

CHAPTER 10 – FUTURE REQUIREMENTS

This chapter summarises the approach to determining, and assessing the preferred options for maximising recycling and composting and recovery from residual waste. It presents the technical assessment taken to translate the Northern Ireland Best Practicable Environmental Option (BPEO) framework into a sub regional context for future management of each of the controlled waste streams assessed in the baseline. It addresses both estimated capacity requirements for the preferred solutions to 2020, and short term needs to 2010 based on remaining capacities of existing facilities and lead times for the development of new capacity.

THE NEED FOR NEW FACILITIES

- 10.1 The key waste streams identified from the baseline management review in Chapter 5 comprise municipal and non-hazardous commercial and industrial wastes. The Plan will make provision for the future management of some 580,000 tonnes per annum of municipal waste arisings, rising to nearly 730,000 tonnes per annum in 2020. Some 403,000 tonnes per annum of commercial and industrial wastes, rising to an estimated 493,000 tonnes per annum in 2020, will also have to be managed. Construction, excavation and demolition wastes totalling 1.87 million tonnes will require management rising to 2.21 million tonnes by 2020. Current management of these waste streams relies heavily on landfill disposal.
- 10.2 To achieve strategic objectives for waste reduction, reuse, recycling, recovery and landfill diversion, significant changes will be needed to the way this waste is dealt with in the arc21 Region. Waste management practice also needs to evolve in line with Government policy set out in Chapter 2. From the discussion of options in Chapters 6 and 7 the following conclusions on waste management options can be deduced:
- Prevention and re-use are recognised at the peak of the waste hierarchy and are duly advocated as a prime instrument in the management of waste.
 - Recycling and composting should form a core part of the solution.
 - Source segregation of recyclable materials is preferred to residual waste treatment wherever practical.
 - Commercially viable and proven technologies should be the priority.
 - Energy from waste incorporating state of the art environmental protection will form part of the solution in the longer term, and will not distract effort from increasing recycling and composting.
 - The waste management solution should be practical but also allow flexibility to accommodate changing circumstances.

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- There is scope for direct integration of the preferred solution for municipal wastes with the future waste management requirements for commercial and industrial wastes.
 - The role of landfill for municipal waste should change from primary waste disposal to being subsidiary to other waste management methods, and should take only residual and pre-treated waste. New landfill capacity should only be considered where it is necessary as part of the preferred solution.

10.3 In translating these conclusions into future needs for waste management facilities, the baseline waste arisings and projections set out in Chapter 5 as well as the BPEO elements already implemented in the arc21 region as set out elsewhere in the Plan, were used to develop overall systems for the future management of the municipal waste stream. These systems were then subjected to a technical assessment that built on the NI BPEO framework into a sub regional context, to develop a preferred solution for the management of municipal waste arisings.

10.4 In addition to the arc21 technical assessment for municipal wastes, a high level assessment of other waste streams has been carried out to establish the overall requirements for future waste management in the arc21 Region. This assessment includes consideration of an integrated waste management solution, in particular identifying:

- the extent to which different waste streams may be accommodated in the same type of facilities to provide economies of scale, enhance commercial viability, reduce costs and/or minimise environmental impact, and
- the extent to which requirements should be planned on a regional rather than sub-regional basis.

10.5 Policies and siting criteria for the required facilities are developed in Chapter 11 and Chapter 12. Implementation actions and timescales for the preferred solution are described in Chapter 14.

CONCEPT OF TECHNICAL ASSESSMENT

10.6 The various methods for waste collection, treatment and disposal can be combined in many different ways to provide an integrated waste management system for arc21. In selecting the preferred solution, consideration has been given to the source segregated schemes that have already begun to be implemented as a result of the original BPEO analysis carried out in 2002, the advantages and disadvantages of different treatment and disposal options and the guidance and direction provided by the NI BPEO analysis (2005). The objective was to identify a solution that best

matched the source segregated schemes with the options for treatment that provided the best solution to meet arc21 objectives.

