Appendix 2

Assessment of Socio-economic and Operational Objectives

CONTENTS

INTRODUCTION

This Appendix presents the results of the assessment of socio-economic and operational objectives (Table A2.1) of a number of waste management scenarios for the Municipality reported in the Case Study. Five scenarios were assessed (detailed in Chaper 3), including a base case representing a continuation of the existing situation. The base case serves to provide a reference point against which the performance of the other options can be compared.

Table A2.1: Summary of Objectives and Indicators

Socio-economic Objectives	**Indicators**
8. To provide local employment opportunities	Number of direct jobs created (jobs)
9. To minimise costs of waste management	Overall costs (£million - to 2010) - *WASTEFLOW*
Operational Objectives	**Indicators**
10. To ensure reliability of delivery	Likelihood of implementation within required timescale (planning issues) -*(performance score)*
	Likelihood of implementation within required timescale (technical status and risk) -*(performance score)*
11. To conform with waste policy	Percentage of material recovered (%) - *WASTEFLOW*
	Percentage of material recycled/composted (%) - *WASTEFLOW*

COST ASSESSMENT METHODOLOGY

All costs are given at current (2002) prices. Collection costs are based on transport and labour requirements plus the cost of providing containers where necessary. Treatment costs are based on the capital and operating costs for waste treatment plants plus transport and residue landfilling costs minus any income from power or recycled material sales. Income from waste treatment charges on commercial customers has not been considered.

All scenarios are assumed to be fully operational by 2010. Professional judgement has been applied as to the phasing of various collection and treatment operations taking account of, for example, time necessary to secure required authorisations, planning permissions and construction periods.

The analysis has been undertaken using AEA Technology's WASTEFLOW cost and performance model. The capital and operating cost of the treatment and disposal operations are based on industry norms and proprietary sources[1].

[1] AEA Technology have direct access to competitively tendered cost information (for various waste management systems) as part of their activity in the environmental consultancy sector – this confidential source information has been used to inform the capital and operating costs used in this assessment.

WASTEFLOW Assumptions

The WASTEFLOW model uses the discounted cash flow technique (DCF) to compare the costs of different scenarios on a like-for-like basis. Whilst the DCF technique is a convenient tool for comparative purposes, it is not the way in which financing for a specific project is determined. This is because, for financing, issues of risk allocation to contracts, levels of debt/equity and other such factors come into play. Nevertheless, the technique provides a reliable method for the appraisal of capital intensive projects. The DCF technique relate, in terms of present worth, the value of revenues and costs which occur over the economic life of the project.

For a given discount rate, the DCF technique determines the gate fee (or annual cost) required to equate the net present value of costs (capital and operating) with the net present value revenues (from power sales, recyclables). A discount rate of 13 per cent has been used for the purposes of this analysis. This is a competitive rate which, in the present analysis also compensates for some of the development costs (e.g. financing) not explicitly included in our analysis. The discount rate chosen reflects the average cost of capital for the project; it is a real discount rate, ie. inflation has been assumed to affect all cash flows to the same extent, enabling it to be excluded from the analysis.

Further assumptions of the cost evaluation are listed below

Parameter	Comment
Landfill Tax	As announced by Government ie. £1/t/y increase to 2004/5
Landfill Gate fee (Ex Tax)	£15/t post 2006/7 on closure of a local site
Value of Landfill Permits	£10 – reflecting the difference in cost between typical cost for recovery operations and disposal cost.

SOCIO-ECONOMIC OBJECTIVES

TO PROVIDE EMPLOYMENT OPPORTUNITIES

A high employment rate is one of the key objectives of sustainable development. It is considered that employment enables people to meet their needs and improve their living standards, and thereby help to tackle poverty and social exclusion. Development of new waste management facilities will create operational jobs, the nature of which will depend on the facility. There will also be temporary opportunities associated with their construction, although these are not considered in this assessment.

The national target is to achieve an increase in the proportion of working age people in employment. The employment structure of the 168,000 workforce (in 2000) in the Municipality's TTWA (travel to work area) was composed of 125,700 employees, 20,300 self-employed, 12,000 armed forces and MOD civilians. This leaves some 10,000 unemployed, of which 5,000 were claimant count unemployed and a further 5,000 were economically active, but out of work. In January 2002 the TTWA had a claimant count unemployment rate of 3% compared to 3.3% nationally. The TTWA has a low economic activity rate: only 69% of the working age population are in employment, compared with 77% in the South West region. Unemployment in the 18-24 age group is also a problem.

