survey, a report had been published.
It was noted that the document had a lot of errors in it.
The ECC Freight Strategy consultation should start in May.
A case is being built up to ask for more Police presence in the Nazeing area.

Item 4: Clean Neighbourhoods – this was essentially complete except for a report on fixed penalty notices.

Item 7: Anti-social behaviour in car parks – this is part of the Safer, Cleaner, Greener initiative. Overview and Scrutiny will get a report asking how they wish to monitor this. It can come to this Panel or go to an altered Crime and Disorder T&F Panel.

Item 8: Parking on Grass Verges/ in residential areas – this is still outstanding. O&S need to decide who will handle highways issues. It may be that larger issues would go to the main O&S Committee and the smaller issues to this Panel. There are future plans to pass responsibilities back from County to District level. In which event we may need a local Highways committee scrutinising how to spend the local highways money; each district may get up to £2million in the 2009/10 financial year.

Item 9: Need to change the title of Climate Change to the Nottingham Declaration, which has now been adopted by Cabinet. Officers are now setting up a "Greener Group" – to monitor the declaration and work out our corporate policy on green issues. They are still formulating the terms of reference and this Panel will be kept informed.

53. LOCAL BETTER REGULATION OFFICE - DRAFT STRATGEY 2008-2011

The Director for the Environment and Street Scene introduced the report on Local Better Regulations Office – Draft Strategy 2008-11. The Panel noted that the draft strategy was tabled, and the Director apologised for its late appearance. It contained nothing really new to come out from the Rogers Review. The Local Better Regulation Office (LBRO) wished to help local authorities change their approach to enforcement to achieve positive outcomes. It saw regulatory activities as needing to be:

- Proportionate
- Accountable
- Consistent
- Transparent and
- Targeted.

The Regulatory Enforcement and Sanctions Bill gives six key functions to the LBRO:

i) To operate the primary authority scheme;
ii) Provide advice to central government on local regulatory issues;
iii) Issue statutory guidance to regulatory authorities;
iv) Review and revise the (Rogers Review) national and local priorities;
v) Map the regulatory landscape to better understand how it all works; and
vi) Work with national regulators and representative and professional bodies to create benchmarks for a 'world class' regulatory system.

To achieve this the LBRO will focus its activities around three strategic objectives:

(1) support for service improvement and change;
(2) the delivery of consistency; and
(3) improved services generally.

The LBRO have asked for comments on their draft strategy. The report provided a response to this and the Panel reviewed this response and commented appropriately.

RESOLVED:

1) That the Panel agreed the response to the LBRO strategy as set out in paragraph 9 of the report.
2) That the Overview and Scrutiny Committee be asked to endorse this Panel's recommendation.

54. REPORTS TO BE MADE TO THE NEXT MEETING OF THE OVERVIEW AND SCRUTINY COMMITTEE

Report on the VOSA presentation and Local Better Regulation Office – Draft Strategy 2008-2011.

55. FUTURE MEETINGS

23 April 2008 at 7.30 pm.

Environmental and Planning Services Standing Panel			
Item	**Report Deadline / Priority**	**Progress / Comments**	**Programme of Future Meetings**
(1) Essex County Joint Waste Procurement Process	To receive the minutes from the last meeting/s.		23 April 2008
(2) New Local Development Scheme and East of England Plan – EFDC Response to Final Version	See comments	Still awaiting the final version of the East of England plan – expected in the new year.	
(3) Re use of buildings in the Green Belt/Traffic Issues in the Roydon and Nazeing Areas.	Ongoing	**Underway** – Police and VOSA to attend meeting on 28 Feb 2008. VOSA attended February meeting.	
(4) Clean Neighbourhoods and Environment Act 2005 – Implementation of provisions		**Completed:** Report submitted to 31 January OSC. Request submitted for further work to be carried out on issues arising from the Rogers Review (See Item 12)	
(5) Ongoing Traveller Issues	Work transferred to the Housing Standing Panel.	**Completed:** Paynes Lane Report and Actions now completed.	
(6) Planning Performance – monitoring of enforcement figures/outcomes		**Completed**	
(7) Anti Social Behaviour in Car Parks	High	New Item added to the work plan by the OSC on 4 October 2007.	

(8) Parking on Grass Verges/ Parking in Residential Area To monitor the recommendations of the 2005/06 Task and Finish Panel on Parking in Residential Areas and identify any follow action required.		West Area Highways Manager attended meeting on 29 October 2007.	
(9) Nottingham Declaration	Cabinet has now adopted this.	Further reports to be submitted to future Panel meetings. Action Plan to be submitted to Panel	
(10) ECC Speed Management Plan			
(11) Essex Freight Strategy			
(12) Local Better Regulation Office – Draft Strategy 2008 - 2011			

Report to Environmental & Planning Services Standing Panel

Date of meeting: 23 April 2008

Subject: "The Future of Waste in Essex"

Officer contact for further information: J Gilbert

Committee Secretary: Adrian Hendry

Recommendation:

To consider the Council's response to "The future of Waste in Essex" consultation and associated Strategic Environmental Assessment

Report:

Background

1. Essex County Council, with its District and Borough partners, is consulting the people of Essex on the revised draft Essex Joint Municipal Waste Management Strategy (JMWMS). The revised draft strategy reflects the changing circumstances over the last 5 years or so and also reflects the availability of new / revised technology and changes in national and European legislation.

2. In 2002 the County Council and Districts and Boroughs, with Southend-on-Sea, established the Waste Management Advisory Board (WMAB) which has examined many aspects of waste management within the County. The WMAB has always seen public and stakeholder involvement as key in developing a strategy, and all previous public consultation exercises, such as "War on Waste" have been considered in putting together the revised draft JMWMS.

3. This proposed strategy is crucial to the future management of waste within the County. It will determine the way forward in terms of procuring the infrastructure for waste collection and disposal for the next 25 years as well as meeting the statutory requirement for the County and Districts & Boroughs to adopt an agreed JMWMS to take forward the management of all the component elements of the waste stream.

Some key statistics

4. It is important to put the revised draft strategy into some context, so that the scale of the problem that has to be managed is clearly understood:

- in 2006/07 around 740,000 tonnes of municipal solid waste was produced in Essex
- on average each Essex resident produces around half a ton of waste per annum (500 kilos)
- in 2006/07 36% of this waste was recycled (via collection and/or at the Recycling Centres for Household Waste)
- around 68% of all waste produced is biodegradable i.e. can break down to produce greenhouse gases and leachate
- the EU landfill directive requires significant reductions in biodegradable waste going to landfill with a penalty (at present) of £150 per tonne where allowances are exceeded
- if the allowances for 2009/10 are exceeded Essex taxpayers could face a penalty of £9 million and if no change was to be made this would reach £24 million per annum by 2013
- each tonne of waste going to landfill currently costs £24 in landfill tax, increasing by £8

per tonne per annum. This could result in a total tax bill of £22 million by 2010/11 on top of the EU penalties

- the Waste Strategy for England 2007 has set challenging targets for the diversion of waste from landfill with new national targets for recycling and composting of 40% by 2010, 45% by 2015 and 50% by 2020
- the Waste Strategy for England has also set challenging targets for residual waste per person (i.e. that not reused, recycled or composted) of 225kg by 2020 this being a reduction of 50% from 2000 levels
- the County Council's waste disposal costs have increased from £36 per tonne in 2001/02 to £61 per tonne in 2006/07, reflecting the increased costs of landfill. The districts' and boroughs' costs range from £35 to £78 per household per annum depending upon performance and other local issues (2006/07 data).

Where are we now?

5. The responsibility for waste management lies jointly with the County Council as a waste disposal authority and the districts and boroughs as waste collection authorities. Southend-on-Sea as a unitary authority carries both responsibilities. Over the past 5 years or so diversion performance has steadily increased from 17% in 1999/2000 to 36% in 2006/07.

6. It is clear from previous consultations that Essex residents want to see a strategy that diverts as much waste as possible from landfill, but by the provision of high levels of recycling and composting and not through mass burn incineration (i.e. the burning of all waste). The increases in performance across the County demonstrates the wish of the County and the Districts & Boroughs to achieve that, and a considerable investment has been entered into by many districts, including Epping Forest DC, into new collection and recycling arrangements. In this District this has seen recycling increase from 22% in 2003/04 to around 42% now.

The current consultation

7. What are the key messages within the consultation?:

(1) reduce the overall waste stream and re-use more of it;
(2) to achieve 60% recycling by 2020;
(3) favouring composting technologies such as anaerobic digestion (AD) for source segregated organic wastes;
(4) using mechanical biological treatment (MBT) for waste which cannot be recycled; and
(5) the potential to use solid recovered fuel (SRF) to provide energy and heat

8. A key issue in this proposed strategy is that relating to the outputs from the MBT plant. There are two clear options available:

(i) send to landfill; or
(ii) produce SRF and use to create renewable energy source

The strategy suggests that the use of SRF should be explored since it provides energy which can be supplied back into the national grid and heat which could be used for other commercial purposes. This would have financial and climate change benefits, when compared to landfilling, and reduces even further reliance upon landfill.

9. For the strategy to be effective new waste management facilities will be required, such as MBT, AD, energy plants (for SRF) and materials handling. The numbers will vary dependant upon type, and details of this are set out in the County Council's "Reference Project" which forms part of its application to Government for PFI funding for the provision of the necessary waste management infrastructure. Final details of the reference case will come forward to the Council for consideration later this year.

10. As set out in the earlier part of the report, the costs of waste management are increasing significantly. This will happen no matter what action is taken, but it is clear that

doing nothing will cost more than implementing a revised strategy and will not deal with the environmental consequences of not diverting waste away from landfill. It is estimated that implementing the proposed new strategy will save Essex taxpayers some £750 million over the next 25 years compared with carrying on as we are.

11. The Panel's views are sought on the following key questions:

(1) does it agree with the basic underpinning policy of reuse, recycling and composting?;
(2) does it agree that 60% is a realistic target for recycling by 2020?;
(3) does it agree that AD and MBT are appropriate technologies for the handling of Essex waste?; and
(4) does it agree that the outputs from the MBT plant should be used to produce a fuel for renewable energy (SRF) rather than being sent for landfill?

12. The full strategy document (and supporting documents) can be found on the County Council's website on www.essex.gov.uk/wasteconsultation

Strategic Environmental Assessment (SEA)

13. The County is required by law to commission an SEA as part of this process, and whilst not strictly part of the consultation process, the Panel's attention is drawn to the SEA Environmental Report and the County would welcome any comments. The SEA is also available on the County website at the same address as the draft JMWMS (see para. 12 above)

14. The consultants, 'Eunomia Research & Consulting' found the draft strategy to be generally positive in environmental terms, but it did comment upon some potentially negative impacts such as:

- the reliance upon road transport to transport waste to plants, although this was placed in context of the affects upon the climate being 50 times lower by virtue of the removal of waste from landfill compared to its transportation
- waste plants may cause some local air quality issues but these can be managed through the consents required
- the reliance upon new technology and a move away from landfill does reduce flexibility in the event of plant related difficulties

15. The SEA process requires that the environmental effects of the strategy should be monitored such that unforeseen effects can be identified at an early stage and appropriate remedial actions taken. The SEA puts forward a monitoring plan and in so doing recognises the burdens placed on councils in gathering the data required. The monitoring arrangements are attached for the Panel's information and comment as appropriate.

How should Epping Forest District Council respond to the consultation?

16. This Council has over recent years increased its recycling performance considerably. The new contract with Sita provides opportunities to continue this progress, although it does get more difficult and more expensive as the recycling rate moves towards 50%.

17. Key elements of the proposed strategy align with what we are presently doing and our future intentions, such as:

- continued high recycling levels
- the collection of food waste
- increasing public education & information
- providing more recycling facilities in flats and other communal buildings

18. The proposed strategy has also to be seen alongside the procurement strategy, which is presently being considered in detail by the Area Joint Waste Committees. The

procurement process will have to be capable of delivering on the ground the final JMWMS and this Council will be required to make decisions on use of the facilities to be provided by the County Council. These decisions will have an impact on what the Council does for many years to come.

19. There is only one potentially controversial issue in the proposed strategy, and that relates to the issue of SRF. SRF, or solid recovered fuel, is a source of fuel for energy generation, but this could require a plant to be constructed somewhere in Essex. There will be inevitable concerns that this is incineration by another name, but this is a different technology, specifically designed to burn this type of fuel effectively and efficiently. The electricity produced can be fed back into the national grid and it receives a higher payment due to the biomass component of SRF being considered as renewable energy. The biomass component of SRF is typically in excess of 50%.

20. SRF is generated from the MBT process, and MBT relies upon all of the potentially recyclable materials having been removed from the process before the main MBT process commences. The MBT process itself has a number of possible waste separation techniques to again ensure the removal of potentially recyclable or reusable materials before actual treatment commences. It is estimated that an MBT plant can contribute an additional 5% of recycling performance on top of other traditional means of recycling. The biological treatment component of the process then reduces the remainder of the waste through one or more of drying, composting or anaerobic digestion. The outputs vary dependant upon the technologies used and can include compost like outputs (CLOs) and SRF. CLO can be problematical in that it cannot be used on agricultural land and therefore is only really useful for land reclamation etc. This limits its long term use and leads towards the preference of SRF which can be used for a variety of purposes including fuelling existing plants (such as cement kilns) or for purpose designed energy plants.

21. A failure to provide a market for MBT outputs would require it to be landfilled. Whilst this is far preferable to landfilling unprocessed waste, it still uses up limited landfill capacity and has a cost associated with it, albeit reduced due to the MBT process reducing the overall biomass of the waste.

22. The questions as set out earlier in the report are reproduced here to assist in members' deliberations:

(1) does it agree with the basic underpinning policy of reuse, recycling and composting?;
(2) does it agree that 60% is a realistic target for recycling by 2020?;
(3) does it agree that AD and MBT are appropriate technologies for the handling of Essex waste?; and
(4) does it agree that the outputs from the MBT plant should be used to produce a fuel for renewable energy (SRF) rather than being sent for landfill?

10.0 Monitoring

The SEA regulations make clear the requirement to monitor the implementation of the plan with the purpose of identifying unforeseen adverse effects at an early stage and being able to undertake appropriate remedial action.

Monitoring should be an important factor in the implementation of any plan, and should occur over the course of the strategy. In particular monitoring helps to answer the following questions:

- Is the JMWMS contributing to the sustainability of Essex in the way envisaged?
- Have there been any unforeseen impacts (positive or negative) that have arisen from the strategy? Do these impacts require remediation?

It is therefore important that the correct monitoring framework is put in place for this JMWMS. However, such a framework should ensure that while the above questions can be answered, the requirements of the framework are not over-onerous on the councils involved, since it will be the responsibility of Essex County Council to gather all of the required information and to implement any remedial action should any negative impacts be identified.

It will also be essential for ECC to maintain the monitoring framework and baseline information as appropriate. The monitoring proposals below are intended to be flexible over the course of the strategy, taking into account that technical and scientific advances may mean that alternative measures for monitoring become more appropriate or accurate for the purpose and possible more cost effective. Table 21 sets out the proposed monitoring framework for the JMWMS.

Table 21: Proposed Monitoring Framework

	Objective	Indicator / Information Required	Frequency	Data Source(s)	Suggested Trigger for Remedial Action
Env1	Reduce requirement for mineral and primary material extraction globally.	Aggregate recycling and composting performance of Partnership authorities Amount of energy generated / recovered (and form of energy generated / recovered) Total waste generated	Annually	WCAs, WDA, contractors Published sources for materials recycled and energy generated	Less than 3% improvement in any one year
Env2	Minimise global bio-diversity & geological impacts.	As Env1	As Env1	As Env1	As Env1
Env3	Reduce reliance on road transportation of waste.	Road miles travelled by vehicle fleet Proportion of total distance travelled undertaken by road	Annually	WCAs, WDA, contractors	Greater than 10% increase in any given year Greater than 40% increase over baseline (It is expected that this will increase. The aim should be to ensure this increase is constrained).
Env4	Minimise net energy balance requirements.	Energy use and outputs	Annually	Site audits and operator information Published sources for materials recycled	Less than 3% improvement in any one year
Env5	Minimise local air pollution as a result of	Air pollutant emissions of SOx, NOx, VOCs,	Annual	Operators / Environment Agency	Increases in emissions in Essex to levels above

	Objective	Indicator / Information Required	Frequency	Data Source(s)	Suggested Trigger for Remedial Action
	waste management activities.	dioxins, Cd, Cr, Pb particulates.		Clean Air for Europe / Methodex database	£2 per tonne equivalent (all waste) or £4 per tonne for any specific facility
Env6	Minimise greenhouse gas (GHG) emissions arising from waste management activities.	Greenhouse gas emissions from waste management activities in the County Fuel used by waste management vehicles Quantity of waste sent for recycling, and end use of materials recycled Quantity of waste sent for different treatments	Annually	WCAs / contractors & WDA Published sources for emissions from individual activities and offsets associated with recycling, energy generation, application of organic matter to soil	Improvement of less than 3% in any given year
Env7	Minimise impact on cultural heritage with particular reference to historically and architecturally significant buildings, landscapes and archaeology.	Emissions of acidifying air pollutants (see also Env12)	Annually	Operators / Environment Agency Clean Air for Europe / Methodex database CMLCA impact assessment weightings for acidification	Per tonne increases, in any given year, from a given facility
Env8	Reduce contamination of soil.	Amount of biologically treated material applied to land and concentration of potentially toxic elements Amount of material	Annually	WCAs / contractors & WDA	Unclear

	Objective	Indicator / Information Required	Frequency	Data Source(s)	Suggested Trigger for Remedial Action
		landfilled			
Env9	Improve organic matter content of soil	Amount of biologically treated material applied to land Stability / maturity of material applied	Annually	WCAs / contractors & WDA Humus reproduction rates for materials of differing stability / maturity	Decline in total C applied to soils in any given year
Env10	Manage waste in accordance with the hierarchy.	As Env 1 Quantity of waste landfilled	Annually	Waste Data Flow (WCAs / WDAs)	Significant shortfall on targets: 40% household waste recycled by 2010 45% household waste recycled by 2015 60% household waste recycled by 2020
Env11	Manage waste at the nearest appropriate facility.	Distance to facilities used relative to facilities available	Annual review / update Contract review dates	WCAs / WDAs / contractors Environment Agency Waste planning Authority (ECC)	Where it becomes clear that distances travelled are excessive relative to what is necessary
Env12	Minimise landscape impacts.	Number of facilities in the area Total area occupied Total height of buildings	Annual review / update	WCAs / WDAs / contractors/WPA	Unclear
Env13	Minimise net water use as a result of waste management activities.	Water consumption by facilities in use	Annually	WCAs / WDAs / contractors Benchmark	Total water consumption increases by more than 50%

	Objective	Indicator / Information Required	Frequency	Data Source(s)	Suggested Trigger for Remedial Action
				performance for facilities	above baseline Water consumption above benchmarked norms at any given facility
Env14	Reduce the incidence of fly-tipping.	Reported incidents of fly-tipping	Annually	Fly Capture WCA / WDA information	Successive year on year increases
Soc1	Provide equitable and convenient distribution of waste services and publicly accessed facilities.	Number of households covered by collection services of differing scope Density of RHWCs (number per 10,000 hhlds) Density of bring banks (no of households per site)	Annually	WCAs/WDA / ONS	Where differences of scope and coverage widen (subjective) Where density is in decline for more than 3 consecutive years Where density is in decline for more than 3 consecutive years
Soc2	Involve all sections of the community in waste decision making and local action by promoting waste awareness.	Number of strategic decisions regarding waste management which are taken without community involvement	Annually	WCAs / WDA	Where non-emergency strategic decisions have not involved communities
Soc3	Promote positive and permanent behavioural change among target groups to encourage sustainable waste management.	Number of initiatives designed to promote behavioural change Financial support for initiatives	Annually	WCAs / WDA	Decline in number of initiatives Real terms decline in funding

	Objective	Indicator / Information Required	Frequency	Data Source(s)	Suggested Trigger for Remedial Action
Soc4	Minimise nuisance impacts.	Number of breaches of waste management licence conditions at facilities handling MSW Number of incidents reported to officers	Annually	Environment Agency	Repeated breaches at any facility Successive year-on-year increases
Soc5	Protect the health of local residents and populations beyond the boundaries of the County.	See Env 5 above	See Env 5 above	See Env 5 above	See Env 5 above
Soc6	Provide flexibility in waste management solutions so to protect waste management choice for future generations.	Proportion of waste for which minimum tonnages are contracted to enter a given facility, and duration of such agreement	Annually	WCAs / WDA	Where more than 40% of waste is affected by such agreements
Econ1	Minimise cost of waste management.	Cost of waste management per household	Annually	Consolidated waste management budget for the partnership authorities, including outlays on / revenue from landfill allowance purchases / sales, and including contributions from PFI Credits	Increases by more than 3% above RPI
Econ2	Maximise job-creation and development of skills.	Local employment as a consequence of waste management activities	Biannually	Information from WCAs / WDAs and contractors / reprocessors	Any decline in total waste management-related jobs

	Objective	Indicator / Information Required	Frequency	Data Source(s)	Suggested Trigger for Remedial Action
Econ3	Develop joint working / partnerships between different regions and with the private sector to promote best practice and economic efficiency.	Cashable efficiency savings associated with partnership working	Annually	WCAs / WDAs	Standstill relative to baseline Subsequently, any three year period with no additional savings

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Mechanical Biological Treatment of Municipal Solid Waste

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Contents

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Preamble

This Waste Management Technology Brief, updated in 2007, is one of a series of documents prepared under the New Technologies work stream of the Defra Waste Implementation Programme. The Briefs address technologies that may have an increasing role in diverting Municipal Solid Waste (MSW) from landfill. They provide an alternative technical option as part of an integrated waste strategy, having the potential to recover materials & energy and reduce the quantity of MSW requiring final disposal to landfill. Other titles in this series include: An Introductory Guide to Waste Management Options, Advanced Biological Treatment, Mechanical Heat Treatment, Advanced Thermal Treatment, Incineration, Renewable Energy and Waste Technologies, and Managing Outputs from Waste Technologies.

The prime audience for these Briefs are local authorities, in particular waste management officers, members and other key decision makers for MSW management in England. It should be noted that these documents are intended as guides to each generic technology area. Further information can be found at the Waste Technology Data Centre, funded by the Defra New Technologies Programme and delivered by the Environment Agency (www.environment-agency.gov.uk/wtd). These Briefs deal primarily with the treatment and processing of residual MSW. Information on the collection and markets for source segregated materials is available from Defra and from ROTATE (Recycling and Organics Technical Advisory Team) at the Waste & Resources Action Programme (WRAP).

These waste technologies can assist in the delivery of the Government's key objectives, as outlined in *The Waste Strategy for England 2007,* for meeting and exceeding the Landfill Directive diversion targets, and increasing recycling of resources and recovery of energy

The Defra New Technologies Demonstrator Programme has provided nine projects aimed at proving the economic, social and environmental viability (or not) of a selection of waste management technologies. For information on the demonstrator projects see the Defra website or email Wastetech@enviros.com.