- 10.7 The NI Waste Management Strategy and waste planning guidance in PPS11 require that the choice of waste management systems is founded on the principle of the waste hierarchy and is informed by an assessment of the BPEO. The NI BPEO is a central part of the NI Waste Management Strategy Review and is defined as:

“a systematic and balanced assessment of a range of different development options, in order to maximise environmental, economic and social benefits” (NI BPEO Guidance Document Foreword)

- 10.8 The NI BPEO process identified the following with respect to waste management needs in NI:

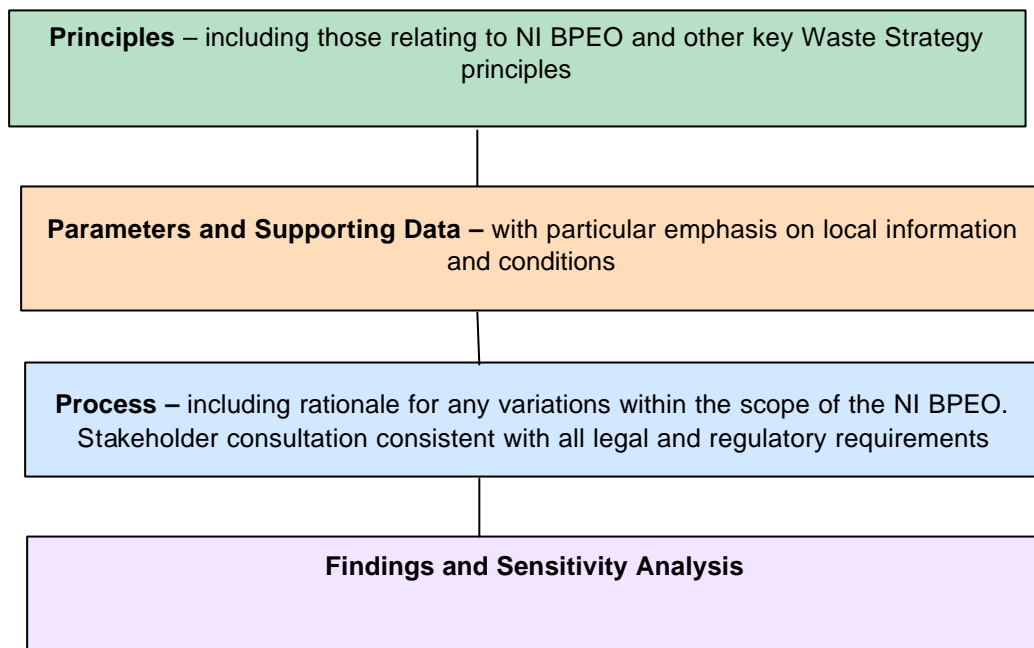
- Challenging but achievable recycling rates proposed
- A significant reduction in landfill required
- Recommended the use of a balanced mix of proven technologies to treat residual waste, including biological and thermal (energy from waste) treatment

One of the objectives of the NI BPEO process was to provide direction and guidance for the three Waste Groups (arc21, SwaMP and the NWRWMG) for review of their Waste Management Plans.

- 10.9 The technical assessment is therefore not a BPEO assessment as this would essentially replicate the process and decision making already undertaken at the NI level. The assessment is however a decision making process that aims to complement the NI BPEO whilst taking account of arc21 specific issues. This approach is followed in other parts of the UK and in the Strategic Environmental Assessment framework. It has been designed to provide a transparent and robust assessment whilst allowing flexibility to adapt to future developments.

- 10.10 The scope of technical assessment that is undertaken at the arc21 regional level as defined by the NI BPEO guidance is recommended to include details of the parameters shown in Figure 10.1.

Figure 10.1 Recommended Scope for Sub Regional Technical Assessment



Source: BPEO for Waste Management in Northern Ireland: Guidance Document, EHS, June 2005

10.11 The DOE recognises that some flexibility will be required to enable Waste Groups to deliver the basic elements of the NI BPEO whilst also obtaining best value in the marketplace. The DOE has therefore provided the following guidelines that can apply to municipal waste and relate to the proportions of technologies at 2020:

1. “Application of the framework should focus on the preferred mix of recycling & composting, technologies for the treatment of residual waste and landfill requirements at 2020. For interim milestone years, Waste Groups should clearly set out their projected levels for the contribution of each element to demonstrate progressive improvement towards statutory targets. “
2. “Within the overall target of 45% recycling and composting by 2020 for Northern Ireland, Waste Groups may adjust projected levels to allow for differences in achievable rates arising from local demographics.”
3. “Waste Groups that exceed 45% recycling and composting have the flexibility to reduce the contribution of the other technologies.”
4. “Any of the alternative technologies can be increased to further reduce the amount of waste going directly to landfill below the 25% level envisaged in the NI BPEO. “
5. “Waste Groups may vary the relative proportions of biological and thermal treatment technologies for residual waste as required to meet local needs. “

6. “Waste Groups should take into account the most up-to-date information available on local waste growth rates.”
7. “Waste Groups can combine the technologies IVC, AD and MBT under the more general heading of Biological Waste Treatment.”
8. “Waste Groups that intend to collect only garden waste have the flexibility to assign this portion of waste to open composting rather than IVC.”
9. “Waste Groups have the flexibility to include additional thermal capacity in their plans to treat refuse derived fuel from MBT. “
10. “Waste Groups should co-ordinate their approach, so that one group may increase the relative proportion of a particular technology while another group may decrease the contribution of that technology.”