Table A2.2 (overleaf) shows, for each scenario, the facility requirements, operational throughputs (2010 tonnages) and the estimate of associated (direct) jobs. The latter is summarised in Table A2.3.

Table A2.3: Direct Jobs

Objectives	Indicators	Scenario				
		A	B	C	C1	D
8. To provide local employment opportunities	Number of direct jobs (jobs)	162	234	244	254	184

TO MINIMISE COSTS OF WASTE MANAGEMENT

The projected mass flows for each scenario allow the determination of the required capacities of the infrastructure necessary to manage the waste stream. Once these are known it is possible to then determine the capital and operating costs of the various components of the system. In Table A2.4 the estimates of capital expenditure for each type of facility is listed. It is assumed that arrangements for green waste composting are made directly with third parties through a normal gate fee arrangement (i.e. as per existing case) so no capital expenditure is incurred.

Table A2.4: Estimate of Capital Expenditure

Facility	Estimated Capital Expenditure (£k)				
Scenario	**A**	**B**	**C**	**C1**	**D**
CAS		2,000	2,000	2,000	
RTS	4,650				
MRF		2,000	2,000	2,000	2,000
Biowaste		4,000	4,000	4,000	3,000
EfW		31,200			33,200
MBT/AD			16,000		
MBT/AD/EfW				30,000	

Through application of the WASTEFLOW model the estimate of the annual revenue costs to the Council have been determined; these are presented graphically in Figure A2.1 (page 5) for the period to 2020. The sum of the annual revenue costs to year 2010 (*Objective 9)*, the baseline year for the BPEO assessment is displayed in Table A2.5 as is, for information only, the actual revenue cost in 2010.

Table A2.5: Revenue Costs

Objectives	Indicators	Scenario				
		A	**B**	**C**	**C1**	**D**
9. To minimise costs of waste management	Overall costs (£million – sum of annual costs to 2010)	148.8	153.7	152.7	154.4	148.2
	Revenue Cost in 2010 (£k)	18,286	19,908	19,977	20,856	18,743

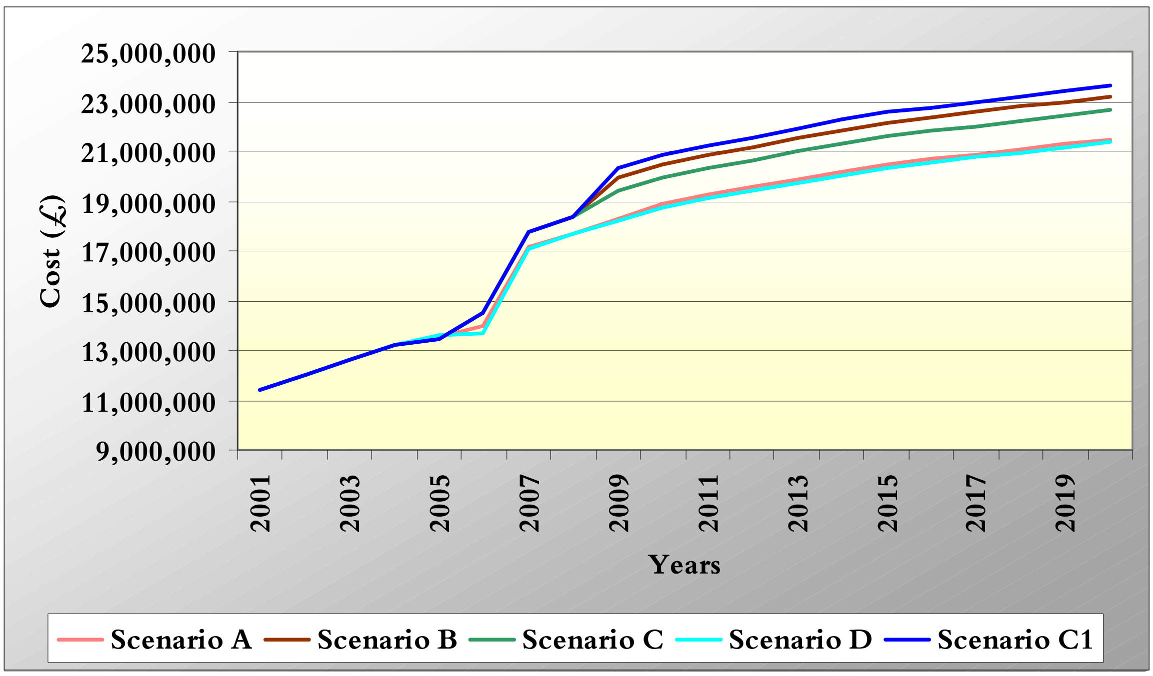
Table A2.2: Facility Requirements & Job Estimates