1. Introduction

Municipal Solid Waste (MSW) is waste collected by or on behalf of a local authority. It comprises mostly household waste and it may include some commercial and industrial wastes. Historically, the quantity of MSW has risen year on year[1], presenting a growing problem for local authorities particularly as legislation that limits (by implication[2]) the amount of mixed MSW that can be sent to landfill, becomes more stringent over time.

One of the guiding principles for European and UK waste management has been the concept of a hierarchy of waste management options, where the most desirable option is not to produce the waste in the first place (waste prevention) and the least desirable option is to dispose of the waste to landfill with no recovery of either materials and/or energy. Between these two extremes there are a wide variety of waste treatment options that may be used as part of a waste management strategy to recover materials (for example furniture reuse, glass recycling or organic waste composting) or generate energy from the wastes (for example through incineration, or digesting biodegradable wastes to produce usable gases).

At present more than 62% of all MSW generated in England is disposed of in landfills[3]. However, European and UK legislation has been put in place to limit the amount of biodegradable municipal waste (BMW) sent for disposal in landfills[4]. The Landfill Directive also requires waste to be pre-treated prior to disposal. The diversion of this material is one of the most significant challenges facing the management of MSW in the UK.

There are a wide variety of alternative waste management options and strategies available for dealing with MSW to limit the residual amount left for disposal to landfill. The aim of this guide is to provide impartial information about the range of technologies referred to as Mechanical Biological Treatment (MBT). MBT technologies are pre-treatment technologies which contribute to the diversion of MSW from landfill when

1 This is now showing signs of slowing down and in some areas waste arisings are falling, and indeed in 2005/6 there was a 3% fall nationally. However, this may be partly explained by other factors occurring in that particular financial year.
2 Targets pertain to the biodegradable fraction in MSW
3 Results from WasteDataFlow http://www.defra.gov.uk/environment/statistics/wastats/bulletin.htm
4 The Landfill Directive, Waste and Emissions Trading Act 2003 and Landfill Allowances Trading Scheme Regulations

1. Introduction

operated as part of a wider integrated approach involving additional treatment stages. They are part of a range of alternatives currently being assessed and investigated through the New Technologies work stream of Defra. Further details about the new technologies featured in this report are available from Defra's Waste Technology Data Centre:

http://www.environment-agency.gov.uk/wtd

The technologies described in this Brief have a varying track record in the UK. Early examples of similar processes in the UK included 'Refuse Derived Fuel' (RDF) processing plant and residual waste Materials Recovery Facilities ('Dirty MRFs'). This early generation of mixed waste processing facilities often encountered technical and marketing difficulties during operation and most have closed or been reconfigured. The new MBT technologies are now second or third generation plant including many well proven examples. On the continent many of these processes are established, viable and bankable. The aim of this document is to raise awareness and help bring the UK up to that standard.

This guide is designed to be read in conjunction with the other Waste Management Technology Briefs in this series and with the case studies provided on the Waste Technology Data Centre. Other relevant sources of information are identified throughout the document.

2. How it works

MBT is a generic term for an integration of several processes commonly found in other waste management technologies such as Materials Recovery Facilities (MRFs), sorting and composting or anaerobic digestion plant. MBT plant can incorporate a number of different processes in a variety of combinations. Additionally, MBT plant can be built for a range of purposes. This section provides an overview of the range of techniques employed by MBT processes.

2.1 The Aim of MBT Processes

MBT is a residual waste treatment process that involves both mechanical and biological treatment processes. The first MBT plants were developed with the aim of reducing the environmental impact of landfilling residual waste. MBT therefore compliments, but does not replace, other waste management technologies such as recycling and composting as part of an integrated waste management system.

A key advantage of MBT is that it can be configured to achieve several different aims. In line with the EU Landfill Directive and national recycling targets, some typical aims of MBT plants include the:

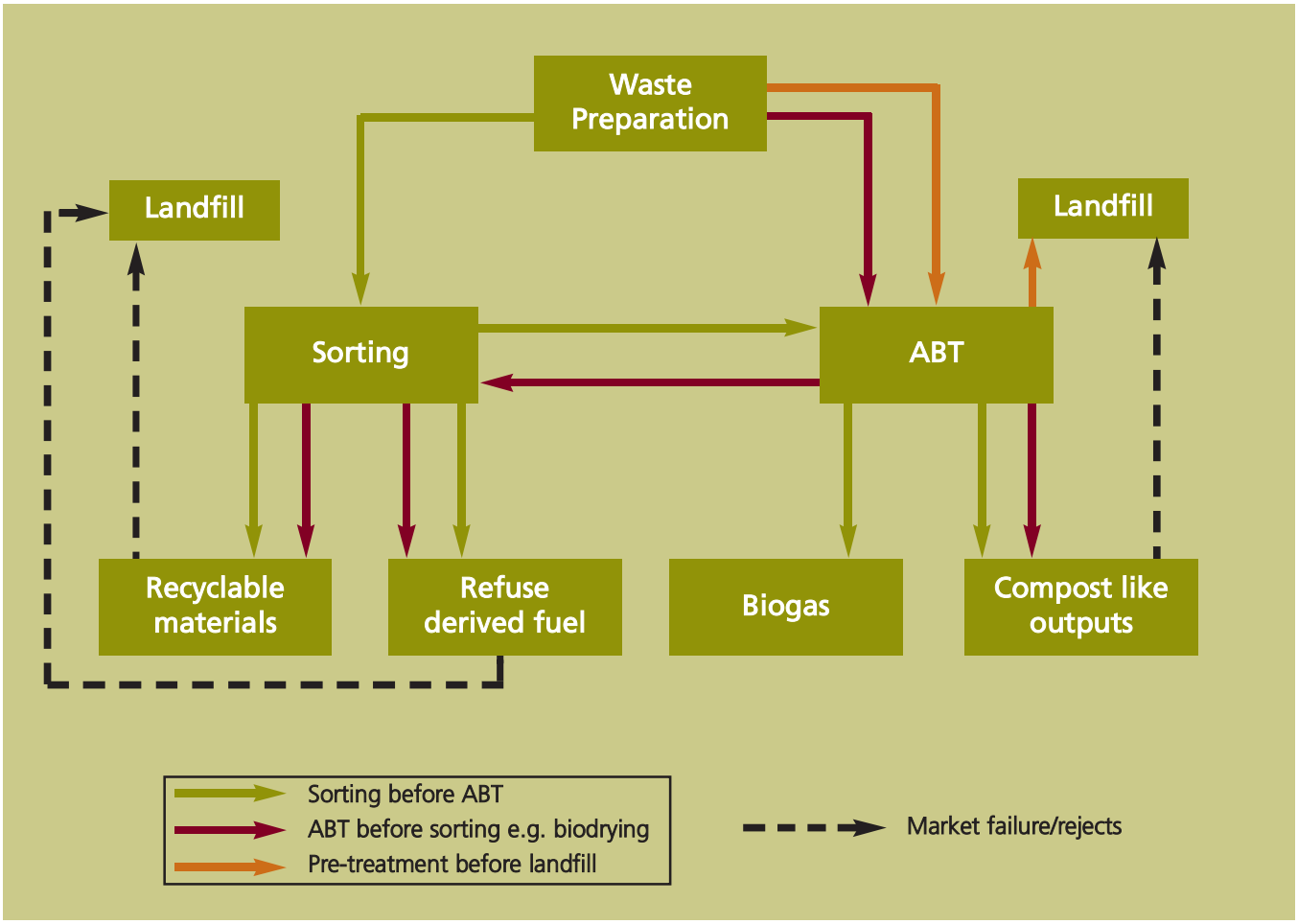
- Pre-treatment of waste going to landfill;
- Diversion of non-biodegradable and biodegradable MSW going to landfill through the mechanical sorting of MSW into materials for recycling and/or energy recovery as refuse derived fuel (RDF);
- Diversion of biodegradable MSW going to landfill by:
  - Reducing the dry mass of BMW prior to landfill;
  - Reducing the biodegradability of BMW prior to landfill;
- Stabilisation into a compost-like output (CLO)[5] for use on land;
- Conversion into a combustible biogas for energy recovery; and/or
- Drying materials to produce a high calorific organic rich fraction for use as RDF.

MBT plants may be configured in a variety of ways to achieve the required recycling, recovery and biodegradable municipal waste (BMW) diversion performance. Figure 1 illustrates configurations for MBT and highlights the components within each. ABT is an acronym for an Advanced Biological Treatment process, which are covered in a separate Technology Brief in this series and further information is available on the Waste Technology Data Centre concerning different configurations of plant.

[5] Compost-like Output (CLO) is also sometimes referred to as 'stabilised biowaste' or a soil conditioner; it is not the same as a source-segregated waste derived 'compost' or 'soil improver' that will contain much less contamination and has a wider range of end uses

2. How it works

Figure 1: An illustration of the potential Mechanical Biological Treatment options



2.2 Waste Preparation

Residual waste requires preparation before biological treatment or sorting of materials can be achieved. Initial waste preparation may take the form of simple removal of contrary objects, such as mattresses, carpets or other bulky wastes, which could cause problems with processing equipment down-stream.

Further mechanical waste preparation techniques may be used which aim to prepare the materials for subsequent separation stages. The objective of these techniques may be to split open refuse bags, thereby liberating the materials inside; or to shred and homogenise the waste into smaller particle sizes suitable for a variety of separation processes, or subsequent biological treatment depending on the MBT process employed.

A summary of the different techniques used for waste preparation is provided in Table 1.

2. How it works

Table 1: Waste Preparation Techniques

Ref	Technique	Principle	Key Concerns
A	Hammer Mill	Material significantly reduced in size by swinging steel hammers	Wear on Hammers, pulverising and 'loss' of glass / aggregates, exclusion of pressurised containers
B	Shredder	Rotating knives or hooks rotate at a slow speed with high torque. The shearing action tears or cuts most materials	Large, strong objects can physically damage, exclusion of pressurised containers
C	Rotating Drum	Material is lifted up the sides of a rotating drum and then dropped back into the centre. Uses gravity to tumble, mix, and homogenize the wastes. Dense, abrasive items such as glass or metal will help break down the softer materials, resulting in considerable size reduction of paper and other biodegradable materials	Gentle action – high moisture of feedstock can be a problem
D	Ball Mill	Rotating drum using heavy balls to break up or pulverise the waste	Wear on balls, pulverising and 'loss' of glass / aggregates
E	Wet Rotating Drum with Knives	Waste is wetted, forming heavy lumps which break against the knives when tumbled in the drum	Relatively low size reduction. Potential for damage from large contraries
F	Bag Splitter	A more gentle shredder used to split plastic bags whilst leaving the majority of the waste intact	Not size reduction, may be damaged by large strong objects

2.3 Waste Separation

A common aspect of many MBT plant used for MSW management in the sorting of mixed waste into different fractions using mechanical means. As shown in Figure 1, the sorting of material may be achieved before or after biological treatment. No sorting is required if the objective of the MBT process is to pre-treat all the residual MSW to produce a stabilised output for disposal to landfill.

Sorting the waste allows an MBT process to separate different materials which are suitable for different end uses. Potential end uses include material recycling, biological treatment, energy recovery through the production of RDF, and landfill. A variety of different techniques can be employed, and most MBT facilities use a series of several different techniques in combination to achieve specific end use requirements for different materials.

Separation technologies exploit varying properties of the different materials in the waste. These properties include the size and shape of different objects, their density, weight, magnetism, and electrical conductivity. A summary of the different options for waste separation is shown in Table 2.

2. How it works

Table 2: Waste Separation Techniques

	Separation Technique	Separation Property	Materials targeted	Key Concerns
1	Trommels and Screens	Size	Oversize – paper, plastic Small – organics, glass, fines	Air containment and cleaning
2	Manual Separation	Visual examination	Plastics, contaminants, oversize	Ethics of role, Health & Safety issues
3	Magnetic Separation	Magnetic Properties	Ferrous metals	Proven technique
4	Eddy Current Separation	Electrical Conductivity	Non ferrous metals	Proven technique
5	Wet Separation Technology	Differential Densities	Floats - Plastics, organics Sinks - stones, glass	Produces wet waste streams
6	Air Classification	Weight	Light – plastics, paper Heavy – stones, glass	Air cleaning
7	Ballistic Separation	Density and Elasticity	Light – plastics, paper Heavy – stones, glass	Rates of throughput
8	Optical Separation	Diffraction	Specific plastic polymers	Rates of throughput

Figure 2: Waste separation using a trommel screen

2. How it works

2.4 Biological Treatment

The biological element of an MBT process can take place prior to or after mechanical sorting of the waste, as illustrated in Figure 1. In some processes all the residual MSW is biologically treated to produce a stabilised output for disposal to landfill and no sorting is required. The biological processes used are either:

- Aerobic Bio-drying
- Aerobic In-vessel composting
- Anaerobic digestion

Each approach has its own particular application and examples of methodologies are described in the case studies in the track record section and in more detail on the Waste Technology Data Centre.

There are a variety of different biological treatment techniques which are used in MBT plant. These are described in greater detail in the Advanced Biological Treatment Brief, in this series. Table 3 below outlines the key categories of biological treatment.

Table 3: Biological Treatment options

Options	Biological Treatment
I	Aerobic - Bio-drying / Biostabilisation: partial composting of the (usually) whole waste
II	Aerobic - In-Vessel Composting: may be used to either biostabilise the waste or process a segregated organic rich fraction
III	Anaerobic Digestion: used to process an segregated organic rich fraction

2.5 Summary

This section illustrates that MBT systems can be described as two simple concepts: either to separate the waste and then treat; or to treat the waste and then separate. In some systems only biological treatment is required to treat all the residual MSW before disposal to landfill. Whilst a variety of treatment and mechanical separation options are offered, these need to be optimised in terms of the outputs in order to find outlets for the various materials / fuels derived from the process (see Markets for the Outputs section).

3. Markets and outlets for the outputs

In the UK, at present, the market or outlet for many of the outputs from MBT is still under development. Plants being specified today will need to provide materials into as yet undeveloped markets. It is prudent to install or at least maintain the option of installing for flexibility in the degree and types of separation of materials that any proposed plant can achieve.

The following section summarises some key issues with regard to the outlets for outputs from MBT systems for MSW.

3.1 Materials Recycling

Recyclables derived from the various MBT processes are typically of a lower quality than those derived from a separate household recyclate collection system and therefore have a lower potential for high value markets. The types of materials recovered from MBT processes almost always include metals (ferrous and non-ferrous) and for many systems this is the only recyclate extracted. However these plant can help enhance overall recycling levels and enable recovery of certain constituent items that may not otherwise be collected in household systems (e.g. batteries, steel coat hangers, etc.).

Other materials which may be extracted from MBT processes include glass, textiles, paper / card, and plastics. The most common of these is glass, which may be segregated with other inert materials such as stones and ceramics. These materials are typically segregated and arise as the "dense" fraction from air classifiers or ballistic separation (see Table 2 on mechanical waste preparation technologies). This dense fraction could find application for use as a low grade aggregate; however this would be subject to achieving a suitable quality material. This mixed material from some processes has found application as Alternative Daily Cover (ADC) at landfill sites, though this would not count towards recycling performance or diversion from landfill.

Segregating glass for recycling from residual waste or a mixed waste arising from an MBT plant would require material-specific sorting techniques if recycling into high-value products is to be achieved. Examples of this approach can be found both in MBT plant as well as more traditional "dirty MRF" processes treating mixed residual waste in other countries. In these examples manual sorting of glass has been applied to segregate the material. However, labour costs in the UK are considered to be high, and are likely to preclude this approach as being uneconomic. There are also significant issues with respect to worker Health and Safety, and the handling of broken glass objects from mixed waste streams.

Textiles, paper and plastics, if extracted, are unlikely to receive an income as a recyclate and in some instances may not yield a positive value. Most of these plant can experience problems with the heavier textiles such as carpets. Clearly none are likely to separate textiles into different types of fibre.

3. Markets and outlets for the outputs

Although unlikely, paper can potentially be separated for recycling but often it is combined with textiles and plastics; recycling markets or outlets for the material are very limited. Manual sorting or more sophisticated mechanical sorting can be undertaken on this waste stream. The quality of the paper will be lower than if source segregated and the markets available will be fewer and of lower value. With the improving performance of kerbside recycling schemes there has been an increase in the quantity of paper separately collected for recycling. This paper will be able to secure a market, either in the UK or overseas, more easily than paper separated in an MBT facility. Consequently, few MBT processes attempt to segregate paper for recycling, preferring instead to utilise it as a high calorific value Refuse Derived Fuel (RDF), which is easily achieved using conventional mechanical sorting techniques.

Any plastics separated from these processes will almost always be mixed plastics. The use of high-tech optical sorting technology, such as Near Infra-Red (NIR), offers the potential to recover high value material-specific waste streams, such as segregated plastic by polymer type. Application of such techniques is currently rare in MBT processes, and its effectiveness is yet to be fully proven in residual waste applications. The capital costs associated with installing such technologies are high, and cost/benefits of adopting them would be significantly influenced by the effectiveness of any recycling achieved upstream through kerbside collection systems serving to limit the quantity of recyclable materials present in residual waste.

For more information on the contribution of MBT to Best Value Performance Indicators and recycling see section 9, and for the latest developments see the local authority performance pages on the Defra website http://www.defra.gov.uk/environment/waste/localauth/perform-manage/index.htm and http://www.wastedataflow.org/Documents/BVPI%20FAQs.pdf

3.2 Use of compost-like outputs (CLO)

MBT processing of mechanically separated organics can produce partially/fully stabilised and sanitised CLO or partially stabilised digestate material. Digestate material is produced from an MBT process that uses anaerobic digestion as the biological process. CLO is usually the term used for an output using an aerobic process such as bio-drying or in-vessel composting. The potential applications of these outputs are dependent upon their quality and legislative and market conditions. CLO and digestate has the potential to be used as a source of organic matter to improve certain low quality soils, e.g. in the restoration of brown field sites, or for landfill cap restoration.

A summary of the estimated size of the potential market outlets for CLO is given in table 4.

3. Markets and outlets for the outputs

Table 4: Market outlets for CLO

Material	Application	Potential market in Tonnes per year	Source
Soil Conditioner / Organic based output from MBT	Land Restoration / Remediation	1,300,000 – 11,900,000 NB: a variety of scenarios considered to constitute this range	Sita Trust 2005[6]
Soil Conditioner / Organic based output from MBT	Land Restoration / Remediation	>6,000,000	WRAP 2002[7]
Soil Conditioner / Organic based output from MBT	Landfill Cap / Restoration	1,200,000 – 4,600,000 NB: a variety of scenarios considered to constitute this range	Sita Trust 2005
Soil Conditioner / Organic based output from MBT	Landfill Cap / Restoration	>5,000,000	WRAP 2002

It is generally assumed that CLO derived from mixed waste will be of lower quality and value compared to compost derived from source-segregated materials, largely due to higher contamination levels. Trials on mixed waste derived materials have reported[8] large amounts of physical contaminants (e.g. glass) and levels of potentially toxic elements above limits for the British Standards Institute (BSI) Publicly Available Specification (PAS) 100: for composted materials, in particular for zinc, lead, cadmium and mercury. Table 5 shows the limits for heavy metals and other criteria for PAS 100 compost.

Table 5: BSI PAS 100 criteria*

Parameter	BSI PAS 100 limit
Cadmium, ppm	1.5
Chromium, ppm	100
Copper, ppm	200
Mercury, ppm	1
Nickel, ppm	50
Lead, ppm	200
Zinc, ppm	400
Impurities >2mm	0.5%; of which 0.25% maximum can be plastic
Gravel & stones	>4mm <8% in grades other than coarse mulch; >4mm in coarse mulch grade <16%
Pathogens	E.coli 1000 cfu/g; No Salmonella in 25g
Microbial respiration rate	16 mg CO_2/g organic matter/day

** BSI PAS 100 is only valid for composts derived from source segregated waste, by definition*

6 MBT: A Guide for Decision Makers- Processes, Policies and Markets, Juniper Consultancy 2003 (produced for SITA Trust

7 Research Analysis for the Market Potential for Lower Grade Composted Materials in the UK, WRc, 2002 (for WRAP)

8 Development of a dynamic housed windrow composting system: performance testing and review of potential use of end products, ORA (March 2005) for Canford Environmental

3. Markets and outlets for the outputs

The quality of CLO produced will vary with different MBT technologies, the quality of raw waste inputs, and the method and intensity of waste preparation and separation prior to biological treatment, as well as the methods used to screen of the outputs.

Due to its low quality, opportunities to apply CLO or digestate produced from mixed MSW to land will be limited. As a waste, these materials require a waste management licence (WML) exemption in order to be used on land. Currently, they can only be used on non-agricultural land and must be shown to be ecologically beneficial. A risk-based assessment is needed in relation to their contamination content, and the nature of the land to which they are to be applied. This is similar approach to regulations covering the use of sewage sludge in agriculture. CLO or digestate that is used on land must also meet the requirements of the Animal By-Products Regulations (ABPR).

If an outlet cannot be found for the CLO then it may have to be disposed to landfill. This will incur a disposal cost and any biodegradability remaining will contribute to local authority BMW landfill allowances under LATS (the Landfill Allowance Trading Scheme). For more information on LATS see http://www.defra.gov.uk/environment/waste/localauth/lats/index.htm.

Waste Management Licensing Regulations

Changes to the Waste Management Licensing Regulations came into force on 1st July 2005[9]. A waste management licence (WML) exemption, under Paragraph 7A of the regulations, is required by land owners/managers before any compost or digestate (fibre or effluent) derived from source-segregated waste materials can be applied to agricultural land[10]. CLO, derived from mixed waste, is not allowed to be applied to agricultural land. These outputs may be applied to brownfield and restoration land under a WML exemption, under Paragraph 9A, provided that ecological benefit is demonstrated.

The Government and the National Assembly for Wales consulted in May 2006 on the requirement for compost or digestate derived from source-segregated materials for it to be permitted to be spread to agricultural land, under a Paragraph 7A WML Exemption. In the light of consultation, the Government has concluded that, for now, the source-segregation requirement should remain. However, the Government views this as an interim measure, and will carry out work to find a longer term, more sustainable solution that will encourage the development of [mixed MSW ABT] technologies that will produce high standard outputs which could be safely spread to land.

Animal By-Products Regulations (ABPR)

MBT plants that intend to use the stabilised organic material on land (including landfill cover) will be considered to be a composting or biogas plant, and will fall within the scope of the ABPR. These sites must therefore meet all treatment and hygiene standards required by source-segregated waste composting/ biogas plants.

Mixed MSW will contain household kitchen ('catering') waste including meat, and as such will, at least, fall under UK national ABPR[11] standards for catering waste containing meat.