10.12 These principles have been considered by arc21 in conducting the technical assessment of the municipal waste stream.

TECHNICAL ASSESSMENT METHODOLOGY FOR ARC21

10.13 A systematic approach has been adopted for the sub regional technical assessment of the municipal waste stream for the arc21 Region based on the above concepts and consistent with the principles of guidance issued by the Department¹. The assessment has been structured using guidance from the 4P’s Waste Management Procurement Pack² to provide a robust and transparent methodology for the assessment.

10.14 The technical assessment for the arc21 Region has been applied to the selection and analysis of *options* and *scenarios* for residual municipal waste management. An individual technique or technology is referred to as an *option*, whilst the combination of options to form a waste management system is referred to as a *scenario*. The scenario identified as the sub regional BPEO represents the preferred solution for the arc21 Region.

Options – waste management techniques for collection, recycling, treatment and disposal of wastes

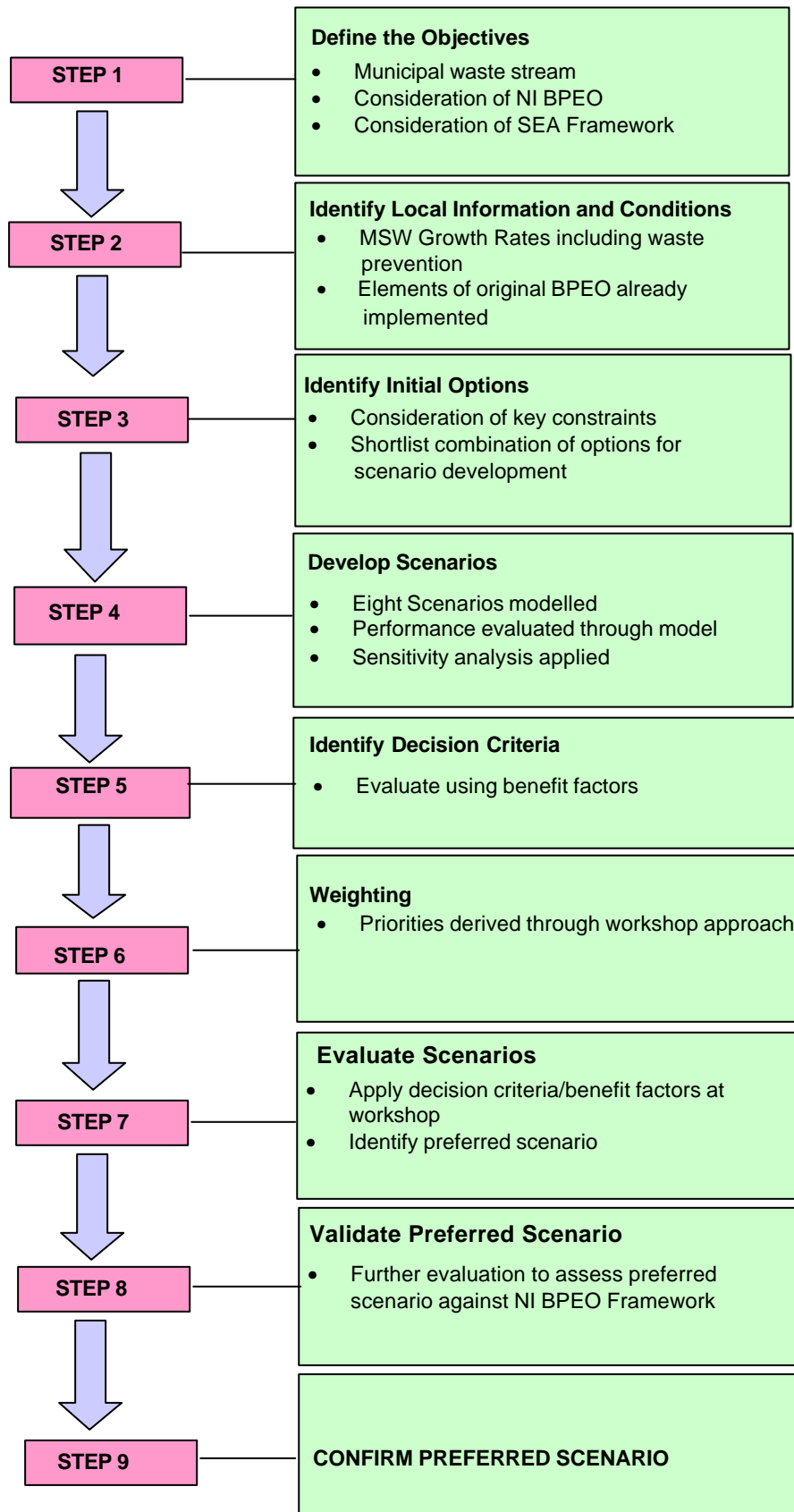
Scenarios – combination of a number of options for collection, treatment and disposal