Facility	Capacity (tonnes)	Jobs
Scenario A		
Civic Amenity Site x 3 (1 new)	90,247	9
RTS x 1	175,609	2
Composting Windrow (remains the same)	11,986	2
MRF (remains the same)	17,345	20
Landfill	183,000	10
Collection	N/A	100
Total Scenario A		**143**
Scenario B		
Civic Amenity Site x 3 (1 new)	90,247	9
RTS x 1	N/A	
Composting Windrow (remains the same)	14,463	3
MRF x 1	40,637	50
Composting In-vessel x 1	21,929	7
EfW x 1	106,581	32
Landfill	41,000	5
Collection	N/A	130
Total Scenario B		**227**
Scenario C		
Civic Amenity Site x 3 (1 new)	90,247	9
RTS x 1	N/A	
Composting Windrow (remains the same)	14,463	3
MRF x 1	40,637	50
Composting In-vessel x 1	21,929	7
MBT (AD) x 1	106,581	35
Landfill	65,000	5
Collection	N/A	130
Total Scenario C		**230**
Scenario C1		
Civic Amenity Site x 3 (1 new)	90,247	9
RTS x 1	N/A	
Composting Windrow (remains the same)	14,463	3
MRF x 1	40,637	50
Composting In-vessel x 1	21,929	7
MBT (AD/EfW) x 1	106,581	47
Landfill	26,000	5
Collection	N/A	130
Total Scenario C1		**242**
Scenario D		
Civic Amenity Site x 3 (1 new)	90,247	9
RTS x 1	N/A	
Composting Windrow (remains the same)	13,126	3
MRF x 1	26,979	34
Composting In-vessel x 1	13,326	4
EfW x 1	131,265	39
Landfill	57,000	5
Collection	N/A	95
Total Scenario D		**180**

Figure A2.1 shows that the costs of waste management are set to rise substantially whichever scenario is chosen. Over the period from 2001 to 2006 there is a gradual increase in cost – rising from about £11.4M (2001) to about £13.5M (2006). There is a dramatic increase in costs of about £3.5M per annum over the period between 2006 and 2008. For Scenario A, this represents the increase in cost to transfer waste out of the area once the local landfill is full. For the remaining scenarios the increase in cost reflects the cost of increased recycling activity as well as the cost of transfer of residual waste to distant landfill. A further reason for the projected cost increase is the cost of landfill (excluding tax). For this Municipality, the current cost of landfill is unusually low – less than £4/t. Post 2006 this is assumed to increase to £15/t reflecting the cost, more generally, of landfill disposal in the South West region.