[9] The Waste Management Licensing (England and Wales) (Amendment and Related Provisions) (No. 3) Regulations 2005 (S.I. No. 1728)

[10] Unless the Quality Protocol for Compost applies for source segregated biowaste - The Quality Protocol for the production and use of quality compost from source-segregated biowaste, developed by the Business Resource Efficiency and Waste (BREW) programme, WRAP and the Environment Agency, published March 2007

[11] Animal By-products Regulations 2003 (SI 2003/1482); Wales (SI 2003/2756 W.267); Scotland (SSI 2003/411)

3. Markets and outlets for the outputs

In some cases it may also contain certain commercial/industrial waste containing raw meat or fish; classified as 'Category 3' animal by-products. Category 3 animal by-products must be treated in accordance with the EU regulation[12] standards.

3.3 Production of biogas

An MBT plant that uses anaerobic digestion (AD) as its biological process will produce biogas. During AD, the biodegradable material is converted into methane (CH_4) and carbon dioxide (together known as biogas), and water, through microbial fermentation in the absence of oxygen leaving a partially stabilised wet organic mixture known as a digestate.

The biogas can be used in a number of ways. It can be used as a natural gas substitute (distributed into the natural gas supply) or converted into fuel for use in vehicles. More commonly it is used to fuel boilers to produce heat (hot water and steam), or to fuel generators in combined heat and power (CHP) applications to generate electricity, as well as heat.

Biogas electricity production per tonne of waste can range from 75 to 225 kWh, varying according to the feedstock composition, biogas production rates and electrical generation equipment. Biogas is a source of renewable energy, with electricity generated from it being supporter by the Renewables Obligation.

In most simple energy production applications, only a little biogas pre-treatment is required. Biogas used in a boiler requires minimal treatment and compression, as boilers are much less sensitive to hydrogen sulfide and moisture levels, and can operate at a much lower input gas pressure.

Where biogas is used for onsite electricity generation, a generator similar to that used in landfill gas applications can be used, as these generators are designed to combust moist gas containing some hydrogen sulfide. Gas compression equipment may be required to boost the gas pressure to the level required by the generator.

Some electricity is used by the AD plant, but any excess electricity produced can be sold and exported via the local electricity distribution network. Excess heat can also be used locally in a district heating scheme, if there is an available user.

For high specification applications (e.g. vehicle fuel, natural gas substitute), or when using more sophisticated electricity generation equipment (e.g. turbines), biogas will require more pre-treatment to upgrade its quality. This includes the removal of hydrogen sulphide (a corrosive gas); moisture removal; pressurization to boost gas pressure; and removing carbon dioxide to increase the calorific value of the biogas. However, the cost of the equipment required to upgrade biogas can be prohibitive.

3.4 Materials Recovered for Energy

Where the MSW is sorted / treated to produce a high calorific value waste stream comprising significant proportions of the available combustible materials such as mixed paper, plastics and card, this stream may be known as Refuse Derived Fuel (RDF - see Box 1)

[12] Regulation EC 1774/2002 laying down health rules concerning animal by-products not intended for human consumption

3. Markets and outlets for the outputs

Box 1: Fuel from mixed waste processing operations

The current prevalent term used for a fuel produced from combustible waste is Refuse Derived Fuel (RDF). The types of technologies used to prepare or segregate a fuel fraction from MSW include the MBT processes described within this Brief.

A CEN Technical Committee (TC 343) is currently progressing standardisation work on fuels prepared from wastes, classifying a Solid Recovered Fuel (SRF). Preliminary standards have been published in June 2006, and are following an evaluation process, during which the functioning of the specifications will be verified. The technical specifications classify the SRF by thermal value, chlorine content and mercury content. For example, the thermal value class will be based on the number of megajoules one kilogram of recovered fuel contains. In addition, there are many characteristics for which no specific values have been determined. Instead, they can be agreed upon between the producer and the purchaser of SRF.

Along with the standardisation process, a validation project called QUOVADIS (http://quovadis.cesi.it/) on solid recovered fuels is currently being implemented.

It is anticipated that once standards are developed and become accepted by users, then SRF will become the terminology used by the waste management industry. Other terminology has also been introduced to the industry as various fuel compositions may be prepared from waste by different processes. Examples include 'Biodegradable Fuel Product' (BFP) and 'Refined Renewable Biomass Fuel' (RRBF).

European standards for SRF are important for the facilitation of trans-boundary shipments and access to permits for the use of recovered fuels. There may also be cost savings for co-incineration plants as a result of reduced measurements (e.g. for heavy metals) of incoming fuels. Standards will aid the rationalisation of design criteria for combustion units, and consequently cost savings for equipment manufacturers. Importantly standards will guarantee the quality of fuel for energy producers.

Within this Brief, Refuse Derived Fuel will be used as a term to cover the various fuel products processed from MSW.

Potential outlets for RDF

Defra has identified 6 potential outlets for RDF. The viability of some of these is dependent on legislative changes being made, which may or may not happen. The 6 potential outlets are:

1. Industrial intensive users for power, heat or both (Combined Heat and Power - CHP)
2. Cement kilns
3. Purpose built incinerators with power output or power and heat (CHP)
4. Co-firing with coal at power stations
5. Co-firing with fuels like poultry litter and biomass which are eligible for Renewable Obligation Certificates (ROCs – see section 3.3.2) in conventional technologies
6. Advanced thermal technologies, such as pyrolysis and gasification which are ROC eligible technology

RDF from a UK MBT facility is already utilised at a cement works as an energy source, replacing other fuels. Industrial intensive energy users are not yet using RDF but some interest from industry is being shown in the market place.

3. Markets and outlets for the outputs

There is currently only one dedicated conventional combustion plant (incinerator) in the UK that uses RDF as a fuel to generate electricity. Another facility which accepts prepared fuel, (generated from raw MSW delivered at the front end of the plant) which could be termed crude RDF is also combusted in a recently commissioned Fluidised-Bed incinerator in Kent, illustrated in Table 6.

Table 6: Combustion technology plant generating electricity from RDF in England

RDF Combustion plant	Operator	K tonnes/ year
Slough, Berkshire	Slough Heat & Power	100
Allington, Kent	Kent Enviropower	500

RDF may also be utilised within some appropriate Advanced Thermal Treatment (ATT) processes. A suitably scaled, dedicated ATT plant could represent a part of an integrated strategy in combination with MBT. A separate Waste Management Technology Brief, in this series, is available on the subject of ATT processes.

The energy use incurred in the separation of waste typically involves around 15 – 20% of the energy value of the waste. If the RDF is to be used as an energy source then a high efficiency process (e.g. Advanced Thermal Treatment or Incineration with Combined Heat and Power) needs to be used, or the RDF needs to be used as a fossil-fuel replacement fuel to establish any environmental benefit over directly combusting the residual waste in an incinerator. Not all ATT processes will offer the efficiencies appropriate.

The advantage of co-combusting RDF at power stations or other large thermal processes is that the infrastructure may already be in place; a disadvantage is that the outlet for the fuel is subject to obtaining a contract of sufficient duration and tonnage, with a commercial partner. An estimate of the potential market for RDF in the UK is provided in the table 7 below.

Table 7: Estimated size of the RDF market

Output	Outlet	Predicted Market size (t/a)	Source
RDF	UK Cement Kilns	350,000	Resource Recovery Forum, 2004[13]
Packaging & Packaging waste (incl. municipal derived RDF)	UK Cement Kilns	500,000	British Cement Association, 2003[14]
RDF	Paper Industry	300,000 – 600,000 NB: Required construction of dedicated RDF plant at paper mills	Resource Recovery Forum, 2004

The co-combustion of RDF is an emerging market. It is currently anticipated that cement kilns along with large industrial energy users and the power generation sector will provide the majority of potential capacity for using RDF. There is however, competition from other wastes to be processed within the cement production process including tyres, some hazardous wastes, secondary liquid fuels etc. Consequently it is expected that there may be competition (and competitive gate fees) for acceptance of RDF at cement

[13] RDF Opportunities: Coal and Cement Industries, Fichtner Consulting, RRF 2004
[14] Submission of Evidence to House of Commons Select Committee, January 2003

3. Markets and outlets for the outputs

kilns. A local authority currently would have to pay for the RDF to be used in a cement kiln. Emphasis should be put on developing sustainable markets for materials

As an emerging market there are also potential risks in terms of the operations of large thermal facilities accepting RDF from mixed waste processing as a fuel source. However, waste contractors are developing relationships with the cement industry and others to try and meet their specifications and provide a useful industrial fuel and waste recovery operation.

Renewable Energy

RDF is classified as a waste and therefore any facility using the fuel will be subject to the requirements of the Waste Incineration Directive (WID). As with the cement industry, power stations would need to be WID compliant. This would represent a significant capital investment for the industry. However WID only requires an operator to upgrade those facilities at a power station in which waste is handled to WID standards[15]. If an operator has more than one boiler then only one would need to be upgraded. This might make RDF a more attractive option for the power generation industry.

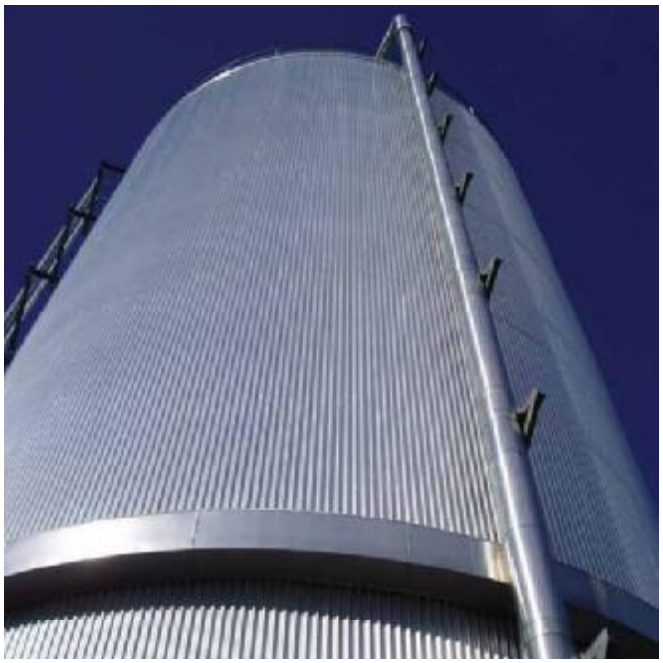
Electricity generated from the biodegradable fraction of waste in certain technologies is eligible for support under the Renewables Obligation (RO). Electricity recovered from the biomass component of RDF qualifies for support if it is generated in 'advanced conversion technologies', including pyrolysis or gasification plant (see the Advanced Thermal Treatment Brief), or in a conventional combustion facility with Good Quality Combined Heat and Power (CHP)

Up-to-date information regarding RDF and ROCs can be obtained from the DTI website http://www.dti.gov.uk/energy/renewables/. Also see the Defra New Technologies Demonstrator Programme for demos using RDF.

[15]Written answers to Alan Whitehead MP from Ben Bradshaw, Minister of State for Defra, 07/03/2007

4. Track record

The concept of MBT originated in Germany where it is an established waste treatment method. Regulatory restrictions on landfill space, the search for alternatives to incineration and increased costs of landfill disposal have been the major drivers for the development of these technologies. The largest European markets for established MBT plant include Germany, Austria, Italy, Switzerland and the Netherlands, with others such as the UK growing fast. Furthermore, other countries outside Europe are also using this technology.



Since the early 1990s, MBT processes have changed significantly, so today, numerous configurations of plant have developed, and these are provided by a variety of companies.

There are over 70 MBT facilities in operation in Europe, with over 40 MBT facilities operating in Germany. However, not all of these facilities are commercial and some of those included in Table 8 include pilot and demonstration plants.

Table 8: Examples of MBT plant operational in Europe

Technology Provider	Country	Number of Plants
Hese Umwelt (Leicester)	UK	1
EcoDeco (ELWA)	UK	1
Civic Environmental Systems (Durham)	UK	1
New Earth Solutions (Dorset)	UK	1
CRS (Argyll and Bute, Northumberland)	UK	2
Hot Rot (Western Isles)	UK	1
Sutco	Germany	5
Electrowatt-Ekono	Germany	1
Herhof	Germany	3
Dranco	Germany	2
ISKA	Germany	1
Horstmann	Germany	4
Wehrle Werk	Germany	1
BTA	Germany	1
BTA	Italy	1
Dranco	Italy	1
Ionics Itabila	Italy	1
Snamprogetti	Italy	1
Valorga	Italy	1
EcoDeco	Italy	4
Herhof	Italy	1
Valorga	Spain	2
Linde	Spain	1
Dranco	Spain	1
BTA/Roediger	Poland	1
Citec	Finland	1
Citec/Vagron	Holland	1
Valorga	Belgium	1
Valorga	France	2
Valorga	Netherlands	1
Dranco	Switzerland	1
Dranco	Austria	1
VKW	Austria	1
VKW	Italy	1
VKW	Turkey	1

4. Track record

4.1 Case Studies

The following case studies illustrate examples of MBT system using the different mechanical preparation, separation and biological treatment techniques, described in Section 2.

Shanks East London Sistema Ecodeco MBT facility on Frog Island

This facility is designed to take up to 180,000 tonnes per year of mixed residual waste from the East London Waste Authority. It is a fully enclosed bio-drying system. Waste is shredded before being placed into a bio-drying area where the material is treated using a suction forced-aeration system in the floor. The material is biologically treated for two weeks. The dry material is then put through a mechanical separation process to remove metals and a glass / aggregate fraction. The remaining dried waste (consisting mainly of dried organics, card, paper, plastics and other miscellaneous materials) is highly calorific and used as RDF. The RDF is currently used by a cement kiln, however, it will be utilised by an Advanced Thermal Treatment (ATT) process operated by Novera Energy Ltd at the Ford Dagenham plant, which will be part funded by the Defra New Technologies Demonstrator programme.

Bournemouth Council's New Earth MBT facility

The £4.4 million New Earth MBT facility based at Poole in Dorset is designed to take 50,000 tonnes per year of mixed MSW. The waste is shredded and an organic-rich fraction is screened out. The organic fraction is then composted in elongated piles (windrows) placed on forced-aeration ducts inside one of two composting buildings. The material is turned using specialised machinery 3 times during a two-week process. The material is then composted in a second building with suction forced aeration for a further two weeks. The facility produces around 9,000 tonnes of compost-like output per year.

Earth Tech Western Isles MBT facility

This is a £10 million project to build 2 treatment facilities. The main facility in Stornoway on the Isle of Lewis treats 21,000 tonnes per year of source-separated organics and residual waste. Anaerobic digestion (using Linde technology) is used to treat the source separated waste and in-vessel composting (by HotRot) is used to treat the residual waste. Mixed residual MSW is shredded and screened to produce a fine organic fraction which is composted to produce a CLO for landfill restoration.

Biffa/Leicester MBT facility and AD plant

This MBT facility (estimated to cost £20 million) has a capacity of up to 150,000 tonnes per year of mixed residual waste. The facility is spread over two sites: Bursom, home to a large ball mill used to crush the waste before it is screened and classified into various usable fractions; and Wanlip, where an AD facility is used to process the fine (<5mm) organic-rich fraction from the milled waste. The AD process is designed to handle up to around 50,000 tonnes per year. The AD plant uses a two-stage process: first, the fines are made into wet slurry that is then pumped with air during a 24 hour aerobic hydrolysis process; and second, this pre-treated (biologically heated and acidified) slurry is then sent to an 18 day thermophilic wet AD process. The plant is expected to produce enough biogas to provide 1.5 MW of electricity. The digestate undergoes further treatment to produce a CLO.

4. Track record

4.2 Summary

The case studies represent a selection of MBT projects currently operational in the UK. Numerous MBT projects can be found abroad and especially across Europe, where MBT has been well established for many years. MBT process configurations can vary significantly and can be designed to suit local market conditions and the regulatory framework specific to the country in which it operates. More information on different MBT systems can be found on the Environment Agency's website in the Waste Technology Data Centre – www.environment-agency.gov.uk/wtd

MBT as illustrated by the case studies, represent significant facilities, which are capital intensive (see Cost section) and are anticipated to be in operation for 15 – 25 years. With the emergent nature of markets/outlets for outputs from such processes, it is prudent to ensure sufficient installed capacity for flexibility within any plant (which may require new equipment, etc) to adapt to the needs of the market over time.

5. Contractual and financing issues

5.1 Grants & Funding

Development of MBT plant will involve capital expenditure of several million pounds. There are a number of potential funding sources for Local Authorities planning to develop such facilities, including:

Capital Grants: general grants may be available from national economic initiatives and EU structural funds;

Prudential Borrowing: the Local Government Act 2003 provides for a 'prudential' system of capital finance controls;

PFI Credits and Private Sector Financing: under the Private Finance Initiative a waste authority can obtain grant funding from central Government to support the capital expenditure required to deliver new facilities. This grant has the effect of reducing the financing costs for the Private Sector, thereby reducing the charge for the treatment service;

Other Private-Sector Financing: A contractor may be willing to enter a contract to provide a new facility and operate it. The contractor's charges for this may be expressed as gate fees; and

Existing sources of local authority funding: for example National Non-Domestic Rate payments (distributed by central government), credit (borrowing) approvals, local tax raising powers (council tax), income from rents, fees, charges and asset sales (capital receipts). In practice capacity for this will be limited.

The Government is encouraging the use of different funding streams, otherwise known as a 'mixed economy' for the financing and procurement of new waste infrastructure to reflect the varying needs of local authorities.

5.2 Contractual Arrangements

Medium and large scale municipal waste management contracts are likely to be through the Competitive Dialogue procedure under the Public Contract Regulations (2006).

The available contractual arrangement between the private sector provider (PSP) and the waste disposal authority (or partnership) may be one of the following:

Separate Design; Build; Operate; and Finance: The waste authority contracts separately for the works and services needed, and provides funding by raising capital for each of the main contracts. The contract to build the facility would be based on the council's design and specification and the council would own the facility once constructed;

Design & Build; Operate; Finance: A contract is let for the private sector to provide both the design and construction of a facility to specified performance requirements. The waste authority owns the facility that is constructed and makes separate arrangements to raise capital. Operation would be arranged through a separate Operation and Maintenance contract;

Design, Build and Operate; Finance: The Design and Build and Operation and Maintenance contracts are combined. The waste authority owns the facility once constructed and makes separate arrangements to raise capital;

Design, Build, Finance and Operate (DBFO): This contract is a Design and Build and Operate but the contractor also provides the financing of the project. The contractor designs, constructs and operates the plant to agreed performance requirements. Regular performance payments are made over a fixed

5. Contractual and financing issues

term to recover capital and financing costs, operating and maintenance expenses, plus a reasonable return. At the end of the contract, the facility is usually transferred back to the client in a specified condition;

DBFO with PFI: This is a Design, Build, Finance and Operate contract, but it is procured under the Private Finance Initiative. In this case the waste authority obtains funding for future payment obligations from Government as a supplement to finance from its own and private sector sources.

The majority of large scale waste management contracts currently being procured in England are Design, Build, Finance and Operate (DBFO) contracts and many waste disposal authorities in two tier English arrangements (County Councils) are currently seeking to partner with their Waste Collection Authorities (usually District or Borough Councils). Sometimes partnerships are also formed with neighbouring Unitary Authorities to maximise the efficiency of the waste management service and make the contract more attractive to the Private Sector Provider.

Before initiating any procurement or funding process for a new waste management treatment facility, the following issues should be considered: performance requirements; waste inputs; project duration; project cost; available budgets; availability of sites; planning status; interface with existing contracts; timescales; governance and decision making arrangements; market appetite and risk allocation.

Further guidance on these issues can be obtained from the following sources:

- Local Authority funding http://www.defra.gov.uk/environment/waste/localauth/funding/pfi/index.htm
- The Local Government PFI project support guide www.local.odpm.gov.uk/pfi/grantcond.pdf
- For Works Contracts: the Institution of Civil Engineers 'New Engineering Contract' (available at www.ice.org.uk).
- For large scale Waste Services Contracts through PFI and guidance on waste sector projects see the 4ps, local government's project delivery organisation http://www.4ps.gov.uk/PageContent.aspx?id=90&tp=Y

A number of PFI funded/contracted waste management projects have and will continue to involve large scale MBT technologies some of these are shown in Table 9).

Table 9: Examples of PFI Contracts in Local Authority Waste Management including MBT technology

Year	Local Authority	Lead Contractor	Solutions
2003	East London	Shanks	2 MBT with Bio-drying
2003	Leicester	Biffa	MRF + AD
In progress	Lancashire	Global Renewables	4 MBT + 5 Transfer Stations
In progress	Cambridgeshire	Donarbon	2 MBT, EfW, AD
In progress	Northumberland	SITA	3 Civic Amenity sites, MRF, MBT, composting

6. Planning and permitting issues

This section contains information on the planning and regulatory issues associated with MBT facilities based on legislative requirements, formal guidance, good practice and in particular drawing on information contained in the Office of the Deputy Prime Minister's research report on waste planning published in August 2004[16].

6.1 Planning Application Requirements

All development activities are covered by Planning laws and regulations. Minor development may be allowed under Permitted Development rights but in almost all cases new development proposals for waste facilities will require planning permission.

Under certain circumstances new waste facilities can be developed on sites previously used for General Industrial (B2) or Storage and Distribution (B8) activities. In practice even where existing buildings are to be used to accommodate new waste processes, variations to existing permissions are likely to be required to reflect changes in traffic movements, emissions etc.

Under changes to the planning system introduced in 2006 all waste development is now classed as 'Major Development'. This has implications with respect to the level of information that the planning authority will expect to accompany the application and also with respect to the likely planning determination period. The target determination periods for different applications are:

- Standard Application – 8 weeks
- Major Development - 13 weeks
- EIA Development - 16 weeks

The principal national planning policy objectives associated with waste management activities are set out in Planning Policy Statement (PPS) 10 'Planning for Sustainable Waste Management' published in July 2005. Supplementary guidance is also contained within the Companion Guide to PPS 10. . Both of these documents can be accessed via the Department of Communities and Local Government (DCLG) website[17].

PPS 10 places the emphasis on the plan led system which should facilitate the development of new waste facilities through the identification of sites and policies in the relevant local development plan. Separate guidance on the content and validation of planning applications is also available from DCLG through their website[18]. Individual Planning Authorities can set out their own requirements with respect to supporting information and design criteria through Supplementary Planning Documents linked to the Local Development Framework. It is important that prospective developers liaise closely with their Local Planning Authorities over the content and scope of planning applications.

6.2 Key Issues

When considering the planning implications of an MBT facility the key issues that will need to be considered are common to most waste management facilities and are:

- Plant/Facility Siting;
- Traffic;
- Air Emissions / Health Effects;
- Dust / Odour;
- Flies, Vermin and Birds;
- Noise;

16 http://www.communities.gov.uk/embeddedindex.asp?id=1145711
17 http://www.communities.gov.uk/index.asp?id=1143834
18 http://www.communities.gov.uk/pub/494/BestPracticeGuidanceontheValidationofPlanningApplicationsPDF326Kb_id1144494.pdf

6. Planning and permitting issues

- Litter;
- Water Resources;
- Visual Intrusion; and
- Public Concern.

A brief overview of the planning context for each of these issues is provided below.

6.3 Plant Siting

PPS 10 and its Companion Guide contains general guidance on the selection of sites suitable for waste facilities. This guidance does not differentiate between facility types but states that:

"Most waste management activities are now suitable for industrial locations, many fall within the general industrial class in the Use Classes Order.[19]

The move towards facilities and processes being enclosed within purpose designed buildings, rather than in the open air, has accentuated this trend. The guidance goes on to state:

"With advancement in mitigation techniques, some waste facilities may also be considered as light industrial in nature and therefore compatible with residential development. In more rural areas, redundant agricultural and forestry buildings may also provide suitable opportunities, particularly for the management of agricultural wastes"

Mixed waste processing (such as MBT) can take place in many different buildings at a variety of locations but the following issues should be considered:

- MBT processes can be similar in appearance and characteristics to various process industries. It would often be suitable to locate facilities on land previously used for general industrial activities or land allocated in development plans for such (B2) uses;
- Facilities are likely to require good transport infrastructure. Such sites should either be located close to the primary road network or alternatively have the potential to be accessed by rail or barge;
- The location of such plants together with other waste operations such as MRFs and thermal treatment plants can be advantageous. The potential for co-location of such facilities on resource recovery parks or similar is also highlighted in the Companion Guide; and
- General concerns about bio-aerosols from biological processing may require an MBT site to be located away from sensitive receptors.

6.4 Traffic

Centralised waste facilities will most likely be served by large numbers of HGVs with a potential impact on local roads and the amenity of local residents. It is likely that the site layout/road configuration will need to be suitable to accept a range of light and heavy

[19] The Town and Country Planning (Use Classes) Order 1987. SI 1987 No. 764

6. Planning and permitting issues

vehicles. Mixed waste processing operations are designed to split a mixed waste stream into a number of individual streams some of which are low tonnage or low bulk density. As a result traffic implications may be greater than initially considered.

The traffic movements anticipated from a 50,000tpa plant would be 20 – 30 refuse collection vehicles per day. This would be reduced if bulk transport systems are used.

6.5 Air Emissions and Health Effects

No studies specifically looking at the health effects of MBT facilities have been carried out. Depending on the nature of an individual facility, the health effects of MBT facilities might be expected to be comparable to those of in-vessel composting facilities.

Studies have found no increase in cancer or asthma in populations close to composting facilities. There have been public concerns that open composting facilities could in theory affect the health of people living in close proximity to the facility. The Environment Agency suggests that risk assessments may be undertaken on sites where there are sensitive receptors nearby. Emissions and potential risks to health can be more readily controlled in an in-vessel composting system, or MBT facility.

MBT processes result in the production of a fibrous material. This could be recycled or disposed to landfill as a stabilised waste material, or could be burnt as a refuse-derived fuel. Combustion of RDF is subject to the stringent emission control requirements of the Waste Incineration Directive and would result in a similar range of emissions to those from the incineration of waste, although this may well take place at a separate facility to the MBT process.

6.6 Dust / Odour

Any waste management operations can give rise to dust and odours. The control of odour at MBT facilities needs careful consideration. Because MBT facilities are located within an enclosed building, potential odour emissions can normally be controlled through the building ventilation system. If there is a combustion element to the facility, odorous air extracted from process areas can be used in the combustion stage.

If there is no combustion element, the process of air extraction and ventilation will nevertheless dilute odorous air. It may be necessary to disperse extracted air from an elevated point, and/or treat the air. Biofiltration systems can be used to control odours in air extracted from working areas if required. The need for, and design of odour control systems would need to be assessed on a site-by-site basis.

6.7 Flies, Vermin and Birds

The enclosed nature of MBT operations will limit the potential to attract vermin and birds. However, during hot weather it is possible that flies could accumulate, especially if they have been brought in during delivery of the waste. Effective housekeeping and on site management of tipping and storage areas is essential to minimise the risk from vermin and other pests. In some operations waste heat from the process may be used in fresh input waste to bring temperatures to levels above which flies can live. Similarly, waste storage in some MBT plant is designed to be less that the breeding cycle of vermin such as rats.

6.8 Noise

Noise is an issue that will be controlled under the permitting regulations and noise levels received at nearby sensitive receptors can be

limited by a condition of a planning permission. The main contributors to noise associated with MBT are likely to be:

- vehicle movements / manoeuvring;
- traffic noise on the local road networks;
- mechanical processing such as shredders, screens, trommels and ball mills; and
- air extraction fans and ventilation systems.

6.9 Litter

Any waste which contains plastics and paper are more likely to lead to litter problems. With MBT as long as good working practices are adhered to and vehicles use covers and reception and processing are undertaken indoors, litter problems can be minimised.

6.10 Water Resources

Common to many new waste treatment processes the enclosed nature of the operations significantly reduces the potential for impacts on the water environment. The greatest potential for pollution to surface and ground water is linked to the arrangement for delivery of waste and the collection of processed materials.

Pollution of water is unlikely due to MBT facilities being under cover and rainfall is unlikely to come into contact with the process. Even so, any wash down waters or liquid within the waste will need to be managed using a drainage system on site.. This is often cited as being reused within the process, but again such process water will need to be managed.

The level of water usage will be specific to the technology and therefore it is not possible to provide detail on the nature of the effluent that might be generated and how it should be managed. However, as part of the permitting requirements for a facility a management plan would be required for effluent.

The case studies on the Waste Technology Data Centre include an assessment of water usage.

6.11 Design Principles and Visual Intrusion

The new planning guidance emphasises the importance of good design in new waste facilities. Good design principles and architect input to the design and physical appearance of waste facilitates is essential. Buildings should be of an intrinsically high standard and should not need to be screened in most cases.

Good design principles also extend to other aspects of the facility including issues such as:

- Site access and layout;
- Energy efficiency;
- Water efficiency; and
- General sustainability profile

Construction of any building will have an effect on the visual landscape of an area. Visual intrusion issues should be dealt with on a site specific basis and the following items should be considered:

- Direct effect on landscape by removal of items such as trees or undertaking major earthworks;

6. Planning and permitting issues

- Site setting; is the site close to listed buildings, conservation areas or sensitive viewpoints;
- Existing large buildings and structures in the area;
- The potential of a stack associated with some air clean up systems for mixed waste processing operations may impact on visual intrusion;
- Use of screening features (trees, hedges, banks etc);
- The number of vehicles accessing the site and their frequency; and

6.12 Size and Landtake

Table 10 shows the land area required for the building footprint and also for the entire site (including supporting site infrastructure, although this is likely to vary greatly depending on the specific technology used and the quantities of waste being handled.

Table 10: Landtake estimates for MBT facilities

	Size	Buildings Area	Total Landtake
MBT Plant A[b]	50,000tpa	3,000m²	
MBT Plant B[c]	75,000tpa	5,500m²	15,000m²
MBT Plant C[c]			0.36 m2/t
MBT Plant D[a]	140,000tpa	9,000m²	
MBT Plant E[a]	180,000tpa		35,000m²

a Source: Review of Residual Waste Treatment Options, 2003, AilE

b Source: Planning for Waste Management facilities, ODPM, 2004

c Source: Waste Technology Data Centre, 2004

An average MBT plant may have a height of 10 – 20m. Some facilities may also have a stack if using particular air clean-up systems, potentially increasing overall height. For more information on landtake for specific waste management operations, see Defra's Waste Technology Data Centre.

www.environment-agency,gov.uk/wtd

6.13 Public Concern

Section 7, Social and Perception Issues, relates to public concern. In general public concerns about waste facilities in general relate to amenity issues (odour, dust, noise, traffic, litter etc). With facilities which include thermal treatment of the RDF, health concerns can also be a perceived issue. Public concern founded upon valid planning reasons can be taken into account when considering a planning application.

6.14 Environmental Impact Assessment

It is likely that an Environmental Impact Assessment (EIA) will be required for MBT facilities as part of the planning process.

Whether a development requires a statutory EIA is defined under the Town and Country Planning (Environmental Impact Assessment)(England and Wales) Regulations 1999. Care should be taken with the difference in meaning between 'treatment' and 'disposal' when applying these regulations. A MBT facility is a waste treatment facility and is not a waste disposal installation. The existing additional guidance in DETR circular 02/99 is currently being revised. This new guidance is likely to focus on appropriate criteria for establishing need for EIA and not relate to the general nature of proposals.

6. Planning and permitting issues

For more information on Planning issues associated with waste management options see Planning for Waste Management Facilities – A Research Study. Office of the Deputy Prime Minister, 2004. http://www.communities.gov.uk/pub/713/PlanningforWasteManagementFacilitiesAResearchStudy_id1145713.pdf

6.15 Licensing/Permitting

If a MBT plant processes over 50 tonnes per day it may be assumed that they will require a Pollution Prevention & Control (PPC) permit to operate, if processing less than this quantity a waste management licence would be required. If the process is shown to produce a fuel (e.g. RDF) rather than a waste, then it would be subject to PPC irrespective of the tonnage threshold. The Environmental Permitting Programme (EPP) is due to be implemented in April 2008 which will combine waste licensing and permitting systems.

For more information on licensing & permitting see the Environment Agency site[20].

For more information on licensing & permitting see http://www.environment-agency.gov.uk/subjects/waste/?lang=_e

Box 2 illustrates some of the key planning features of the Frog Island MBT facility operated by Shanks in the planning authority of Havering Borough Council.

Box 2: Frog Island MBT facility

- One of two MBT facilities, 180,000 tpa each, built for the East London Waste Authority (ELWA) 25 year PFI waste management contract
- Located on a 4.2 ha site, together with a Material Recycling facility (MRF), within the Ferry Island Industrial Estate near Rainham
- Site was allocated in the Havering Unitary Development Plan for light and industrial uses and is surrounded by other industrial users
- Application submitted January 2003, went to committee in March and approved with conditions in November 2003
- The Council consulted with the Mayor of London in February who considered the planning report in July and advised the proposal was acceptable with regard to strategic planning policy
- To meet the condition that it is aesthetically pleasing from the River Thames, the facility has timber cladding
- Refuse derived fuel produced from the Frog Island facility will be processed by the proposed nearby Novera Gasification facility, which was granted planning permission in October 2006

[20] http://www.environment-agency.gov.uk/subjects/waste/?lang=_e

7. Social and perception issues

This section contains a discussion of the social and public perception considerations of MBT facilities.

7.1 Social Considerations

Any new facility is likely to impact on the local residents and may provide both positive and negative impacts. Potential impacts on local amenity (odour, noise, dust, landscape) are important considerations when siting any waste management facility. These issues are examined in more detail in the Planning Section of this brief. Transport impacts associated with the delivery of waste and onward transport of process outputs may lead to impacts on the local road network. The Planning and Permitting section of this document provides an estimate of potential vehicle movements.

An MBT facility may also provide positive social impacts in the form of employment opportunities and educational opportunities. Typical employment for a MBT plant of 50,000tpa capacity would be 2 – 8 persons at any one time (more if manual picking operations are used). The plant may be operated on a shift system, for example to allow for 24 hour operations. Many new facilities are built with a visitors centre to enable local groups to view the facility and learn more about how it operates.

7.2 Public Perception

Recent changes in waste management arrangements in many areas has raised the profile of municipal waste services. Many people as a result of greater publicity and targeted education are now embracing the need for waste reduction, recycling and to a lesser extent the need for new waste facilities. The wider perception of waste facilities as a bad neighbour will take longer to overcome. New waste facilities of whatever type are rarely welcomed by residents close to where the facility is to be located.

Public opinion on waste management issues is wide ranging, and can often be at extreme ends of the scale. Typically, the most positively viewed waste management options for MSW are recycling and composting. However, this is not necessarily reflected in local attitudes towards the infrastructure commonly required to process waste to compost, or sort mixed recyclables. It should be recognised that there is always likely to be some resistance to any waste management facility within a locality.

7. Social and perception issues

At present there is a relatively low level of understanding of the concept of MBT by the public. In public consultations these technologies scores inconsistently when explained in detail as a residual waste treatment technology.

Two examples of public consultations highlighting the diversity of opinion with regard to MBT are illustrated in Box 3, below.

Box 3: Public consultation on MBT

A public consultation in an area of Wales resulted in a clear preference that any waste that could not be recycled or composted should be dealt with through MBT. Respondents felt that an MBT-led strategy was a positive approach for residual waste whether it aims to achieve or exceed diversion targets.

Conversely, a large scale public consultation in an area of England revealed the opposite reaction with MBT being the least favoured approach of the residual waste treatment options.

Overall, experience in developing waste management strategies has highlighted the importance of proactive communication with the public over waste management options. The use of realistic and appropriate models, virtual 'walk – throughs' / artists impressions should be used to accurately inform the public. Good practice in terms of public consultation and engagement is an important aspect in gaining acceptance for planning and developing waste management infrastructure. Defra is funding the development of small to medium scale demonstration plant in England for local authorities to visit and for Defra to publish data on performance. For more information contact Wastetech@enviros.com.

8. Cost

The cost of constructing, operating and maintaining MBT facilities are addressed using a common cost model on Defra's Waste Technology Data Centre. Both capital and operating costs are included on specific technologies which may be used for the purposes of indicative comparisons rather than accurate reflections of actual costs. The table below shows indicative capital expenditure (Capex) and operational expenditure (Opex) for aerobic and anaerobic MBT facilities. There are a wide range of costs dependent upon the complexity of the technology and the degree of mechanisation and automation employed.

Table 11: Typical MBT cost using Anaerobic and Aerobic processes

	Aerobic processes		AD processes	
Capacity	Capex £/t/yr	Opex £/t	Capex £/t/yr	Opex £/t
<50,000	70 – 150	up to 140	160 – 420	From 23
>50,000	28 – 225	20 – 69	107 – 278	16 – 69

Sources: Waste Technology Data Centre 2007 and Juniper Consultancy Services (2005) Mechanical Biological Treatment: A Guide for Decision Makers Processes, Policies and Markets

These costs provided are predominantly based on European examples. Costs in the UK will involve differing site specific issues such as permitting, labour, emission controls and other requirements.

It should also be noted that MBT systems are sensitive to the markets and outlets for recycled materials, RDF and soil conditioners that are produced by different processes. It is likely that many of the material outputs from MBT will have a negative value and these are not included in the above costs. The impact of the markets/outlets for these materials is not reflected in the costs provided, nor is the cost associated with the landfill of any residues should a market fail to emerge. Partnerships between MBT operators and potential users of outputs should be established at the earliest opportunity and care should be taken to ensure plant can deliver materials of sufficient quality for the required market outlet.

It is vital in any negotiation, that there is a true appreciation of the cost of essential repairs and refurbishment. Additionally the undeveloped markets/outlets (and risks associated with loss of markets) for products / outputs of these processes needs to be reflected in cost models. Any building should have sufficient capacity to house new separation equipment. The above costs are also not the same as the price a Local Authority may pay for a treatment service, which will also include other factors such as finance costs and profit margins.

For cost information on examples of different processes see Defra's Waste Technology Data Centre www.environment-agency.gov.uk/wtd

9. Contribution to national targets

9.1 Recycling

Recyclate derived from a MBT plant processing household waste qualifies for BVPI 82a (Recycling) at the point at which it leaves the plant to be sent to the reprocessor. The material must pass to the reprocessor (and not be rejected for quality reasons) to count as recycling. The same would also apply to glass used as an aggregate. It should be noted that some materials may have market limitations due to being derived from a mixed MSW source. For example British Standard BS EN 643 states that 'Recovered paper from refuse sorting stations is not suitable for use in the paper industry.' Although this standard is not legally binding, it is supported by the main trade associations for the paper recycling sector.

The Government has recently increased national recycling and composting targets for household waste through the *Waste Strategy for England 2007.* Targets are at least 40% by 2010, 45% by 2015 and 50% by 2020. For more information on the contribution of MBT to Best Value Performance Indicators and recycling see the local authority performance pages on the Defra website

http://www.defra.gov.uk/environment/waste/localauth/perform-manage/index.htm and http://www.wastedataflow.org/Documents/BVPI%20FAQs.pdf

9.2 Composting

Compost generated through the processing of source segregated organic material by in-vessel composting will contribute to BVPI 82b, the indicator for the amount of composting a local authority has achieved. The definition of BVPI 82b now also includes waste which has been treated through a process of anaerobic digestion.

Where MBT processes are configured to produce an organic rich stream known as an CLO from mixed residual MSW to be utilised as a low grade soil conditioner for example, this material may (but is 'unlikely to') qualify as composting under BVPI 82b. The CLO could be utilised in applications such as brownfield restoration, landfill restoration or some bulk fill uses (provided that the appropriate engineering and quality standards are met).

These materials will only qualify as 'composted' under the Best Value Performance Indicator (BVPI 82b) if the output meets the appropriate criteria for use in the intended application. Some waste management contractors have demonstrated that there is a market for these materials, however the current Best Value Performance Indicator Guidance (as of November 2004) states the criteria for composting should be '*a product that has been sanitised and stabilised, is high in humic substances, and can be used as a soil improver, as an ingredient in growing media or blended to produce a top soil that will meet British Standard BS2882 incorporating amendment no.1…'* It also states that it is '*unlikely that products of a Mechanical Biological Treatment process will meet this definition*.' However if the definition could be achieved then the product would qualify as BVPI 82b.

9.3 Landfill Allowance Trading Scheme (LATS)

The European Landfill Directive and the UK's enabling act, the Waste & Emissions Trading Act 2003, require the diversion of biodegradable municipal waste (BMW) from landfill. MBT processes have the potential to divert BMW from landfill. Any outputs that are recycled, used as soil conditioner (under an exemption) or burnt as RDF and which are

9. Contribution to national targets

not landfilled will count directly towards diversion targets. The ability of MBT to meet a high level of landfill diversion will therefore depend upon the availability of markets or outlets for the outputs, and the quality of the process outputs.

However, MBT plant can also be used to bio-stabilise waste prior to landfilling. In this case biological treatment is used to reduce the waste's potential to degrade and produce methane once landfilled. The Environment Agency (EA) has developed a methodology to determine the 'stability' or 'biodegradability' of any outputs from an MBT plant which are sent to landfill. This methodology can be used to determine the actual amount of biodegradable material being landfilled. This information could help an authority achieve allowance allocations under the Landfill Allowance Trading Scheme (LATS). The testing is not a statutory requirement currently. Detailed guidance on how the diversion of biodegradable waste is measured in MBT processes can be found on the Environment Agency website:

http://www.environment-agency.gov.uk/commondata/acrobat/mbt_1154981.pdf

As any MBT plants developed in the UK are likely to vary in their method of operation, the stability test is likely to be applied to each MBT plant on a regular basis. Up to date information can be obtained from Defra's LATS information webpage:

http://www.defra.gov.uk/environment/waste/localauth/lats/index.htm

As the requirements of the Landfill Directive relate to the amount of biodegradable material landfilled, the stability of materials diverted from landfill via MBT will not need to be measured.

9. Contribution to national targets

9.4 Recovery

MBT technologies will only contribute towards recovery targets through the waste streams that are sent to an energy recovery process. This may be either RDF combusted or degraded in a thermal plant (e.g .Incineration with Energy Recovery, Advanced Thermal Treatment or co-combusted in a Cement Kiln), or the biological stream that is processed in an Anaerobic Digestion plant (see the specific guidance for BVPI 82c and also 82b for AD). The Government has recently increased national recovery targets for municipal waste through the *Waste Strategy for England 2007.* Targets are 53% by 2010, 67% by 2015 and 75% by 2020. For more details see

http://www.defra.gov.uk/environment/waste/localauth/perform-manage/index.htm

9.5 Renewables

The Renewables Obligation (RO) was introduced in 2002 to promote the development of electricity generated from renewable sources of energy. The Obligation requires licensed electricity suppliers to source a specific and annually increasing percentage of the electricity they supply from renewable sources, demonstrated by Renewables Obligation Certificates (ROCs). The target currently rises to 15.4% by 2015/16. In essence, the RO provides a significant boost to the market price of renewable electricity generated in eligible technologies.

Electricity generated from the biomass (renewable) fraction of waste (including RDF) in 'advanced conversion technologies' (including AD, gasification and pyrolysis) or incineration plant with good quality heat and power is eligible for support under the RO. This can provide an important additional revenue stream for a proposed plant, as long as it meets the qualifying requirements. As the value of a ROC is not fixed, the long term value would need to be assessed in detail to determine its overall financial value to the project.

The Department for Industry (DTI) is considering providing greater support to technologies producing renewable energy and assessing methods for removing barriers to renewable energy generation.

Up-to-date information regarding RDF and ROCs can be obtained from the DTI website

www.dti.gov.uk/energy/sources/renewables/index.html.

10. Further reading and sources of information

WRATE (Waste and Resources Assessment Tool for the Environment)
http://www.environment-agency.gov.uk/wtd/1396237/?version=1&lang=_e

The Waste Technology Data Centre
www.environment-agency.gov.uk/wtd

New Technologies Demonstrator Programme Wastetech@enviros.com

Defra New Technologies website,
http://www.defra.gov.uk/environment/waste/wip/newtech/index.htm

Integrated Pollution Prevention and Control, Draft Reference Document on Best Available Techniques for the Waste Treatments Industries, *European Commission – Directorate General Joint Research Centre*, January 2004

Refuse Derived Fuel, Current Practice and Perspectives (B4-3040/2000/306517/Mar/E3), *European Commission – Directorate General Environment*, July 2003

Local Authority funding
http://www.defra.gov.uk/environment/waste/localauth/funding/pfi/index.htm

The Local Government PFI project support guide
www.local.odpm.gov.uk/pfi/grantcond.pdf

For Works Contracts: the Institution of Civil Engineers 'New Engineering Contract'
(available at www.ice.org.uk).