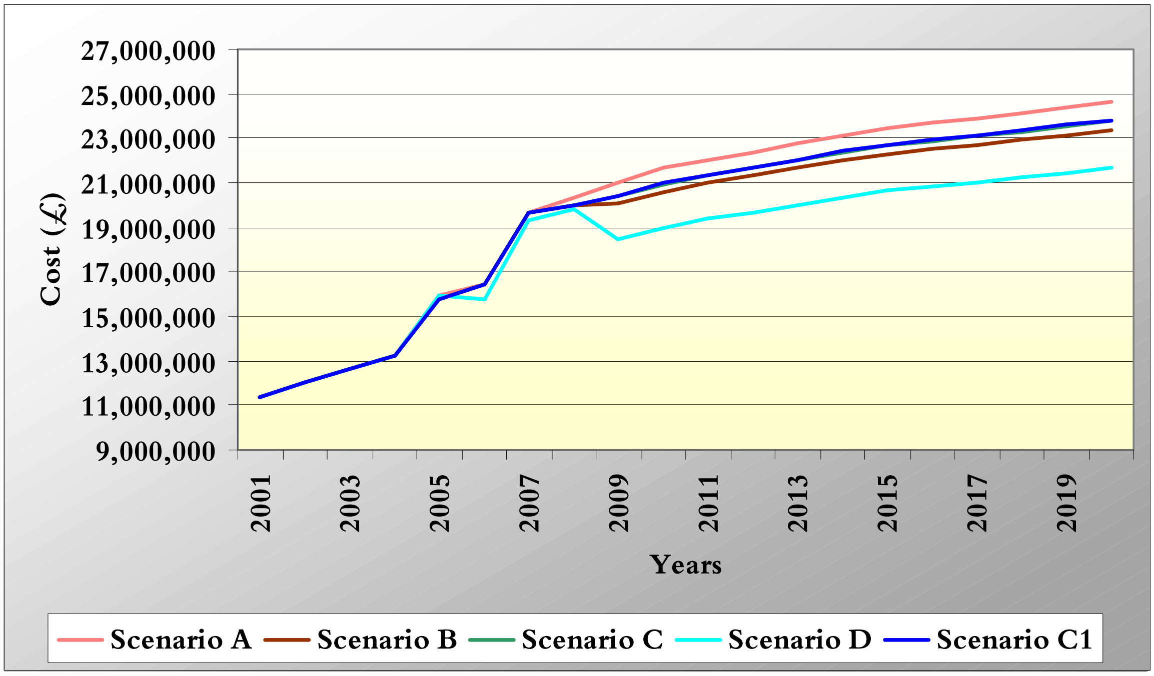
There is an increase of about £1M per annum between 2008 and 2009 for Scenarios B, C and C1 reflecting the cost of the treatment facilities that come on-stream then. The cost profiles of Scenario A and D are, coincidentally, very similar.

Figure A2.1: Projected Cost Profiles



The relative cost performance of the scenarios is of course dependent on a range of cost variables not least the assumed landfill tax. To demonstrate the sensitivity of the cost analysis to this critical factor Figure A2.2 shows the cost profiles if the rate of landfill tax is doubled i.e. from the expected £15/t to £30/t in 2005/6. Clearly such an increase will impact on the scenarios which continue to rely on landfill disproportionately. Hence it is seen that Scenario A now becomes the most expensive. The costs of the other Scenarios (post 2009 – once the treatment facilities are operational) reduce to varying degrees i.e. the cost of treatment becomes less than the cost of landfill. The most dramatic impact is on Scenario D for which the costs decrease by about £2M/y on introduction of the recovery facility.

Figure A2.2: Impact of increase in landfill tax to £30/t/y from 2005/6



OPERATIONAL OBJECTIVES

TO ENSURE RELIABILITY OF DELIVERY

Although a waste management option may perform well against a range of indicators, it may not be possible to implement the option due to practical constraints. The principal constraints include:

- Difficulties in obtaining planning consents.
- Technical risks associated with the procurement of facilities.

Reliability of delivery through the planning system

The principal factors affecting the performance rating of the waste management facilities in terms of gaining planning consent are:

- Scale of development
- Perceived adverse environmental and health impacts (not actual impacts because these are addressed by other indicators)
- Length of the working day.

Judgements made about the potential ease of deliverability through the planning system are based on a scoring system set out in Table A2.6 (overleaf). For each facility type a score is allocated based on a scale of 1 to 5; where 1 represents no significant impact i.e. planning easily approved, to 5 where there are significant planning issues and gaining planning permission is likely to be very difficult. Generally, larger built facilities and those perceived poorly by the public score worst. So, for example EfWI facilities, which receive much public opposition on account of perceived health risks, score poorly, as do landfills with perceived amenity issues.

Table A2.6: Scores by facility type for deliverability (planning)

Facility Type	Score	Comment
MRF, GW Composting, In-vessel Composting, CAS all at small scale (<40,000 t/y).	2	• Small scale development • Less potential for conflict with planning policy and low-medium level of objections • Standard working day
RTS	2	• Less potential for conflict with planning policy and low-medium level of objections
MBT/AD	3	• Large scale development
MBT/AD/EfW	4	• Greater potential for conflict with planning policy and high level of objections (due to EFW component)
EfW	5	• Large scale development • Greater potential for conflict with planning policy and high level of objections
Landfill (large scale (>100kt/y) taking mainly non-inert waste)	4	• Greater potential for conflict with planning policy and Environment Agency policy and high level of objections
Landfill – accepting mainly inert waste	3	• Greater potential for conflict with planning policy and Environment Agency policy and high level of objections

Applying these scores to the number and type of facilities within each scenario provides a totalled score that gives a measure of the planning deliverability of that scenario. Table A2.7 records the total scores allocated for each scenario.

Table A2.7: Total scores for deliverability (planning)

Objectives	Indicators	Scenario				
		A	B	C	C1	D
10. To ensure reliability of delivery	Likelihood of implementation within required timescale (planning issues) –*(performance score)*	16.00	20.00	18.00	18.00	20.00

Scenario A scores best in terms of deliverability in planning terms, which is perhaps surprising given the fact that it includes high levels of landfill. Nevertheless, it requires a smaller number of facilities overall which enhances its deliverability, and it does not include any significant new development. Scenarios C and C1 are the next most 'deliverable', whilst Scenarios B and D are the least 'deliverable' options. These two options perform poorly because they include EfWI facilities that are subject to considerable public opposition. Whereas options C and C1 include MBT plants (one with an element of EfWI) which, for the moment may be considered to be more deliverable in planning terms.

Reliability of deliverability – technical/commercial risk

The extent to which each facility type is deliverable in terms of technical risk has been assessed, by considering which waste management technologies and practices are commercially proven in UK market conditions. The same scoring system as noted above has been applied – Table A2.8 shows the scores given to each facility type informed by taking account of:

- Scale of development, reference facility and years of operational experience.
- Commercial viability and diversity of technology suppliers.

Table A2.8: Scores by facility type for deliverability (planning)

Facility Type	Score	Comment
MRF, GW Composting, CAS and RTS, EfW	1	• Numerous facilities in the UK • Many years of operational experience • Numerous suppliers of technology
In-vessel Composting	2	• Few facilities (<5) operational
MBT/AD	3	• No facilities operational in this configuration • Few suppliers of technology
MBT/AD/EfW	3	• No facilities operational in this configuration • Few suppliers of technology

Applying these scores to the number and type of facilities within each scenario provides a totalled score that gives a measure of the (technical) deliverability of that scenario. Table A2.9 records the total scores allocated for each Scenario.

Table A2.9: Total scores for deliverability (technical)

Objectives	Indicators	Scenario				
		A	**B**	**C**	**C1**	**D**
10. To ensure reliability of delivery	Likelihood of implementation within required timescale (technical status and risk) - *(performance score)*	7.00	9.00	11.00	11.00	9.00

Scenario A scores best in terms of technical delivery as it relies on continued landfill (assuming this is available) with little other infrastructure delivery. Scenarios B and D score better than Scenarios C and C1. The latter require delivery of relatively new technology with complex configuration whereas the former are based on conventional technology options.

TO CONFORM WITH WASTE POLICY (BVPI AND WS2000 TARGETS)

One of the major environmental and resource challenges facing the UK is "reducing the spread of persistent or diffuse pollutants and improving the management of waste" (the Government's Sustainable Development Strategy). The UK currently produces over 100 million tonnes of waste every year from households, commerce and industry, and this figure is increasing significantly.

Sustainable waste management means using resources efficiently, to cut down on the amount of waste we produce. Where waste is generated, it should increasingly be put to good use, through reuse, recycling, composting or as a source of fuel. In accordance with European Directives, the

Government's target is that, by 2005, the amount of industrial and commercial waste landfilled should be reduced to 85% of 1998 levels. To this end, the Government is promoting a waste hierarchy, involving the following order of priorities: waste reduction, re-use, recycling, composting and energy recovery, with disposal as a last resort. The Government also wishes to see waste managed in line with the 'proximity principle', which states that waste should generally be disposed of as near to its source as possible. This is in part to ensure that waste problems are not simply exported to other regions or countries, and also recognises that the transportation of wastes can have significant environmental impacts.