For large scale Waste Services Contracts through PFI and guidance on waste sector projects see the 4ps, local government's project delivery organisation
http://www.4ps.gov.uk/PageContent.aspx?id=90&tp=Y

Planning for Waste Management Facilities – A Research Study. ODPM, 2004
http://www.odpm.gov.uk/stellent/groups/odpm_planning/documents/page/odpm_plan_030747.pdf

AilE Ltd, 2003, Review of residual waste treatment technologies, Report prepared on behalf of Kingston upon Hull City Council and East Riding of Yorkshire Council
http://www.eastriding.gov.uk/environment/pdf/waste_treatment_technologies.pdf

The Additional Paper to the Strategy Unit, Waste Not Want Not study, 'Delivering the Landfill Directive: The Role of New & Emerging Technologies', Dr Stuart McLanaghan
http://www.number10.gov.uk/files/pdf/technologies-landfill.pdf

11. Glossary

Aerobic	In the presence of oxygen.
Aerobic Digestion/Composting	Biological decomposition of organic materials by micro-organisms under controlled, aerobic, conditions to a relatively stable humus-like material called compost.
Anaerobic	In the absence of oxygen.
Anaerobic Digestion	A process where biodegradable material is encouraged to break down in the absence of oxygen. Material is placed in to an enclosed vessel and in controlled conditions the waste breaks down typically into a digestate, liquor and biogas.
Animal By-Products Regulation	Legislation governing the processing of wastes derived from animal sources.
Biodegradable	Capable of being degraded by plants and animals.
Biogas	Gas resulting from the fermentation of waste in the absence of air (methane/carbon dioxide).
Biodegradable Municipal Waste (BMW)	The component of Municipal Solid Waste capable of being degraded by plants and animals. Biodegradable Municipal Waste includes paper and card, food and garden waste, and a proportion of other wastes, such as textiles.
Co-combustion	Combustion of wastes as a fuel in an industrial or other (non waste management) process.
Digestate	Solid and / or liquid product resulting from Anaerobic Digestion.
Feedstock	Raw material required for a process.
Floc	A small loosely aggregated mass of flocculent material. In this instance referring to Refuse Derived Fuel or similar.
Greenhouse Gas	A term given to those gas compounds in the atmosphere that reflect heat back toward earth rather than letting it escape freely into space. Several gases are involved, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), ozone, water vapour and some of the chlorofluorocarbons.
Green Waste	Waste vegetation and plant matter from household gardens, local authority parks and gardens and commercial landscaped gardens.
Incineration	The controlled thermal treatment of waste by burning, either to reduce its volume or toxicity. Energy recovery from incineration can be made by utilising the calorific value of the waste to produce heat and / or power.

11. Glossary

In-vessel Composting	The aerobic decomposition of shredded and mixed organic waste within and enclosed container, where the control systems for material degradation are fully automated. Moisture, temperature, and odour can be regulated, and stable compost can be produced much more quickly than outdoor windrow composting.
Materials Recycling Facility/ Material Recovery Facility (MRF)	Dedicated facility for the sorting / separation of recyclable materials.
Mechanical Biological Treatment (MBT)	A generic term for mechanical sorting / separation technologies used in conjunction with biological treatment processes, such as composting.
Municipal Solid Waste (MSW)	Household waste and any other wastes collected by the Waste Collection Authority, or its agents, such as municipal parks and gardens waste, beach cleansing waste, commercial or industrial waste, and waste resulting from the clearance of fly-tipped materials.
Recyclate/Recyclable materials	Post-use materials that can be recycled for the original purpose, or for different purposes.
Recycling	Involves the processing of wastes, into either the same product or a different one. Many non-hazardous wastes such as paper, glass, cardboard, plastics and scrap metals can be recycled. Hazardous wastes such as solvents can also be recycled by specialist companies.
Refuse Derived Fuel (RDF)	A fuel produced from combustible waste that can be stored and transported, or used directly on site to produce heat and/or power.
Renewables Obligation	Introduced in 2002 by the Department of Trade and Industry, this system creates a market in tradable renewable energy certificates (ROCs), within each electricity supplier must demonstrate compliance with increasing Government targets for renewable energy generation.
Solid Recovered Fuel	Refuse Derived Fuel meeting a standard specification, currently under development by a CEN standards committee.
Source-segregated/ Source-separated	Usually applies to household waste collection systems where recyclable and/or organic fractions of the waste stream are separated by the householder and are often collected separately.
Statutory Best Value Performance Indicators	Local Authorities submit performance data to Government in the form of annual performance indicators (PIs). The Recycling and Composting PIs have statutory targets attached to them which Authorities are required to meet.

Essex Works.

The future of waste in Essex

recycle for Essex

The future of waste in Essex

Waste isn't the most glamorous of subjects, yet it is something that we cannot ignore. Last year in Essex we produced a massive 700,000 tonnes of household waste and with your help we recycled an impressive 36% of it. However, this still meant that over 440,000 tonnes of household rubbish was sent to be buried in the ground in landfill sites.

Relying on landfill sites to hide the problem of rubbish is simply not a sustainable way to carry on. When biodegradable rubbish (things like paper, card, food and garden waste) rots down in landfill sites it produces methane which has the potential to contribute to climate change.

A key part of our solution to the waste issue is to encourage high levels of recycling; however we will always need to deal with the waste that is left. In order to deliver an innovative and resource efficient waste management system for Essex we need to invest in new technologies which treat the residual waste[1] and which can extract further recyclable material from the waste.

What are you consulting on?

The draft Essex Waste Strategy (known officially as the Joint Municipal Waste Management Strategy) sets out the key objectives and targets for the management of municipal waste[2] in the county. At the moment, a lot of Essex's waste still ends up in landfill sites and we need to change this. There are many environmental and financial benefits to diverting waste from landfill, such as the better use of valuable resources, Essex residents paying less landfill tax and helping to tackle climate change.

Furthermore, from previous consultations on the waste strategy, Essex authorities have received a strong message from Essex householders and communities that we should be changing the way we manage waste, with a drive towards waste reduction, high recycling and composting and minimising waste to landfill. The waste strategy is Essex's plan for ensuring that we achieve this change.

It is also a legal requirement of the Waste and Emissions Trading Act (WET) 2003 that the County Council has a joint strategy with the District and Borough Councils for the management of municipal waste.

1 Residual waste is household waste not separated by the householder for recycling or composting.

2 Municipal waste is household waste and any other waste that is collected for treatment and disposal by a local authority.

What does the waste strategy say?

Our proposed strategy for dealing with waste in the future can be summarised as follows:

- We will work hard to **reduce** the amount of waste produced in the first place and **re-use** more of the waste that is produced.

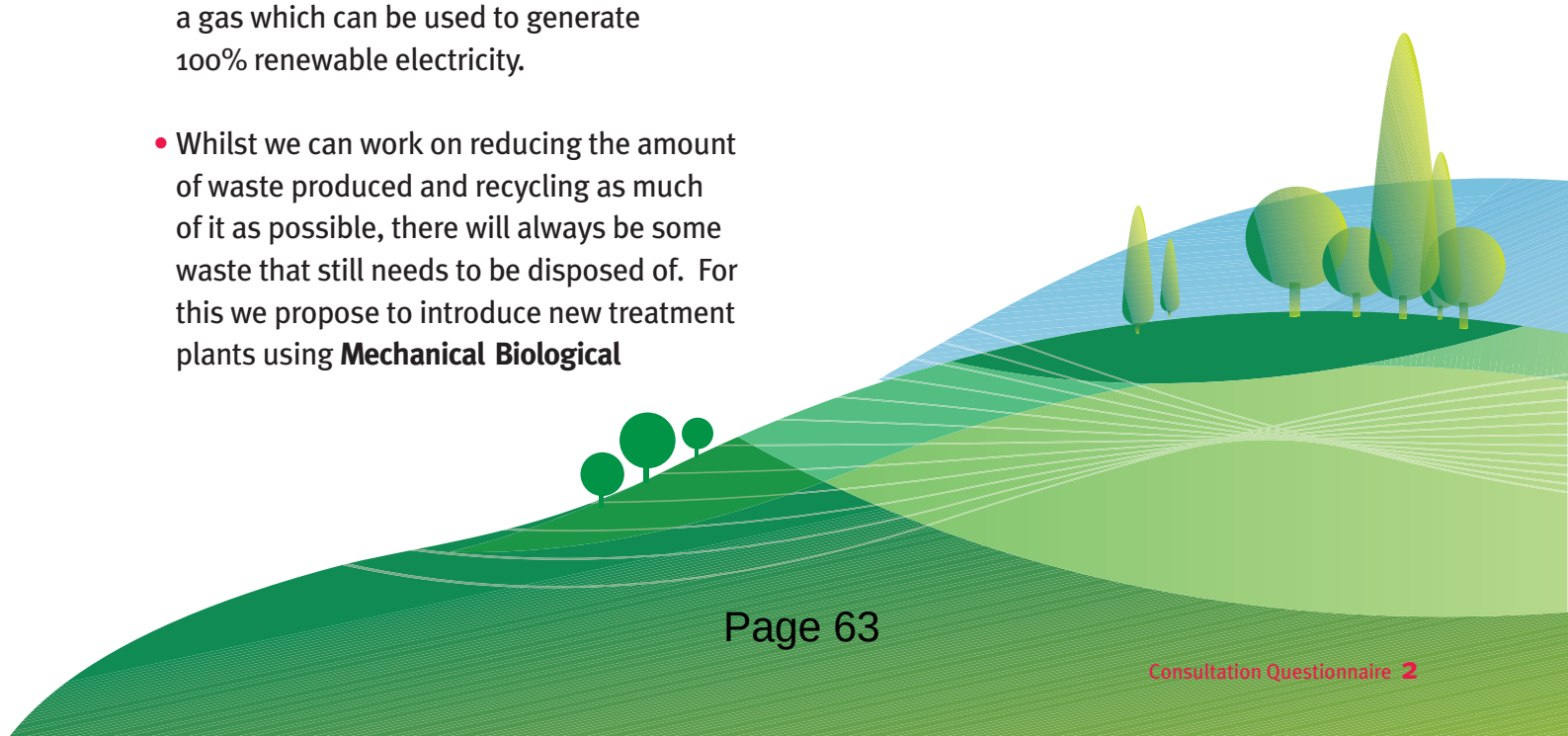
- Our ambition is to achieve 60% **recycling** of household waste by 2020. This could be achieved through a combination of further improvement in the performance of recycling and composting kerbside collection schemes and the Recycling Centres for Household Waste, and the recovery of recyclable materials through new treatment plants.

- We favour **composting** technologies such as **anaerobic digestion** (AD), for source segregated organic wastes. AD is a form of biotreatment and produces a gas which can be used to generate 100% renewable electricity.

- Whilst we can work on reducing the amount of waste produced and recycling as much of it as possible, there will always be some waste that still needs to be disposed of. For this we propose to introduce new treatment plants using **Mechanical Biological Treatment** (MBT). MBT processes any 'black bag' waste and recovers further material for recycling. Part of the remaining material can either be manufactured into a fuel for energy production or can be sent to landfill.

What is Mechanical Biological Treatment?

MBT facilities separate the 'black bag' waste by *mechanical* processes. This means that further material can be separated for recycling and/or to make soil improvers. Some MBT facilities separate and manufacture some of the waste into a *solid recovered fuel* which could be used to generate electricity (and sometimes heat too) in an energy plant.



What is Solid Recovered Fuel?

One output from an MBT process can be the production of a solid recovered fuel (SRF). This is produced from the material that has not been recycled. The biomass component of SRF is typically in excess of 50% and could be a valuable source of renewable energy. Essex authorities will explore the option of producing a SRF from the MBT process and recovering energy from it. Markets for SRF are being explored with current energy users. Essex believes that using SRF in an energy plant has climate change benefits and could prove to be a more cost effective solution than sending it to landfill.

Why do we need new waste management facilities; why can't we just rely on recycling?

Waste reduction, reuse and high recycling are key objectives to the Essex strategy; it will not work without them. However, there will always be some 'black bag' waste that needs to be treated if we are going to minimise waste being sent to landfill sites. For this we will need new waste and recycling facilities which will recycle, compost, treat and recover a range of different waste materials.

What will it cost?

Waste management will cost more in the future, but doing nothing is likely to cost Essex taxpayers more in the future.

This is because landfill tax is increasing significantly year on year. Each tonne of waste sent to landfill incurs a £24 landfill tax in 2007/08 and by 2010/11 this figure will have increased to £48 per tonne. In 2006/07, Essex County Council paid approximately £11million in landfill tax and the figure will increase; it is estimated that Essex could be paying £22million in landfill tax in 2010/11.

In addition, the County Council must meet European landfill diversion targets for biodegradable waste, which means sending less waste to landfill each year. This scheme is called the Landfill Allowance Trading Scheme (LATS)[3]. The County Council faces heavy financial penalties if it does not meet these LATS targets. If we carry on managing waste as we do today, this penalty could be £24million by 2013. However, there are actions that the County Council, in partnership with the District and Borough Councils, could take to reduce the financial risk of penalties to Essex. These actions could include the trading of LATS allowances, increasing recycling and composting performance and building new waste and recycling treatment plants.

3 For more information on the LATS please go to www.essex.gov.uk

We estimate that implementing the waste strategy will save Essex taxpayers £750 million over the next 25 years when compared to the current methods of waste disposal over the same period.

Why are you asking for my opinion on the waste strategy?

The successful delivery of this strategy rests, to a significant degree, on the willingness and desire of Essex Authorities and householders to work together to take responsibility for their waste. Therefore, the involvement of the community is of paramount importance to the development of this strategy.

What we want to know from you is if you agree with the proposals in the current draft waste strategy?

When we asked this question in 2005 there was broad support for the waste strategy aims of high recycling and bio treatment (e.g. MBT and AD technologies). Given that the waste strategy has since been improved by introducing measures to improve performance and to drive down costs, we want to check that this is still the case. We also need to know if you feel that the high target of 60% recycling that we have set by 2020 is achievable, after all we will not be able to achieve this without your support.

Are you asking for my opinion on anything else?

Yes, a key part of the development of the strategy is to assess the environmental impact of implementing the key targets and actions. To do this, a **Strategic Environmental Assessment** (SEA) has been undertaken on the draft strategy. The SEA process helps to ensure that the draft waste strategy is developed with a focus on sustainability and the environment. The SEA process produces an **Environmental Report** and this must also be consulted on at the same time as the strategy and we would welcome your comments on it.

Where can I read copies of the draft Essex Waste Strategy and SEA Environmental Report?

Copies of the draft strategy and SEA Environmental Report are available to view in libraries across the county and at www.essex.gov.uk/wasteconsultation. You can also request copies by phoning **0845 6037625** or by emailing **wastemanagement@essexcc.gov.uk**

Where can I go for more information?

For further more detailed information, please visit www.essex.gov.uk, telephone **0845 6037625** or email **wastemanagement@essexcc.gov.uk**

Tell us what you think...

Your views are important to us so please take a few minutes to answer the questions on the opposite page. Please fill it in and return it to:

Waste & Recycling
Essex County Council
Freepost CL3636
County Hall
Chelmsford
CM1 1XZ

Or, if you prefer, please visit **www.essex.gov.uk** to complete the questionnaire online.

The consultation closes on 5th May 2008.

The information contained in this leaflet can be made available in alternative formats: large print, Braille, audio tape or disk.

We can also translate this information into other languages.

Printed on recycled paper

recycle for Essex

Please fill in...

1) Which of these statements best describes how much you recycle?
Tick one only

☐ I do not recycle anything
☐ I do not recycle much
☐ I recycle a lot but not everything that can be recycled
☐ I recycle everything that can be recycled using the services provided to me

2) Our target is to recycle 60% of Essex's waste. How easy do you feel it is for you to help us achieve this by using your current kerbside collection and Recycling Centres for Household Waste to recycle your waste?

☐ Very easy ☐ Fairly easy
☐ Fairly difficult ☐ Very difficult
☐ Don't know

3) After all practical recycling and composting has taken place, do you agree or disagree that the Essex councils should treat 'black bag' waste by using MBT processes rather than sending the waste directly to landfill?

☐ Strongly agree ☐ Tend to agree
☐ Neither agree nor disagree
☐ Tend to disagree ☐ Strongly disagree
☐ Don't know

4) Would you prefer it if part of the material from the MBT process was used to produce a fuel for energy rather than being sent to a landfill site?

☐ Yes (produce energy)
☐ No (send to landfill) ☐ Don't know

5) Are there any other comments you would like to make about the draft waste strategy for Essex and the Essex councils' plans for managing waste and encouraging recycling in the county?

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6) Are there any comments you would like to make about the SEA Environmental Report as it relates to the draft waste strategy?

Finally, to ensure that we receive a response that is equal and representative, please complete the following questions regarding yourself.

7) The first 4 digits of your postcode (eg CM1 1)
.....

8) Are you:
☐ Female ☐ Male

9) Age group:
Under 18 ☐ 18-24 ☐ 25-34 ☐ 35-44 ☐
45-54 ☐ 55-65 ☐ 65+ ☐

10) Your ethnicity*:
White
British ☐ Irish ☐
Any other white background ☐

Mixed
White and Black Caribbean ☐
White and Black African ☐
White and Asian ☐
Any other mixed background ☐

Asian or Asian British
Indian ☐ Pakistani ☐ Bangladeshi ☐
Any other Asian background ☐

Black or Black British
Caribbean African ☐
Any other Black background ☐

Chinese or other ethnic group
Chinese ☐ Any other background ☐

*These are the categories used by the Government in the 2001 Census

11) Do you have any long-standing illness, disability or infirmity? (Long-standing means anything that has troubled you over a period of time or that is likely to affect you over a period of time.)
Yes ☐ No ☐

12) Are there any young people (age 0 – 18) in your household?
Yes ☐ No ☐

Thank you

Waste & Recycling
Essex County Council
Freepost CL3636
County Hall
Chelmsford
CM1 1XZ

Introductory Guide to Options for the Diversion of Biodegradable Municipal Waste from Landfill

www.defra.gov.uk

defra
Department for Environment
Food and Rural Affairs

Contents

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This Document has been produced by Enviros Consulting Limited (Technical Advisors) on behalf of Defra to provide assistance to Local Authorities and the waste management market generally through awareness raising of the key municipal waste management options for thediversion of BMW from landfill. The Document has been developed in good faith by the Advisors on behalf of Defra, and neither Defra not its Advisers shall incur any liability for any action or omission arising out of any reliance being placed on the Document by any Local Authority or organisation or other person. Any Local Authority or organisation or other person in receipt of this Document should take their own legal, financial and other relevant professional advice when considering what action (if any) to take in respect of any waste strategy, initiative, proposal, or other involvement with any waste management option or technology, or before placing any reliance on anything contained therein.

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Background

Municipal Solid Waste (MSW) is waste collected by or on behalf of the local authority or its agents. It consists of mostly household waste and may include municipal parks and gardens waste, beach cleansing waste, commercial or industrial waste and waste resulting from the clearance of fly-tipped materials. The total quantity of MSW has risen year on year[1], presenting a growing problem for local authorities, particularly as the legislation[2] which limits the amount of biodegradable municipal waste (and therefore residual MSW) that can be sent to landfill becomes more stringent over time.

Over the last 8 years England has increased its recycling rate from 7% to 27%. Despite this considerable improvement, more than 62% of all MSW generated in England is disposed of in landfills[3]. The aim of this guide is to provide an introduction to the options for diverting this remaining MSW from landfill. Some of these options are already established practice in the UK or overseas. Others include technologies which have yet to be commercially tested in the UK for municipal waste management. Further details about the new and established technologies featured in this report are available from the Waste Technology Data Centre available on the Environment Agency website and in separate Technology Briefs in this series.

The most significant challenge facing the management of MSW is how to divert the biodegradable component of MSW (known as Biodegradable Municipal Waste) away from landfills. Legislation and policy measures have been set in place to significantly reduce the amount of this biodegradable waste sent for disposal in landfills. These measures are explained in the following sections.

What is Biodegradable Municipal Waste (BMW)?

Biodegradable Municipal Waste (BMW) is the fraction of MSW that will break down under the action of micro-organisms, either in the presence of oxygen in air (known as aerobic conditions) or in the absence of oxygen such as that within a landfill or digestion plant (known as anaerobic conditions). The types of materials that comprise BMW include food or kitchen wastes, garden wastes, paper, card, wood and some textiles. Figure 1 illustrates the composition of household waste, over half of which consists of garden, kitchen and paper/board, the main biodegradable fractions within MSW.

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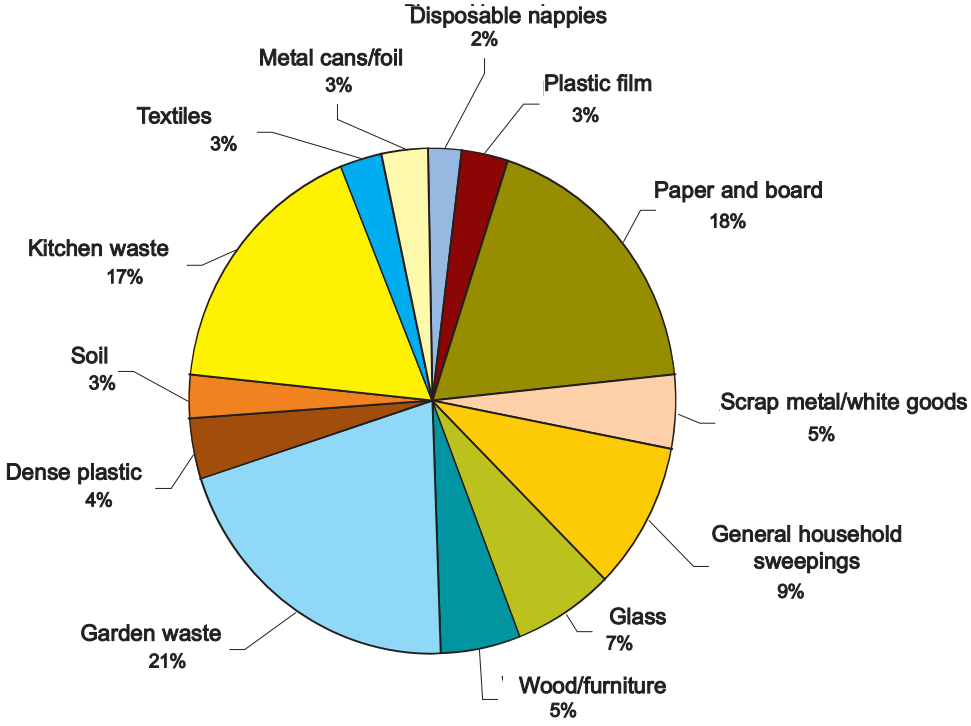
1 This is now showing signs of slowing and in some areas waste arisings are falling, and indeed for 2005/6 there was a 3% fall nationally. However, this may be partly explained by other factors occurring in that particular financial year
2 The Landfill Directive, Waste and Emissions Trading Act 2003 and Landfill Allowances Trading Regulations
3 Results from WasteDataFlow for 2005/6 http://www.defra.gov.uk/environment/statistics/wastats/bulletin.htm

Background

Figure 1: Household waste composition (England, 2000/1)



Source: Dr Julian Parfitt, Waste & Resources Action Programme, Waste Strategy for England 2007

Why seek alternatives to landfill?

The overall goal for Government is to achieve sustainable waste management, to recover value from waste and break the link between economic growth and the environmental impact of waste[4]. Waste is a resource from which recyclable and compostable materials can be extracted and energy-rich fuels can be produced, reducing the amount that requires disposal to landfill. Waste policy in the UK and England sits within wider European policy and legislation framework. The underpinning legislation is the European Union Waste Framework Directive which defines waste as '*any substance or object…which the holder discards or is required to discard*'.