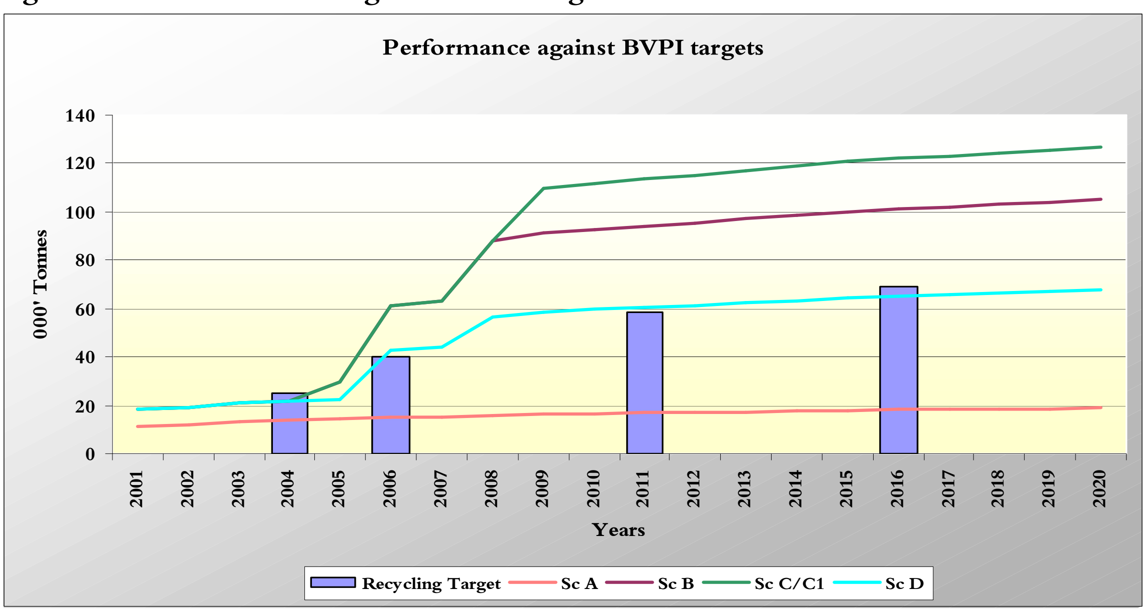
The output of the WASTEFLOW model includes the indicators for recycling and recovery rates as well as the measure of biodegradable municipal solid waste diversion.

Performance against targets

Figure A2.3 shows the performance of the scenarios against the recycling (BVPI) targets[2]. Scenario D is designed to meet the WS2000 targets and Figure A2.3 shows the achievement of these by the due dates. The performance of Scenario C (and C1) is identical and, together with B, these outperform Scenario D. In % terms, Scenarios D and B achieve about 33% and 50% recycling respectively. With the additional recycling of metals from the mixed waste streams, Scenarios C and C1 achieve recycling rates of about 60%.

It should be noted that the higher recycling rates of Scenarios B, C and C1 are dependent on high participation rates and processing efficiencies (of the collection and treatment systems) currently not matched in the UK at scales of operation comparable to those envisaged for the municipality reported in the case study.

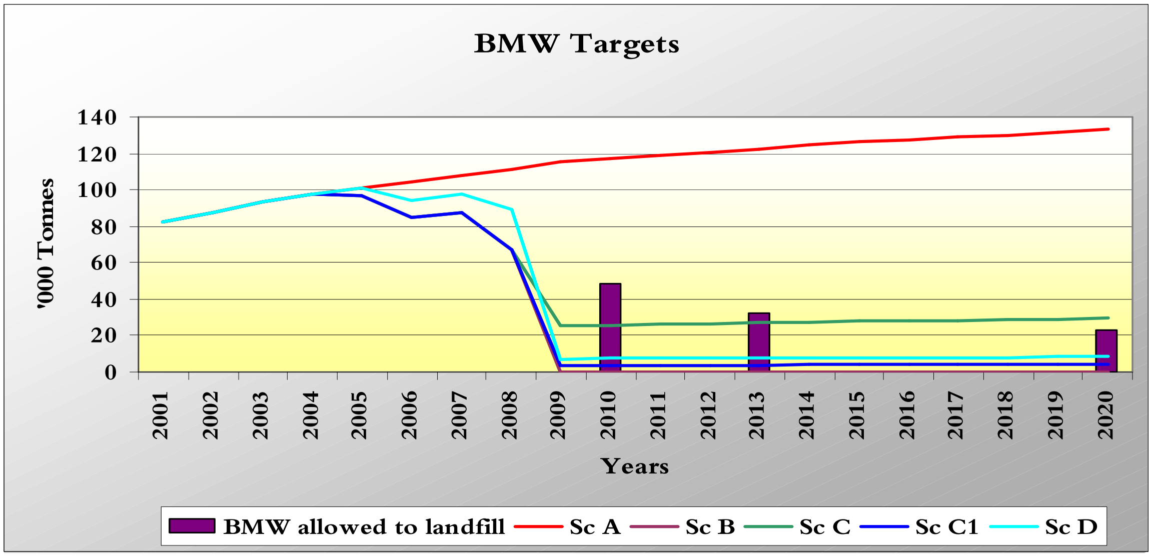
Figure A2.3: Performance against BVPI targets