The Government published the new *Waste Strategy for England in May 2007*[5]. The 5 key objectives of the strategy are to:

- decouple waste growth (in all sectors) from economic growth and put more emphasis on waste prevention and reuse
- meet and exceed the Landfill Directive diversion targets for biodegradable municipal waste in 2010,2013 and 2020
- increase diversion from landfill of non-municipal waste and secure better integration of treatment for municipal and non-municipal waste
- secure the investment in infrastructure needed to divert waste from landfill and for the management of hazardous waste

4 Securing the Future, the UK Government Sustainable Development Strategy, March 2005,available at http://www.sustainable-development.gov.uk/publications/uk-strategy/uk-strategy-2005.htm
5 http://www.defra.gov.uk/environment/waste/strategy/strategy07/index.htm

Background

- get the most environmental benefit from that investment, through increased recycling of resources and recovery of energy from residual waste using a mix of technologies

These objectives emphasise the Government's aim of reducing waste and disposing of less waste to landfill. Increasingly, the contribution waste management can make to climate change is being recognised. The disposal of biodegradable waste to landfill results in the production of methane as the waste degrades, a gas 23 time more potent greenhouse gas than carbon dioxide. Recovering materials and energy from waste reduces the potential contribution waste management makes to climate change.

The EC Landfill Directive

The legislation driving the need to divert BMW from landfill is in response to the EU Landfill Directive published in 1999. The rationale for the need to reduce the levels of BMW is based on the overall aim of the Directive, which is to prevent or reduce as far as possible the negative effects of landfill on the environment, in particular the pollution of surface water, groundwater, soil, and air, and on the global environment, including the greenhouse effect. There are increasing concerns over greenhouse gas emissions from landfills contributing to climate change[6]. The decomposition of biodegradable materials within landfill sites results in the production and escape of methane (this emission will be minimised by good gas control and management of the site). Methane is a potent greenhouse gas, emissions of which need to be reduced. It is estimated that methane from landfill accounted for 40% of total UK methane emissions or 3% of total greenhouse gases in 2005 (including methane and carbon dioxide and other gases)[7].

The Landfill Directive is one measure which aims to reduce the volume of methane released from landfills by imposing a reduction in the quantities of BMW disposed of in this way. Within the Landfill Directive the following targets have been set:

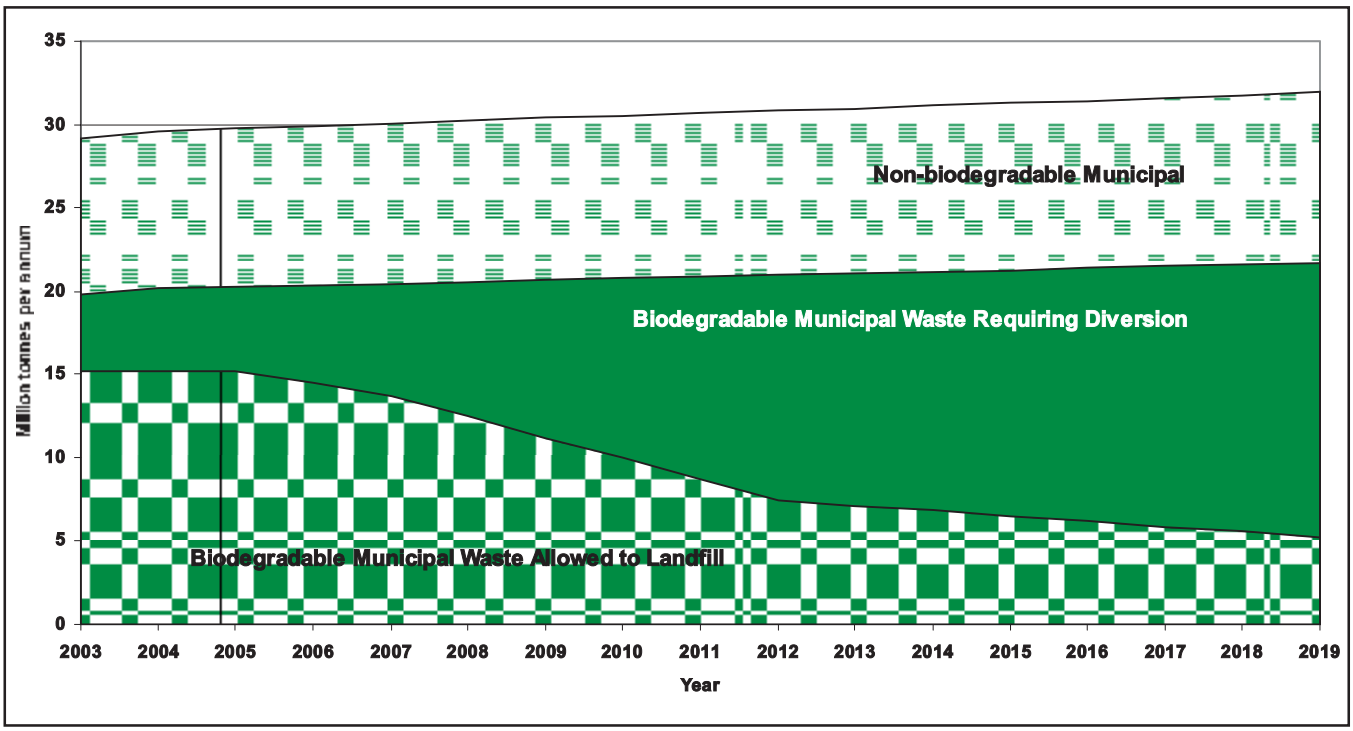
BMW levels allowed to landfill	Target year for UK
75% of 1995 quantities	2009/10
50% of 1995 quantities	2012/13
35% of 1995 quantities	2019/20

These are challenging targets which are made more difficult to achieve because of the UK's historic reliance on landfill as a waste management option, and also because of the increasing quantity of MSW arisings. Failure to meet these targets will result in significant fines for the UK – anticipated to be in the order of £500,000 per day for non-compliance after the target date. These targets have been transposed into English law in the form of the Landfill Regulations 2002, and the Waste & Emissions Trading Act 2003. Data for the last 5 years suggests that MSW growth is around 0.5% per annum. Figure 2 shows the trend of increasing waste arising in England (assuming 0.5% annual growth) and the amount of BMW which will require diversion up until 2020.

6 See Renewable Energy and Waste Management in this Technology Brief series
7 E-Digest Statistics about: Climate Change http://www.defra.gov.uk/environment/statistics/globatmos/gagccukmeas.htm

Background

Figure 2: BMW Diversion & the Landfill Directive Targets



Source: Defra MSW data for England, assuming 0.5 % annual growth of MSW

The Government has introduced the Landfill Allowance Trading Scheme (LATS) as a flexible and cost effective way of enabling England to meet its share of the UK's targets for reducing the landfilling of biodegradable municipal waste under Article 5(2) of the EC Landfill Directive. All Waste Disposal Authorities (WDAs) have been allocated an annual allowance for the amount of BMW they can dispose to landfill up to 2020. The trading scheme offers authorities an alternative approach to targets by providing flexibility of banking, borrowing and trading allowances with each other. The Environment Agency is charged with monitoring WDA compliance with LATS. There is a £150/t penalty for every tonne of BMW landfilled that exceeds the number of allowances a WDA holds for that year. Supplementary penalties may also be imposed on local authorities that contribute to any breach of national landfill directive targets.

WHERE DO I LOOK FOR MORE INFORMATION ON THIS?

The Landfill Directive

http://europa.eu.int/scadplus/leg/en/lvb/l21208.htm

The Landfill Regulations

http://www.defra.gov.uk/environment/waste/topics/landfill-dir/landfilldir.pdf

LATS

http://www.defra.gov.uk/environment/waste/localauth/lats/index.htm

Background

Waste Policy in England

In addition to the EC Landfill Directive and LATS there are wider environmental, legislative and economic reasons to reduce the quantities of wastes disposed of in landfills, including:

- Increasing priority of Government to deal with the threat of climate change and the role of sustainable waste management in reducing greenhouse gas emissions
- The need to shift the emphasis from waste management to resource management (i.e. to reduce the consumption of materials and energy and to deal with waste as a potential resource of recyclable materials and recoverable fuels) is an important central theme of the sustainable development agenda as described in the EU Thematic Strategy and Waste Strategy for England 2007
- Waste generation is a Government headline indicator for sustainable development and there are additional indicators for disposal to landfill
- The recognition of the potential of waste management treatment processes as contributors to renewable energy and security of energy supply
- The Statutory Best Value Performance Indicators, which promote higher composting and recycling rates for household waste
- Financial incentives to seek alternatives to landfill. The Landfill Tax rose to £24/tonne in April 2007 and is due to rise by £8/year until at least 2010
- The Household Waste Recycling Act 2003 includes a requirement for all households to have kerbside collection of recyclables for at least two materials, where practicable, unless alternative comparable provision is made

WHERE DO I LOOK FOR MORE INFORMATION ON THIS?

Waste Strategy for England 2007 and supporting annexes

http://www.defra.gov.uk/environment/waste/ strategy/strategy07/index.htm

Guidance on developing municipal waste management strategies

http://www.defra.gov.uk/environment/waste/management/guidance/mwms/pdf/mwms.pdf

Sustainability / Sustainable Development

http://www.sustainable-development.gov.uk/

The Landfill Tax

http://www.hmce.gov.uk/businesses/moretma.shtml

Best Value Performance Indicators

http://www.defra.gov.uk/environment/waste/localauth/perform-manage/index.htm

Strategy and Option Development

There are a wide variety of alternative waste management options and strategies for dealing with MSW to limit the residual amount left for disposal to landfill. This section provides an introduction to these alternative options each of which has its own strengths, weaknesses, risks and benefits. There are many technical and local variations in how waste is managed. Readers seeking further and more detailed information should consult the contacts and recommended websites at the end of each section.

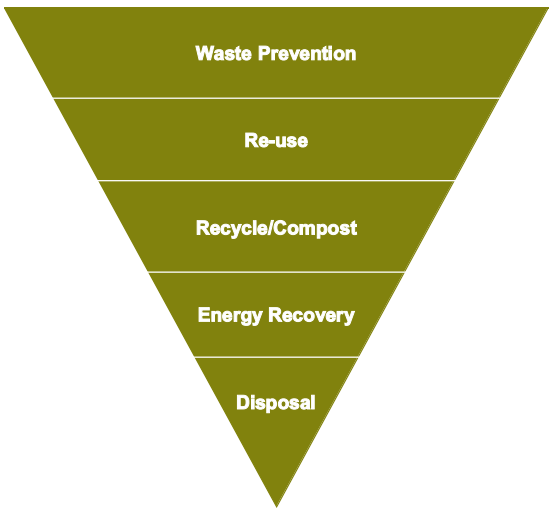
The Hierarchy of Options

One of the guiding principles for European and UK waste management has been the concept of a hierarchy of waste management options, where the most desirable option is not to produce the waste in the first place (waste reduction and prevention) and the least desirable option is to dispose of the waste with no recovery of materials or energy. Between these two extremities there are a wide variety of waste management options that may be used as part of a waste management strategy to recover materials (for example furniture reuse, glass recycling or green waste composting) or generate energy from the wastes (for example through incineration, or fermenting biodegradable wastes to produce usable gases). The role of each of these options is introduced within this guide.

The waste hierarchy (an example of which is shown in Figure 3) is only intended as a guide and should be used in conjunction with life-cycle thinking and with decision making principles as described in the Government's guidance on strategic and spatial planning, specifically:

- Waste and Resources Assessment Tool for the Environment (WRATE), a 'Life Cycle Assessment' (LCA) software tool for comparing different management systems treating Municipal Solid Waste (MSW)
- Guidance on Municipal Waste Management Strategies (DEFRA, July 2005)
- Planning Policy Statement 10: Planning for Sustainable Waste Management (Communities and Local Government, July 2005)
- Companion Guide to Sustainable Waste Management (Communities and Local Government, June 2006)

Figure 3: Waste Hierarchy Diagram

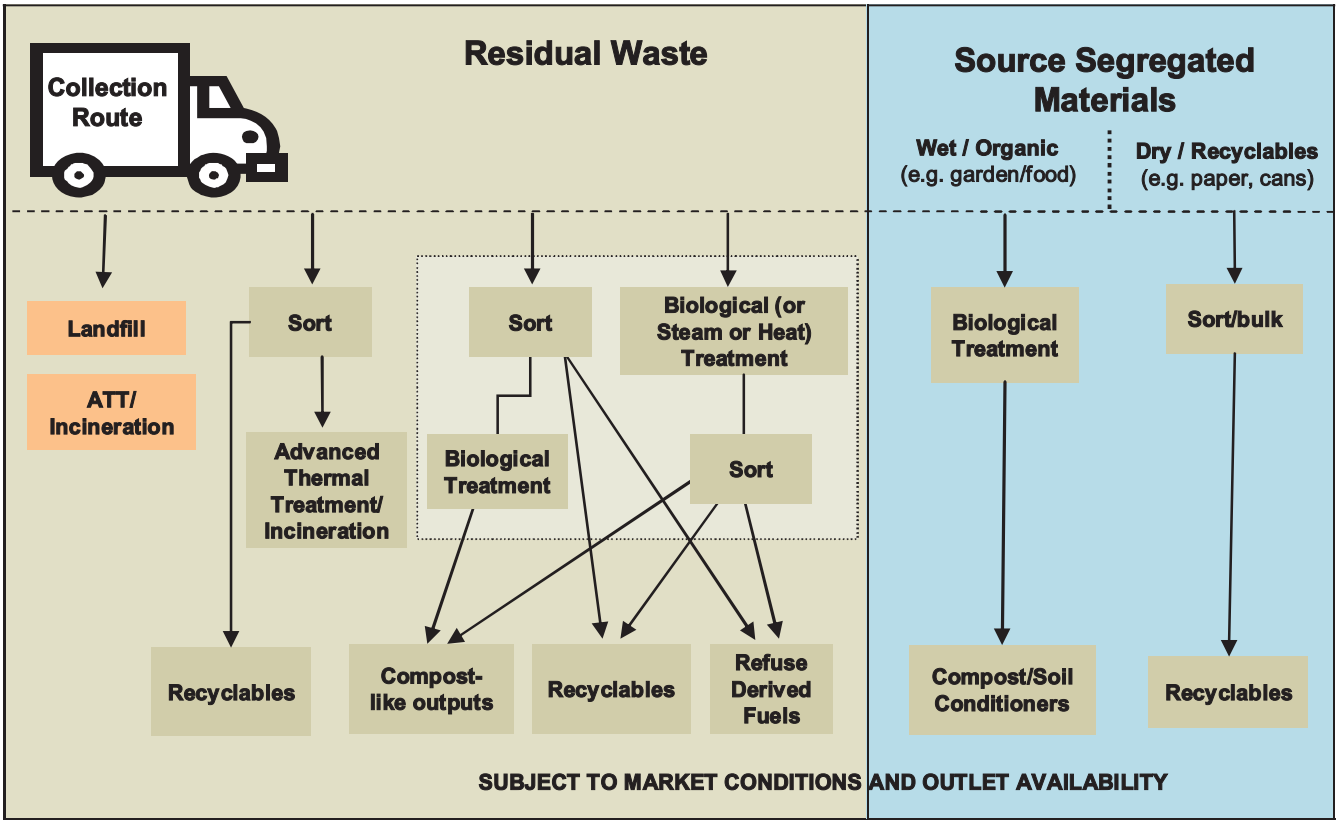


Source: Waste Strategy for England 2007

Waste recovery and disposal options

After reduction and reuse initiatives have taken place, material and energy recovery is required followed by disposal of any remaining waste. How MSW is managed is linked to the collection systems in place to collect waste and materials from the kerbside. In figure 4, the right side of the diagram illustrates the options that are available to local authorities for collecting materials sorted by the householder for recycling and composting (known as 'source segregated' materials). The left side of the diagram illustrates the options available for managing the remaining, residual MSW.

Figure 4: Options for Recovery & Treatment of Municipal Solid Waste



This diagram excludes residues sent directly to disposal from treatment processes and other rejects from the processes which will typically be sent to landfill. There are almost always rejects for disposal from all recycling, composting and treatment processes. Materials which fail in the marketplace are also likely to be sent for disposal.

The rest of this guide describes the main options available for managing MSW, and the role they have in diverting BMW from landfill.

Strategy and Option Development

WHERE DO I LOOK FOR MORE INFORMATION ON THIS?

The Waste Hierarchy

http://www.defra.gov.uk/environment/waste/topics/index.htm

EU Thematic Strategy on Waste

http://www.defra.gov.uk/environment/waste/thematicstrat/index.htm

Guidance on Municipal Waste Management Strategies

http://www.defra.gov.uk/environment/waste/localauth/pdf/guidemunwaste-strategy.pdf

Planning Policy Statement 10

http://www.communities.gov.uk/index.asp?id=1143834

WRATE

http://www.environmentagency.gov.uk/wtd/1396237/

Prevention and Re-use

Prevention

Managing waste places an environmental, social and economic burden on society. Taking steps to prevent waste from being produced in the first place saves natural resources and reduces the burden of waste management. MSW quantities have historically grown by around 1.5% a year, although the average annual rate of growth over the last 5 years has reduced to around 0.5%. There are a number of reasons for this increase, including: the changing demographics of society such as more people living on their own leading to increased waste arisings per person; increased levels of packaging on products and the consumer based 'disposable' society.

Measures which can be used to reduce waste arisings include: changing householder behaviour, for example by promoting the purchase of products with less packaging or encouraging the use of alternatives which reduce the amount of waste entering the waste stream such as providing compost bins to householders with gardens . Initiatives such as developing home composting will tackle directly the organic, biodegradable components of MSW. The promotion of services to reduce unwanted direct mail and the quantity of paper packaging used with in products will also target the biodegradable materials in MSW.

There are a wide variety of initiatives to promote and support waste reduction, delivered by local authorities in the UK. There is also assess to support for waste reduction initiatives either through the promotion of good practice or by providing access to funding, including projects implemented and managed by:

- Waste & Resources Action Programme – working with retailers and their supply chain to encourage waste reduction and recycling; managing a Home Composting Campaign working with local authorities in England and Scotland to encourage householders to purchase compost bins at a subsidised price and providing advice;
- Eco-Schools, a programme of assistance to schools to enable them to analyse their operations and become more sustainable
- Envirowise providing waste minimisation advice to businesses
- Business Resource Efficiency and Waste (BREW) Programme, providing advice and support to business on improving resource efficiency measures, minimising waste production and improving its bottom line

Prevention and Re-use

Re-use

If waste generation cannot be prevented then the next best option is to reuse relevant materials. 'Reuse' means the application of the waste material, product or appliance for the same purpose as was originally intended, by the same or another user. An example of this would be the reuse of furniture collected by a local authority or deposited at a Household Waste Recycling Centre (HWRC). Often waste materials such as discarded electrical goods, furniture, bicycles and similar consumer goods will require repair or some form of safety check to ensure that they are appropriate for reuse by another consumer. The third sector (e.g. community groups) has demonstrated good practice in this area of work. Clothing reuse is most often carried out via charity shops and larger charity organisations such as the Salvation Army. The reuse of furniture, for example, would have a positive impact on the residual waste stream as this would result in less BMW remaining for disposal (wood is considered to be 100% biodegradable and textile / fabrics 50% biodegradable). Households can also reuse materials to avoid or delay them entering the waste stream, for example by reusing glass jars and carrier bags.

Community and charity groups often fulfil their social and environmental aims through the reuse of waste, providing useful items to those most in need in their local area. The Furniture Reuse Network has around 400 member organisations which aim to reduce poverty by helping households in need access furniture, white goods and other household items at affordable prices. Many of these schemes also provide training and employment opportunities for the community.

Where materials are used as a raw material for a new product (i.e. reprocessed in a production or manufacturing process for the original purpose, or for other purposes), this is known as Recycling.

WHERE DO I LOOK FOR MORE INFORMATION ON THIS?

WRAP

http://www.wrap.org.uk/

National Industrial Symbiosis Programme

http://www.nisp.org.uk

Community Composting Network

http://www.comunitycompost.org

Community Recycling Network

http://www.crn.org.uk

Furniture Reuse Network

http://www.frn.org.uk

Community Repaint Network

http://www.communityrepaint.org.uk

Recycling and Collection Systems

Source Segregated Materials for Recycling

The term 'Recycling' means to reprocess a waste material into a usable item either in the same form as the original product or into a different product. To achieve recycling, the appropriate waste materials (recyclables) must be separated from the mixed waste stream. This separation can be achieved in a number of different ways, for example, householders can take the materials to dedicated facilities (known as bring or 'drop – off' sites) such as bottle or paper banks or to Civic Amenity sites (increasingly known as Household Waste Recycling Centres). Alternatively the materials may be collected directly from households in separate containers (source segregated collections of recyclables) or extracted from, residual MSW by a echanical and possibly manual sorting process. However the collection of recyclables represents just the first stage in the recycling process. These recyclables may need further sorting and bulking before they are transported to reprocessors to be converted into new products or into an appropriate feedstock material for a manufacturing process.

The Government has set statutory recycling and composting targets for local authorities in England to encourage increasing levels of recycling across the country and national recycling levels have improved significantly in response. The Household Waste Recycling Act 2003 requires all waste collection authorities to provide kerbside collections for at least two materials from all households, where practicable, and unless equivalent alternative arrangements are in place, by 2010. Over the last few years considerable investment has gone into recycling schemes with England achieving a recycling rate of 27% in 2005/6. *Waste Strategy for England 2007* sets higher national targets for the recycling and composting of household waste of at least 40% by 2010, 45% by 2015 and 50% by 2020.

Technical advice and support is available to local authorities to help them develop and implement segregated collection systems for recyclables and organic wastes from the WRAP Recycling and Organics Technical Advisory Team (ROTATE). Further support and advice is available through the Local Authority Recycling Advisory Committee (LARAC) which promotes waste reduction and recycling, through networking, information provision, campaigning and advocacy.

The following paragraphs explain the types of collection systems available for collecting materials at source. The way materials are collected will influence requirements for further sorting or bulking prior to sale into the marketplace or biological treatment and will impact on the quality of the materials and the markets into which they can be sold.

Collection systems for dry materials

Bring Sites and HWRC Collection Options

Recyclables deposited at bring sites or Household Waste Recycling Centres (HWRCs) are usually segregated by types of material: for example all paper goes into one bank, all green glass into another, cans into another. As a result of this segregation, there is a minimal requirement for further sorting of these materials before they are reprocessed into new materials or products. In this instance, a local authority may only require a bulking station to 'bulk up' materials for transport and logistical reasons, before sending the materials direct for reprocessing or to a materials broker. For materials such as mixed paper and mixed glass there may be further sorting into different grades at specialist facilities.

Recycling and Collection Systems

Kerbside Collection Options

For recyclables collected from the household, there are a variety of possible collection options which fall into the following alternatives, each of which require different supporting infrastructure to process the collected recyclables:

Single Material Collections

The local authority will supply a single container – or the household is asked to supply a container such as a plastic carrier bag - for the collection of specific materials. This material may be appropriate for bulking and direct sale to a reprocessor without further sorting, or some limited mechanical sorting may be used to refine the material quality. This system was more popular when recycling systems were first introduced and when many local authorities collected only one material, typically paper. However, as recycling schemes have expanded some authorities have chosen to provide a separate collection of a single material where it has not been feasible to add this material to their multi-material collection scheme, for example, glass.