[2] The BVPI targets for 2010 and 2015 are assumed to be the same as the WS2000 recycling targets i.e. equivalent to 30% and 33% respectively.

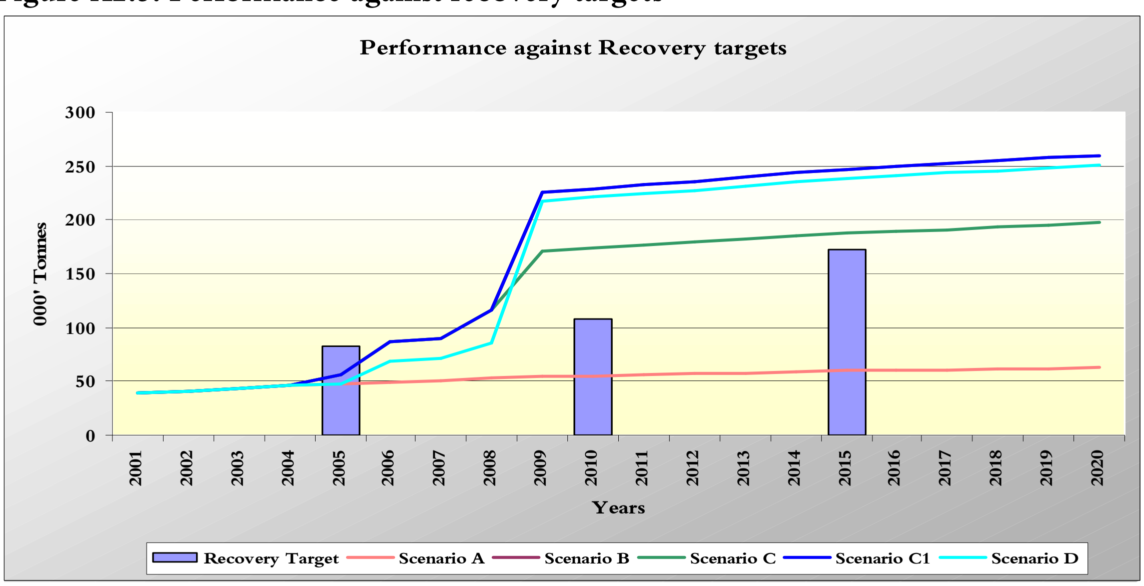
Figure A2.4 shows the performance of the scenarios in achieving the biodegradable municipal waste diversion targets (of the landfill directive). Scenario A does not meet these targets. The remaining scenarios meet the targets with the best performing being Scenarios B followed by C1, D and finally C, the latter falling just short of meeting the final 2020 target.

Figure A2.4: Meeting BWM diversion targets



The recovery (rates) performance of the scenarios is shown in Figure A2.5. The recovery performance of Scenarios B and C1 are identical and so are seen as one curve on the graph. None of the scenarios achieve the short-term (2005) recovery target. However, all except Scenario A achieve the longer term targets with Scenarios B, C1 and D out performing Scenario C. The latter consigns the residual waste after MBT processing (i.e. the RDF product) to landfill.

Figure A2.5: Performance against recovery targets



The percentages of material recycled and recovered are indicators for Objective 11 – *to confrom with waste policy*. Table A2.10 summarises the performance of the scenarios against these indicators.

Table A2.10: Performance against recycling and recovery targets

Objectives	**Indicators**	**Scenario**				
		A	**B**	**C**	**C1**	**D**
11. To conform with waste policy	Percentage of material recovered (%)	23	96	73	96	93
	Percentage of material recycled/composted (%)	13	48	58	58	31