Co-mingled Collections

The term co-mingled means that all recyclable materials targeted by the collection scheme are placed in the same container (box, sack or wheeled bin) by the householder and are collected (co-mingled) in a single compartment vehicle and delivered to a Materials Recovery Facility (MRF) for sorting. Some authorities operate two stream collections whereby households are provided with one or more containers into which specified mixed recyclables are placed for regular collection – either the glass or the paper can be kept separate from the other materials. These materials are collected in two compartment vehicles in order to keep the glass or the paper separate and are delivered to a MRF for sorting In some schemes, households are asked to provide one of their own containers, such as a plastic carrier bag for collection of paper.

This type of collection system requires a specialist facility to sort the recyclables into separate material types and to prepare them for sale to reprocessors. This is known as a Materials Recovery Facility (MRF) or is sometimes referred to as a Materials Recycling Facility.

Kerbside sorting collections

As with co-mingled collections a container is provided to householders for the targeted recyclables which are then sorted into constituent materials at the kerbside (i.e. from the box outside the household) by the operatives of a specialist collection vehicle. This is a more labour intensive process in terms of the collection operation compared with a co-mingled collection scheme. However, generally a MRF is not required and it has benefits in terms of ensuring that a higher quality of material is usually collected.

Mixed Waste Collections

Recyclables may also be extracted from the mixed MSW (normal residual or 'black bag' waste) through separation and treatment processes. These types of systems are described later in this guide and include Mechanical Biological Treatment and Mechanical Heat Treatment. The amount of recyclables extracted from these systems is likely to be limited and of a lower quality (in most instances) than recyclables collected through dedicated source segregated collection systems. However, combined with some form of source segregated collection system, the additional materials recovered from mixed wastes can enhance overall recycling rates.

Collection Systems for organic materials (biowaste)

Bring Sites and HWRC Collection Options

Garden (or green) waste can be deposited by householders at bring sites or HWRCs into designated containers. Good signage is required to reduce contamination from non-biodegradable material, such as plastic bags. The waste is usually composted in open windrows.

Kerbside collection options

The challenges of meeting the statutory recycling and composting targets, as well as the Landfill Directive BMW diversion targets, have led many local authorities to give priority to the biodegradable wastes contained within MSW through separate collections of garden waste, and in some instances, food waste (or kitchen waste). These wastes are typically collected in wheeled bins or sacks and may involve a specialist collection vehicle. Authorities are developing a range of different schemes, some collecting garden waste only, food waste and garden together, and sometimes food waste separately. These wastes are known as 'biowastes'.

WRAP has published the findings of two studies into the management of household biowaste covering the:

- Cost and benefits of different approaches to biowaste collection and management
- Cost and environmental implications of different methods for collecting and treating food waste

The main finding of the work is that there are real benefits to local authorities in terms of cost and capture of biowaste if both the collection and processing costs are considered together. Mixing food waste with garden waste in kerbside collections should be avoided if possible as it adds significant processing costs and may not result in significantly higher biowaste diversion rates if collected on a fortnightly basis. For further information see the reports on the WRAP website[8].

Methods for increasing recycling rates

There are a number of methods local authorities can use to further increase their recycling rates. These include:

- Introducing / expanding kerbside collection schemes to more households
- Collecting more recyclable material streams (such as garden waste and kitchen waste)
- Increasing householder participation/ container set-out rates

[8] http://www.wrap.org.uk/local_authorities/biowaste.html

Recycling and Collection Systems

- Reducing the level of contamination in the materials collected
- Maximising the capture rate: increasing the amount of a particular material that is collected

Markets for Recyclables

It is essential to have secure markets for materials collected for recycling, as material can only be deemed to have been recycled once it is beneficially incorporated into new products. The market for the sale of recyclables can fluctuate considerably, although improved price stability has been experienced in recent years. As more material comes onto the market with improved local authority recycling rates, it is likely that quality issues and the capacity of the market to accept these additional materials will become increasingly important. In 2001, the Government established the Waste & Resources Action Programme (WRAP) to address these market issues and stimulate new markets for recyclates. This programme continues to work in the development of markets.

WHERE DO I LOOK FOR MORE INFORMATION ON THIS?

WRAP Good Practice Guides

http://www.wrap.org.uk/local_authorities/toolkits_good_practice/index.html

Local Authority Support Unit

http://www.defra.gov.uk/environment/waste/wip/support/index.htm

WRAP ROTATE:

http://www.wrap.org.uk/local_authorities/rotate/index

Waste and Recycling Beacon Case Studies

http://www.beacons.idea.gov.uk/idk/core/page.do?pageId=5148277

RecycleNow Partners Developing Recycling Communications campaigns

http://www.recyclenowpartners.org.uk/

Mechanical Sorting and Processing

Mechanical techniques may be used to sort co-mingled recyclates into separate material streams or may be used to separate mixed MSW into different fractions. Mechanical sorting and processing techniques are used, to some extent, in conjunction with most residual waste treatment technologies. Mechanical methods may be combined with manual sorting in the form of picking lines where materials are hand picked and sorted from a co-mingled materials stream. Manual sorting should only be undertaken on appropriate waste streams and using adequate protective equipment and environmental controls. Mechanical sorting techniques are typically based on conveyor systems for moving the materials around the treatment facility, with various processes to sort materials by size and density.

Sorting of Co-mingled Recyclables

The sorting of co-mingled materials, where materials such as cans, plastic and paper are collected from the kerbside in the same vehicle, is required to sort the recyclables into different material fractions. Sorting separates materials according to their physical properties using equipment such as magnets, screens and trommels. Usually manual sorting is included as well as mechanical sorting if source segregated materials are being sorted. The sorting process takes place in a Materials Recovery Facility (MRF). As a greater range of materials are now collected at the kerbside compared with a few years ago, more advanced equipment is used in some MRFs, capable of separating glass from paper, different types of plastic, or paper from plastic.

WRAP has issued some guidance on MRFs that draws on good practice in MRF design and operations from the USA and Europe and has undertaken some work to better understand the contractual arrangements in place between local authorities and their MRF contractors. A MRF costing tool also is available from WRAP.

Sorting and Processing of Residual MSW

There are a variety of techniques which may be used to separate residual MSW into different fractions and the purpose of this may be:

1. To extract recyclable material;

2. To separate out an organic rich fraction (high in BMW) for biological processing; or

3. To produce a fraction with a high calorific value (good combustion properties) to be used as a fuel.

To render the waste more suitable for separation techniques it must first be prepared. Preparation techniques release the waste from the bags it is contained in and reduces the size of the waste. The type of mechanical preparation process used depends on the desired outputs from the overall treatment process. For example, a bag splitting process may be used if the objective is to maximise the recovery of recyclables, where as a more aggressive hammer mill may

Mechanical Sorting and Processing

be used to significantly reduce the size of the waste for fuel production. A complex mechanical sorting system may be used to divide the residual waste into several fractions. There will always be a reject fraction requiring disposal to landfill from MSW processing operations.

It is important to note that there will be some contamination of the different waste fractions sorted through mechanical means from a residual MSW stream. The degree of contamination can be mitigated by the addition of another treatment process (for example partially composting or 'drying out' of the waste, see Mechanical Biological Treatment), or steam treatment, see Mechanical Heat Treatment) and / or intensive mechanical pre-processing through for example, pulverising the wastes down to a more regular sized stream that is more amenable to some of the mechanical sorting processes.

WHERE DO I LOOK FOR MORE INFORMATION ON THIS?

Waste Technology Data Centre

http://www.environment-agency.gov.uk/wtd

Defra Waste Technology Guides

http://www.defra.gov.uk/environment/waste/wip/newtech/index.htm

Materials Recovery Facility Guidance

http://www.wrap.org.uk/local_authorities/toolkits_good_practice/materials.html

Biological Treatment

All biological waste treatment processes involve the decomposition of biodegradable wastes by living microbes (bacteria and fungi) which use the biodegradable waste materials as a food source for growth and proliferation. There are two main types of conditions in which microbes live and therefore two main classes of biological treatment processes:

- Aerobic digestion (or composting) – in the presence of oxygen
- Anaerobic digestion – in the absence of oxygen

These treatment processes can be used for both source segregated organic waste and for the biodegradable fraction of residual MSW, are described below.

Aerobic Digestion

Aerobic digestion, otherwise known as composting, is a biological process in which biodegradable wastes, such as garden and food wastes are decomposed in the presence of oxygen present in air under the action of micro-organisms such as bacteria and fungi. For composting to occur in an optimum manner, five key factors need to be controlled by the process: temperature, moisture content, oxygen concentration, material porosity and the relative amounts of nutrients such as carbon and nitrogen in the material (the Carbon: Nitrogen ratio). The process results in elevated temperatures of the waste, the production of carbon dioxide (like methane, carbon dioxide is a greenhouse gas, but much less potent than methane) water/leachate and a stabilised residue. The carbon dioxide produced from composting is regarded as 'biogenic'. The amount emitted to the atmosphere is equivalent to that adsorbed during its lifetime when the plant matter is growing.

Aerobic digestion can be undertaken on source segregated waste or the organic, biodegradable fraction of residual MSW. The quality of the stabilised residue should be higher for source segregated material and a wider range of markets are available for the resulting compost, which may be marketed as a growing media, soil conditioner or mulch, depending on quality and the physical character of the material. The residue from composted mixed waste will have fewer end market options due to its lower quality. To distinguish it from compost from 'clean' waste the residue is referred to as a compost-like-output in this guide. For more information on the treatment of residual MSW see the technologies described later in this guide.

The composting process is operated according to the types of materials accepted at the facility. If both garden and food waste are composted together (either source segregated or from mixed MSW), stricter rules apply to both the process conditions and end markets for the compost and compost-like outputs. This is due to the potential risks to animals and human health from the transfer of diseases from meat wastes into the environment. These controls are specified by the Animal By-Products Regulations, which are regulated by Animal Health (formally known as the State Veterinary Service).

WRAP deliver an organics initiative under the Defra Waste Implementation Programme, which provides technical advice and training to those active in the composting sector. It has capital funds to help develop new processing capacity for biodegradable waste and is working to develop applications and markets for waste-derived compost.

Biological Treatment

Compost Techniques and Technologies

Composting processes primarily fall into two categories: windrow composting, for garden derived wastes, and 'In-vessel' composting, which is required to process material containing food waste, which has either been collected with garden waste or for the organic fraction mechanically recovered from mixed MSW.

Windrow composting is an established technique for dealing with collected garden wastes in the UK. The material is shredded and then piled in elongated rows, called windrows, and aerated through either turning of the windrows or by air forced through the material. There are many on-farm composting facilities accepting municipal green waste plus an increasing number of centralised, larger composting facilities. Windrow composting generally takes place outdoors and is the least costly form of aerobic digestion. There are other techniques, such as static pile composting, where air is forced through the waste mass to promote biodegradation. Windrow composting is however by far the most prevalent composting technique used in the UK.

In-vessel composting (IVC) embraces a variety of techniques whereby source segregated biowastes or the organic fraction from mixed MSW are initially composted in an enclosed vessel or tunnel, followed by a period of further composting outdoors. The advantage of these processes is that the vessel is designed to achieve and maintain specified temperatures to facilitate pathogen destruction in accordance with the requirements of the Animal By-Products Regulations. This legislation governs the management of wastes arising from animal sources, including food and catering wastes, to prevent animal by-products from presenting a risk to animal or public health through the transmission of disease. As local authorities strive to divert increased quantities of BMW, it is anticipated that UK experience in IVC will significantly increase in the near future.

Compost Markets

The markets available for compost depend on whether the input material was source segregated or from residual MSW, the quality of the resulting compost and the demand for different products. Outputs from facilities processing source segregated waste is usually screened and graded to produce composts, soil conditioners and mulches and is suitable for use in a number of sectors including:

- Land restoration and soft landscaping
- Domestic use in gardens
- Agriculture and horticulture

The activities of the Waste & Resources Action Programme (WRAP) have resulted in the development by the British Standards Institute of a Publicly Available Specification for composted materials (BSI PAS 100). The

purpose of the specification is to increase consumer confidence in buying compost. Compost producers who are PAS 100 certified produce a 'quality compost', by processing source segregated organic waste. The Composting Association is responsible for providing third party assessment and conformity with PAS 100.

A Quality Protocol for Compost developed by WRAP, the Environment Agency and other key players in the industry sector, sets out the criteria for the production of quality compost from source segregated biowaste like food and garden waste. If compost is produced according to these criteria the compost produced is no longer regarded as a waste and can be spreads to land without the need to register with the Environment Agency for a waste exemption. Compost not produced according to the protocol is still considered to be waste, including any output from non-certified composting sites (e.g. sites which are not PAS 100 certified) and any facility processing the organic, biodegradable fraction from residual MSW.

The output from a composting facility processing the organic fraction from residual MSW is not deemed to be suitable for application to agricultural land. Whilst it is sometimes referred to as a soil conditioner by some technology suppliers, the term compost-like-output distinguishes it from 'quality compost'. It can potentially be used to remediate land but would need to demonstrate ecological improvement and a waste management licence exemption would be required from the Environment Agency. Alternatively it can be disposed to landfill, although is likely to have residual biodegradability which would have to be measured and would count towards the landfill allowance scheme (LATS).

Anaerobic Digestion

Anaerobic Digestion (AD) is a biological process where biodegradable wastes, such as food waste or the mechanically separated organic rich fraction of MSW, are converted into a 'digestate' and biogas. The wastes are decomposed by microbes in the absence of oxygen – different to composting which is an aerobic process, taking place in the presence of oxygen. AD systems are enclosed, engineered vertical or horizontal vessels. The biodegradable material is macerated and water is often added to provide suitable moisture and flow properties. Waste remains in the vessels for 2 -3 weeks and reaches temperatures of up to 60 °C. As the waste degrades, biogas is produced, comprising mainly methane and some carbon dioxide. This is collected in tanks and used on or off site. Biogas can be used in a number of ways but is usually burned to produce electricity; the heat from the process may be utilised on site of by neighbouring users. Excess electricity not required by the plant can be exported for distribution in the grid and excess heat can be used for district or industrial heating.

AD is used in the UK for treating agricultural manures and slurries, as well as sewage, however there is limited experience on its application to municipal biowastes in the UK. The Defra New Technologies Demonstrator Programme has partly funded the development of a demonstrator plant in Shropshire to process predominantly source segregated food waste and garden waste. There is also a commercial scale AD facility in Leicestershire treating the mechanically separated organic fraction of residual MSW. There is considerable interest in this technology as an option to help meet the landfill diversion obligations and to generate renewable electricity.

Biological Treatment

Anaerobic digestion is particularly suited to treating source segregated food waste. It is not particularly suitable for treating garden only collections although co-mingled garden and food waste can be treated (providing there is sufficient food waste in the mix). The research by WRAP, referred to previously, concluded that of the treatment options available for collected food waste, from an environmental perspective AD is likely to fare the best.

The residue from AD (digestate and liquor) can be applied to land subject to obtaining regulatory approval. The latter point is an important one and the quality of the output from the process will dictate its potential application. If digestate is produced from source segregated biowaste it can count as 'composting' under the statutory recycling and composting targets. Facilities accepting food waste will be subject to the controls that are specified by the Animal By-Products Regulations.

Outputs from the Process

Solid, liquid and gas components are typically generated by an AD process. These outputs are described below:

Digestate and liquor

Due to the high moisture content of the wastes entering the process, the outputs from an AD process can have a high moisture content. The digestate is stored in a storage tank before it is mechanically pressed into solid and liquid fractions. The solid fraction can be used directly on land or aerobically treated to produce a compost /compost-like output.

The use of both the digestate and the liquor will depend on the quality of the input material and the management and operation of the process. Digestate products generated from source segregated biowaste can be used in the same way as compost. When the mechanically separated biodegradable

Biological Treatment

fraction of residual MSW is digested it is unsuitable for application to agricultural land. It can potentially be used to remediate land but would need to demonstrate ecological improvement. Alternatively it can be disposed to landfill, although is may have some residual biodegradability which will need to be measured.

Biogas

The biogas (mostly methane and some carbon dioxide) produced during this process can be sold as fuel or combusted to generate electricity, for example, in gas engines. The sale of this electricity will be eligible for Renewables Obligation Certificates (ROCs) which can provide an additional income stream. ROCs provide a financial incentive for the production of electricity from renewable sources. Information on renewables is available from the DTI and trading of ROCs are administered by the Non-Fossil Purchasing Agency.

There is more information on both aerobic digestion and anaerobic digestion within the separate Technology Brief on Advanced Biological Treatment (ABT) in this series, available on the Defra New technologies web pages.

WHERE DO I LOOK FOR MORE INFORMATION ON THIS?

Waste Technology Data Centre

http://www.environment-agency.gov.uk/wtd

Defra New Technologies Demonstrator Programme

WRAP, ROTATE and the Organics

programme http://www.wrap.org.uk/

ABT Technology Brief

http://www.defra.gov.uk/environment/waste/wip/newtech/index.htm

Animal By-Products Regulations

http://www.defra.gov.uk/animalh/ by-prods/legislation.htm

Animal Health

http://www.defra.gov.uk/animalhealth/inspecting-and-licensing/abp/index.htm

The Composting Association

http://www.compost.org.uk/

Renewables Obligation

http://www.dti.gov.uk/energy/sources/renewables/index.html/

Non-Fossil Purchasing Agency

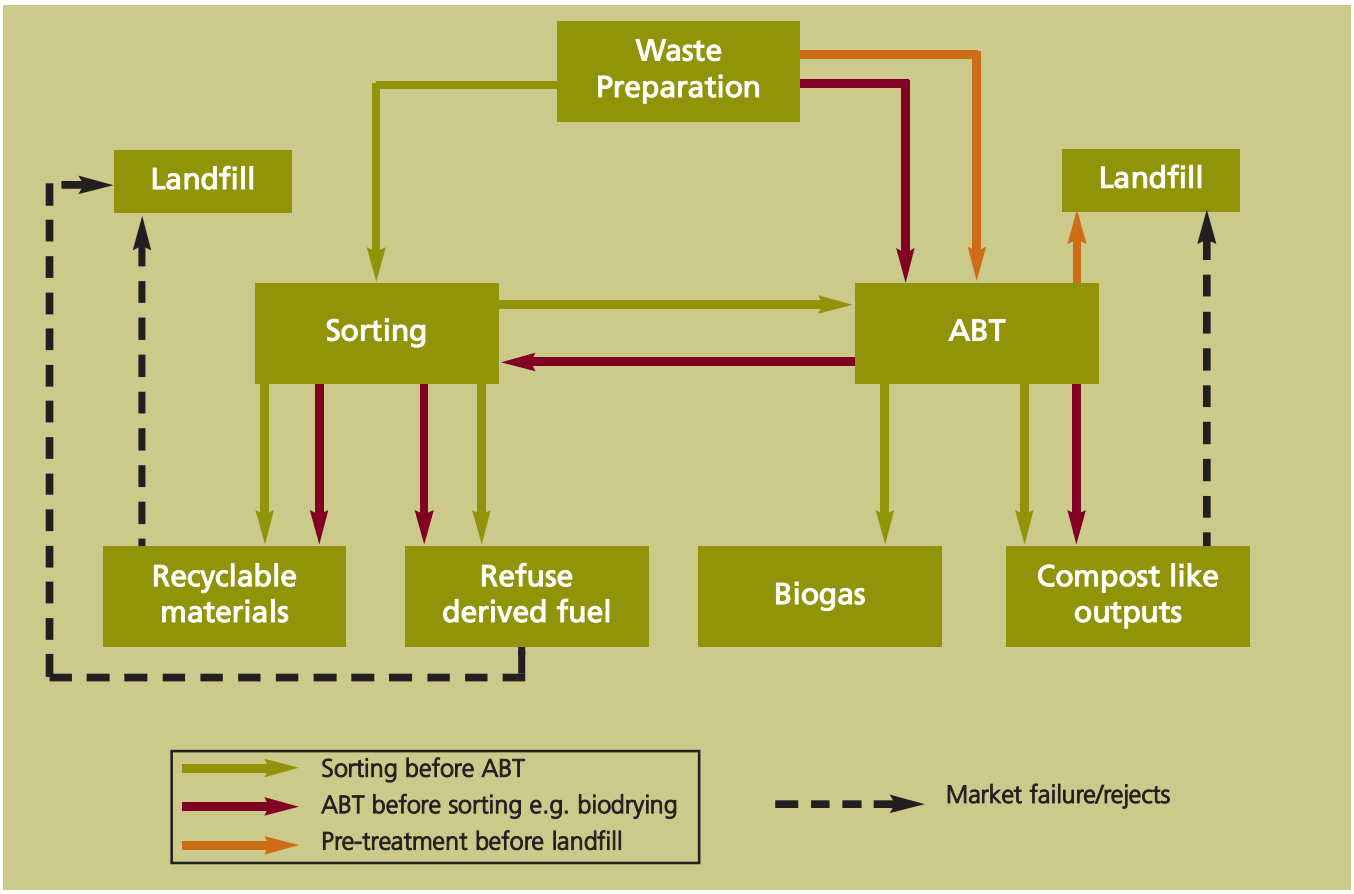
http://www.nfpa.co.uk/

Mechanical Biological Treatment

Mechanical Biological Treatment (MBT) is a generic term for an integration of several processes commonly found in other waste management technologies such as Materials Recovery Facilities (MRFs), sorting and composting or anaerobic digestion plants. MBT facilities always contain both mechanical and biological processes and are used to treat residual MSW. The first MBT plants were developed with the aim of pre-treating waste, reducing the environmental impact of landfilling residual waste. MBT therefore compliments, but does not replace, other waste management technologies such as recycling and composting as part of an integrated waste management system.

MBT plants may be configured in a variety of ways to achieve the required recycling, recovery and BMW diversion performance. In its simplest form, MBT provides a drying and mass reduction operation for residual waste prior to landfill, however this approach is unlikely to achieve significant BMW diversion performance unless further biological treatment is undertaken. Other MBT systems are designed to treat and separate residual MSW into useable fractions of materials and/or a waste fuel for energy recovery. Figure 5 below illustrates the potential options for MBT. Following waste preparation, the waste is either sorted first or undergoes biological treatment first. ABT is short for Advanced Biological Treatment and includes both aerobic and anaerobic techniques.

Figure 5: Mechanical Biological Treatment options



Mechanical Biological Treatment

Mechanical Treatment

Prior to mechanical sorting, waste preparation is required to release the contents of the bags and reduce the size of the waste materials. Techniques used include bag splitting, hammer mills and ball mills.

The mixed waste is sorted by a series of mechanical separation techniques into different fractions. The number of fractions and their composition will be influenced by the markets and outlets available, and the overall performance objective of the facility. The most common fractions obtain are:

- Recyclables – such as metals and sometimes glass/stones to use as an aggregate substitution
- A biodegradable fraction – containing the majority of food waste, garden waste and fines material
- A high calorific, combustible fraction – rich in plastic and paper and card
- A reject fraction – material which is unsuitable for further treatment, perhaps because it is oversize or is a household product such as an electrical item

Treatment options and outputs

Biological treatment can either take place on the whole of the waste or on the separated biodegradable fraction. If all of the residual MSW is biologically treated, a process known as biodrying is often used. This is a form of in-vessel composting and dries the waste, reducing the moisture content making it easier to separate the waste into different fractions. The process usually only takes a maximum of 2 weeks and does not significantly reduce the biodegradability of the waste and the waste is only partially stabilised. The majority of this material is often intended to produce Refuse Derived Fuel (RDF). Alternatively, the waste can be treated for a longer period of time to reduce its biodegradability and disposed to landfill.

When the waste is sorted first, the mechanically separated biodegradable fraction is either composted or undergoes anaerobic digestion. These processes take longer and the objective is to reduce the volume of the waste and to reduce its biodegradability significantly. The material can be regarded as a compost-like output, which can be applied to land under certain circumstances if it meets the regulatory requirements. Currently this outlet is limited since the Environment Agency considers it to be unsuitable for agricultural land[9]. It could be used to remediate poor quality land by contributing to topsoil manufacture, as long as an ecological benefit can be demonstrated. Alternatively the material can be disposed to landfill. The Environment Agency has developed guidance for operators on how to measure the reduction in biodegradability that has taken place through biological treatment. This information could help an authority achieve allowance allocations under the landfill Allowance Trading Scheme (LATS), however the testing regime is not a statutory requirement currently.

9 http://www.environment-agency.gov.uk/commondata/acrobat/mbt_output_guidance_1149762.pdf

Mechanical Biological Treatment

The Government has identified 6 potential outlets for RDF:

1. Industrial intensive users, for power, heat or both (combined heat and power, CHP)

2. Cement kilns

3. Purpose build incinerators with power output or CHP

4. Co-firing with coal at power stations

5. Co-firing with biomass fuels

6. Advanced thermal treatment technologies such as gasification and pyrolysis

The main current example of co-combustion in the UK is the burning of RDF in cement kilns although other markets are developing. Waste contractors are developing relationships with the cement industry and others to try and meet their specifications and provide a useful industrial fuel and waste recovery operation.

MBT plants are well established in mainland Europe and are becoming operational in the UK. Many Local Authorities are considering MBT as a technology choice for treating residual waste and planning permission has been granted for several facilities treating a considerable tonnage of MSW. There is more information on MBT within the separate Technology Brief in this series, available on the Defra New technologies web pages.

Mechanical Heat Treatment

Mechanical Heat Treatment is a relatively new term used to describe configurations of mechanical and thermal, including steam, based technologies. The generic purpose of these processes is to separate a mixed waste stream into several component parts, to give further options for recycling, recovery and in some instances biological treatment. The processes also sanitise the waste, by destroying bacteria present, and reduce its moisture content.

The most common system being promoted for the treatment of MSW using MHT is based around a thermal autoclave. Autoclaving has been used for many years to sterilise hospital and surgical equipment using the action of steam and pressure. This technology is also in common use for the sanitisation treatment of some clinical wastes, and for certain rendering processes for animal wastes, prior to sending to landfill. However its application to MSW is a recent innovation and there is limited commercial experience on this feedstock material.

A second type of MHT system is a non-pressurised heat treatment process, where waste is heated in a rotating kiln prior to mechanical separation.

Most processes carry out a basic initial screening to remove any large items from the waste stream unsuitable for further processing in the system; for example, large metal objects, rubble or particularly bulky or difficult items such as carpets. Several processes then shred the waste to homogenise the particle size. The waste is then loaded into the heat treatment vessel. The steam process 'cooks' the waste to:

- Breakdown biodegradable materials, including paper and card, into a fibre or floc
- Clean glass bottles and cans and disintegrate the glue;
- Plastics are softened and labels are removed. Certain types of plastics are deformed by the heat, but remain in a recognisable state, whereas other plastics soften completely forming hard balls of dense plastic.

The cleaning action of the steam is said to make materials more suitable for recycling, although the limited commercial track record of these technologies for MSW processing should be a consideration when discussing markets or outlets for the outputs. The fibre (sometimes called floc) is promoted to be suitable for recycling into construction products, use as RDF or can be biologically treated to reduce its BMW content prior to landfill. Although there are many options for managing the outputs from MHT they are all dependent on availability of sustained markets and outlets.

There is limited experience in the application of MHT to MSW treatment. There are no commercial UK facilities currently (this may change over the next year) although there are some smaller scale demonstrator facilities. Most commercial experience is derived from a facility in the USA. There is more information on MHT within the separate Technology Brief in this series, available on the Defra New technologies web pages.

Thermal Treatment

Incineration

Incineration involves the combustion of unprepared residual MSW or RDF. All incinerators in the UK recover energy from waste in the form of electricity and/or heat. To allow the combustion to take place a sufficient quantity of oxygen is required to fully oxidise the fuel. Incineration plant combustion temperatures are in excess of 850°C and the waste is mostly converted into carbon dioxide and water. Any non-combustible materials (e.g. metals, glass, stones) remain as a solid, known as Incinerator Bottom Ash (IBA) that always contains a small amount of residual carbon.

Waste is combusted under controlled conditions, to reduce its volume and hazardous properties, and to generate electricity and / or heat. There are currently 19 plants in the UK and England disposed of 2.8 million tonnes of MSW through incineration in 2005/6.

Recovery of energy from residual waste, including by incineration, is compatible with a high recycling strategy. The key to striking the right balance lies in early consultation between stakeholders when local waste strategies are being developed, and in suitably flexible facilities and contracts – i.e. that do not 'lock in' fixed amounts of waste. In mainland Europe, Denmark and the Netherlands divert the most waste from landfill, achieving the highest recycling rates and recovering energy from residual waste.

All waste incineration plant must comply with the Waste Incineration Directive. This Directive sets the most stringent emissions controls for any thermal processes regulated in the EU. The requirements of the Directive have been translated into the UK through The Waste Incineration (England and Wales) Regulations 2002[10] which came into force on 28 December 2002. The Directive imposes strict measures on the operating temperature and control measures for emissions. As a result all facilities have extensive air pollution control equipment to clean exhaust gases and are required to effectively manage the solid residues arising from a facility.

There are two principal solid residues from thermal treatment systems: the bottom ash, which is the solid remainder of the waste feedstock after processing (Incinerator Bottom Ash, IBA) and the treatment residues from the air pollution control process (Air Pollution Control, APC residues). The residues from stack emission control process are classified as hazardous waste and will require specialist treatment whilst the bottom ash may be recycled into appropriate construction applications or disposed of to landfill. Most facilities also recover metals for recycling from the IBA.

Moving Grate Plants

Modern incineration plant tend to use moving grate technology. This means the waste is slowly propelled through the furnace by a mechanically moved grate. Waste continuously enters at one end of the furnace and the ash is continuously discharged at the other. As the waste moves through the furnace (or combustion chamber) it undergoes complete combustion. The technology needs to be managed to ensure the necessary conditions for optimum combustion of the waste. The typical unit capacities of an incinerator plant range from 45 – 200,000 tonnes per annum. Site capacities may be up to 600,000 tonnes per annum (if more than one unit is used on a particular site).

[10]The Waste Incineration (England and Wales) Regulations 2002 (SI 2002 No, 2980). http://www.opsi.gov.uk/si/si2002/20022980.htm

Thermal Treatment

Fluidised Bed Technology

The combustion of MSW using a fluidised bed (FB) technique involves pre-sorting of residual MSW materials to remove heavy and inert objects, such as metals, prior to processing in the furnace. The waste is then mechanically processed to reduce the particle size. The combustion is normally a single stage process and consists of a lined chamber with a granular bubbling bed of an inert material such as coarse sand / silica or similar bed medium. This bed is 'fluidised' by air (which may be diluted with recycled flue gas) being blown vertically through the material at a high flow rate. Wastes are moved through the furnace by the action of this fluidised bed of particles. The UK has much less experience of managing MSW through this technology, although it is widely applied to sewage sludge. A new fluidised bed plant has recently been commissioned in Allington, Kent.

Other Kilns

Oscillating Kilns move waste through the furnace by a 'rocking' or oscillating action, shuffling waste through an inclined combustion zone. There is only one commercial scale facility in the UK using an oscillating kiln design, the 56,000 tpa facility at Grimsby. This plant uses technology more prevalent in France, which is appropriate for smaller scale facilities (25-60,000 tonnes per annum), in this instance incorporating combined heat and power (CHP). Smaller scale plant may be integrated into a more local solution for smaller communities. There is more information on Incineration within the separate Technology Brief in this series, available on the Defra New technologies web pages.

Advanced Thermal Treatment

There are a wide variety of Advanced Thermal Treatment (ATT) systems incorporating alternative heat based technologies for the treatment of residual MSW or prepared RDF. Both incineration and ATT liberate energy from waste and remove its biodegradability. These technologies differ in how the energy is liberated for recovery. Incineration combusts waste in an excess of air to directly release energy, whereas ATT systems treat waste in the absence of oxygen in a limited quantity of air to produce a syngas, which is used to generate energy. The most common ATT systems marketed for MSW fall under one of two groups. Pyrolysis or Gasification based processes, although both can be used sequentially, as part of the same ATT plant.

Pyrolysis

Pyrolysis, often incorporating gasification, is a medium temperature thermal process where organic derived materials in the waste are broken down under the action of heat and in the absence of oxygen. Pyrolysis is similar to the process which produces charcoal. Only carbon based materials can be pyrolysed. Where MSW is to be used it is normally pre-sorted to remove the majority of the non-organics and may be mechanically processed to homogenise the feedstock. A prepared Refuse Derived Fuel (RDF) from another appropriate process may also be used. The Pyrolysis process heats the waste, typically between 300-850°C, and breaks down plastics, paper and other organic derived materials to produce a gas (known as syngas). This gas may be condensed to produce a Pyrolysis Oil. The Pyrolysis Oil or the gas may be used as a fuel to generate electricity or in an engine. Flue

gas clean up measures would be required for Pyrolysis facilities. A solid (Pyrolysis char) is also produced which may require specialist disposal or additional processing, for example in a Gasification process.

Gasification

Gasification operates at a higher temperature range than Pyrolysis, typically above 650°C. Air or oxygen is used to partially combust the waste to achieve higher temperatures. Gasification is equivalent to the process which produced 'town gas' from coal. Additionally for Gasification, water is added to the Gasifier, either as steam or as water included in the feedstock (in this case MSW or a fraction thereof). The high temperature causes, the water 'cracks' to produce hydrogen and oxygen. The oxygen reacts further with the carbon in the feedstock (waste) material. The differentiation between Pyrolysis and Gasification is the high concentration of hydrogen in the gas produced by the process. As with Pyrolysis the gas produced (Syngas) can be combusted to generate electricity (as described above). A solid residue (ash or slag) is also produced which usually requires disposal if no markets for recycling are available. Flue gas clean up measures would be required for emissions from Gasification facilities.

These ATT technologies are unproven for MSW on a commercial scale in the UK, and overseas experience is patchy. The Defra New Technologies Demonstrator Programme contains examples of ATT projects which will assist in demonstrating (or not) their suitability for residual MSW or RDF. There is potential for these systems to be components in an integrated municipal waste management strategy. Facilities may also be appropriate for processing specific 'problem' waste streams or to link in with other pre-processing MSW facilities such as MBT, as they are more suitable for pre-processed, homogenous waste streams (i.e RDF). Their typical small scale (30 – 60,000 tonnes per annum) in contrast to many incineration facilities may make it easier to find suitable locations. The energy production aspects of the processes, with electricity generated from the biomass fraction of waste being eligible for Renewable Obligation Certificates is another positive characteristics of these facilities. There is more information on ATT within the separate Technology Brief in this series, available on the Defra New technologies web pages.

Further information and support on BMW diversion

Waste Technology Data Centre (WTDC)

Run by the Environment Agency, this website is the focus for providing technical data on the new and existing waste management technology options. The site is impartial and aims to provide authoritative and comparable information on waste management technologies. It contains Case Studies on different technology suppliers including aerobic/anaerobic processes, MBT, MHT, ATT and incineration.

WTDC

http://www.environment-agency.gov.uk/wtd

Waste and Resources Assessment Tool for the Environment (WRATE)

WRATE is a 'Life Cycle Assessment' (LCA) software tool for comparing different management systems treating Municipal Solid Waste (MSW). There are other LCA tools; however, none offer the same scope of waste technologies that are provided by WRATE or have the level of sophistication of technical development. The software follows the "Gate to Grave" modelling approach. The system boundary is initiated when materials are discarded into a waste management system (the Gate) to its point of recycling, recovery or final disposal (the Grave).

WRATE has converted the site process data collected by the Waste Technologies Data Centre (WTDC) into 40 life cycle assessments. It includes the processes' environmental costs and benefits of resources used, transport and the operational impacts of materials, and energy treated downstream from WTDC processes. It includes the ecoinvent v1.2 database that is used to estimate the life cycle costs for the materials and energy that are used or recovered by processes. A licence and training is required in order to use WRATE

WRATE

http://www.environment-agency.gov.uk/wtd/1396237/?version=1&lang=_e

Defra New Technologies Publications

This document is one of a series of Waste Technology Briefs produced by Enviros Consulting Ltd for Defra under the Supporter Programme. Technology Briefs in the series include:

- Introductory Guide to Waste Management Options
- Advanced Biological Treatment
- Mechanical Biological Treatment
- Mechanical Heat Treatment
- Advanced Thermal Treatment
- Incineration
- Managing Outputs from Waste Technologies
- Renewable Energy and Waste Technologies

The documents are available electronically on the Defra website.

Defra

http://www.defra.gov.uk/environment/waste/wip/newtech/index.htm

Defra New Technologies Demonstrator Programme

With a budget of £30 million the programme provides nine demonstration projects covering four different waste treatment technologies. The programme aims to prove

Further information and support on BMW diversion

the economic, social and environmental viability (or not) of each selected technology. Visitor centres are provided at each site for key decision makers from local authorities and the waste sector to learn more about the particular strengths and weaknesses of these technologies. There will also be a series of impartial reports, presentations and advice from experts working on behalf of Defra. For further information on the demonstrator projects contact wastetech@enviros.com.

Defra

http://www.defra.gov.uk/environment/waste/wip/newtech/index.htm

Waste & Resources Action Programme (WRAP)

WRAP delivers a number of programmes, funded by Defra, to support and find solutions to resource management issues including:

- An organics market development programme, including support and investment to the composting sector to develop sustainable and reliable markets for increasing tonnages of organic material. This includes capital investment support for the development of composting and anaerobic digestion facilities, business development advice, continued work on compost standards, research and development and specific initiatives with the landscaping and horticultural industries.
- ROTATE - a free advisory service for local authorities providing technical advice and training for local authorities looking to implement and improve collection systems for recyclable materials and organic wastes.
- The national Recycle Now advertising campaign to raise consumer awareness of recycling issues and to get them to act, and a programme of support for locally - managed communications campaigns to increase participation in new or expanded recycling schemes
- A range of issue specific waste minimisation initiatives including home composting, food waste reduction campaign and work with retailers and key brands.

WRAP

http://www.wrap.org.uk

Recycle Now

http://www.recyclenow.com/

Recycle Now Partners

http://www.recyclenowpartners.org.uk/

Glossary

Aerobic	In the presence of oxygen.
Aerobic Digestion/Composting	Biological decomposition of organic materials by micro-organisms under controlled, aerobic, conditions to a relatively stable humus-like material called compost.
Anaerobic	In the absence of oxygen.
Anaerobic Digestion	A process where biodegradable material is encouraged to break down in the absence of oxygen. Material is placed in to an enclosed vessel and in controlled conditions the waste breaks down typically into a digestate, liquor and biogas.
Animal By-Products Regulation	Legislation governing the processing of wastes derived from animal sources.
Biodegradable	Capable of being degraded by plants and animals.
Biogas	Gas resulting from the fermentation of waste in the absence of air (methane/carbon dioxide).
Biodegradable Municipal Waste (BMW)	The component of Municipal Solid Waste capable of being degraded by plants and animals. Biodegradable Municipal Waste includes paper and card, food and garden waste, wood, and a proportion of other wastes, such as textiles.
Bottom Ash	The ash that arises from a combustion process in a furnace.
Bring Sites	Bring Sites are facilities provided at supermarkets and other facilities visited by householders, in which recyclable waste may be deposited.
Char/Slag	Material remaining following partial or complete combustion, or other thermal treatment process such as Pyrolysis and Gasification.
Civic Amenity (CA) Site	A facility where the public can dispose of household waste. Civic Amenity sites often have recycling points.
Co-combustion	Combustion of wastes as a fuel in an industrial or other (non waste management) process.
Co-mingled	Targeted recyclable materials are placed in the same container and collected co-mingled in a single compartment vehicle for sorting at a Materials Recovery Facility.
Digestate	Solid and / or liquid product resulting from Anaerobic Digestion.
Feedstock	Raw material required for a process.
Fermentation	A chemical reaction in which an organic molecule splits into simpler substances.
Flock	A small loosely aggregated mass of flocculent material.
Fluidised Bed Combustion	A combustion technology system in which a sand bed (or similar inert material) is fluidised by air jets, heated to temperatures high enough to support combustion, combustible wastes are then added.
Fly Ash	The fine dust that is removed from the flue gas in the flue gas cleaning process of thermal treatment operations.
Gasification	Gasification is the process whereby carbon based wastes are heated in the presence of air or steam to produce fuel-rich gases. The technology is based on the reforming process used to produce town gas from coal.

Glossary

Greenhouse Gas	A term given to those gas compounds in the atmosphere that reflect heat back toward earth rather than letting it escape freely into space. Several gases are involved, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), ozone, water vapour and some of the chlorofluorocarbons.
Green Waste	Vegetation and plant matter from household gardens, local authority parks and gardens and commercial landscaped gardens.
Incineration	The controlled thermal treatment of waste by burning, either to reduce its volume or toxicity. Incineration recovers energy from waste by utilising the calorific value of the waste to produce heat and / or power.
Inert	Innocuous, undamaging, non-toxic. Something that is not detrimental to health or the environment.
In-vessel Composting	The aerobic decomposition of shredded and mixed organic waste within and enclosed container, where the control systems for material degradation are fully automated. Moisture, temperature, and odour can be regulated, and a stable compost can be produced much more quickly than outdoor windrow composting.
Kerbside Collection	Any regular collection of recyclables or waste from premises, including collections from commercial and industrial premises as well as households.
Liquor	Concentrated liquid, produced as a result of the decomposition of organic waste. If from a landfill site, it is referred to as leachate.
Materials Recycling Facility/ Material Recovery Facility (MRF)	Dedicated facility for the sorting of co-mingled recyclable materials into separate material streams.
Mechanical Biological Treatment MBT	A generic term for mechanical sorting / separation technologies used in conjunction with biological treatment processes, such as composting.
Minimisation	See Reduction
Moving Grate System	A generic term for mechanical sorting / separation technologies used in conjunction with biological treatment processes, such as composting.
Mulches/ Soil Conditioners	Any substance spread or allowed to remain on the soil surface to conserve soil moisture and shield soil particles from the erosive forces of raindrops and runoff. May be used to add texture / structural properties to soil.
Municipal Solid Waste (MSW)	Household waste and any other wastes collected by the Waste Collection Authority, or its agents, such as municipal parks and gardens waste, beach cleansing waste, commercial or industrial waste, and waste resulting from the clearance of fly-tipped materials.
Pyrolysis	During Pyrolysis organic waste is heated in the absence of air to produce a mixture of gaseous and liquid fuels and a solid, inert residue (mainly carbon).
Recyclate/Recyclable materials	Post-use materials that can be recycled for the original purpose, or for different purposes.
Recycling	Involves the processing of wastes, into either the same product or a different one. Many non-hazardous wastes such as paper, glass, cardboard, plastics and scrap metals can be recycled. Hazardous wastes such as solvents, can also be recycled by specialist companies.
Refuse Derived Fuel (RDF)	A fuel produced from combustible waste that can be stored and transported, or used directly on site to produce heat and/or power.

Glossary

Reduction	Reduction can be accomplished within manufacturing processes involving the review of production processes to optimise utilisation of raw (and secondary) materials and recirculation processes. It can be cost-effective, both in terms of lower disposal costs, reduced demand for raw materials and energy costs. It can be carried out by householders through actions such as home composting, reusing products and buying goods with reduced packaging.
Regional Self Sufficiency Principle	Dealing with wastes within the region or country where they arise.
Renewables Obligation	Introduced in 2002 by the Department of Trade and Industry, this system creates a market in tradable renewable energy certificates, for which each supplier of electricity must demonstrate compliance with increasing Government targets for renewable energy generation.
Reuse	Can be practised by the commercial sector with the use of products designed to be used a number of times, such as reusable packaging. Householders can purchase products that use refillable containers, or re-use plastic bags. The processes contribute to sustainable development and can save raw materials, energy and transport costs.
Source-segregated	Usually applies to household waste collection systems where recyclable and/or organic fractions of the waste stream are separated by the householder and are often collected separately.
Statutory Best Value Performance Indicators	Local Authorities submit performance data to Government in the form of annual performance indicators (PIs). The Recycling/ Composting PIs have a statutory target attached to it which Authorities are required to meet.
Sustainable Development	Development which is sustainable is that which can meet the needs of the present without compromising the ability of future generations to meet their own needs.
Waste Collection Authority WCA	District Council (in two tier areas) or Metropolitan/ Unitary Authority with responsibility for waste collection from each household in its area. WCAs also have a duty to prepare and publicise waste recycling plans and strategies.
Waste Disposal Authority WDA	County Council (in two tier areas) or Metropolitan/ Unitary Authority with responsibility for safe disposal of all waste arisings in a particular geographical area. The Environmental Protection Act 1990 required all local authorities to transfer their waste disposal facilities to either a partly owned, arms length Local Authority Waste Disposal Company LAWDC or directly into the private sector to carry out their waste disposal responsibilities exclusively by means of letting contracts.
Waste Hierarchy	This concept suggests that the most effective environmental option may often be to reduce the amount of waste generated (reduction); where further reduction is not practicable, products and materials can sometimes be uses again, either for the same or a different purpose (reuse); failing that value should be recovered through waste (through recycling, composting or energy recovery from waste); only if none of the above offer an appropriate solution should waste be disposed of.
Windrow Composting	The aerobic decomposition of appropriate shredded biodegradable waste using open linear heaps known as 'windrows', which are approximately three meters high and four to six meters across. The process involves mechanical turning of the waste until the desired temperature and residence times are achieved to enable effective degradation. This results in a bulk-reduced, stabilised residue known as compost. Windrow composting can take place outdoors or within buildings and the process takes around three months.

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