¹ NI BPEO Guidance Document June 2005, EHS/ERM

² Waste Management Procurement Pack, Public Private Partnerships Programme, July 2004

10.15 The steps in the technical assessment process are summarised in Figure 10.2. They involve the identification, testing and progressive refinement of a range of possible waste management scenarios against key environmental, economic, deliverability and NI BPEO factors.

Figure 10.2: Technical Assessment Process for the Arc21 Region



Step 1: Define the Objectives

- 10.16 The appraisal was carried out to assess the alternatives for management of the municipal waste stream. The assessment was conducted at a strategic level to identify the range and capacity of facilities required to meet the targets at the three key dates of 2010, 2013 and 2020. Details of the consideration of objectives are provided in Appendix 10A.
- 10.17 Taking into account the assumptions in Appendix 10A the assessment was designed to address the following objectives:
- To develop a preferred solution complementary with the aspects of the original Waste Management Plan BPEO that have already been implemented;
 - To apply the Northern Ireland BPEO within the context of the arc21 region; and
 - To update the preferred solution for residual waste treatment in the arc21 region

Step 2: Identify Local Information and Conditions

- 10.18 At the preliminary stage, the present situation with regards to waste management development was taken into account and used to develop a waste forecast model that estimated performance of proposals against recycling and composting levels as well as the balance of waste that needs to be targeted to achieve statutory diversion targets. Details of the factors taken into consideration are provided in Appendix 10A.

Step 3: Identify Initial Scenarios

- 10.19 The third stage of the assessment process involved a review of available technology options for the collection and management of wastes (Chapter 7) and a review of the current waste strategy and policy requirements (Chapter 2).
- 10.20 To support this process, arc21 delivered a residual waste treatment awareness day and invited members of other Waste Groups, the DOE, EHS, Planning Service and the Strategic Investment Board. The scope of the awareness day and the issues considered are provided in Appendix 10A.
- 10.21 The following treatment scenarios (Table 10.1) were selected to model a comprehensive range of treatment options in a consistent manner. This does not

preclude the selection of a mix of wastes or proportions sent to a particular treatment facility in order to address needs.

Table 10.1 Summary of Scenarios Modelled

Scenario	Element to achieve recycling and composting targets	Element to achieve recovery targets
1	<ul style="list-style-type: none"> • Kerbside collection of dry recyclables and organic wastes (from suitable households) 	<ul style="list-style-type: none"> • Energy from waste to treat domestic residual waste
1a	<ul style="list-style-type: none"> • Bring Banks in areas not suitable for kerbside collection • Maximising diversion of recyclables and green waste at CA sites 	<ul style="list-style-type: none"> • Energy from waste to treat domestic residual waste with mechanical pre-treatment to recover metals
2	<ul style="list-style-type: none"> • Segregated collections of dry recyclables and organic wastes from commercial companies served by District Councils 	<ul style="list-style-type: none"> • Biological mechanical treatment of domestic residual waste with energy from waste encompassing the RDF output
3	<ul style="list-style-type: none"> • Maximising recovery of recyclables from bulky household collections • Maximising recovery of recyclables and compostables from street sweepings and litter collections 	<ul style="list-style-type: none"> • Biological mechanical treatment of domestic residual waste with energy from waste encompassing the RDF output and • additional in-vessel composting to stabilise the organic output from BMT
4		<ul style="list-style-type: none"> • Mechanical Biological Treatment of domestic residual waste including in-vessel composting of the organic fraction • energy from waste encompassing the RDF output from MBT
5		<ul style="list-style-type: none"> • Mechanical Biological Treatment of domestic residual waste including in-vessel composting of the organic fraction
6		<ul style="list-style-type: none"> • Mechanical separation of domestic residual waste with Anaerobic digestion of the organic fraction and • energy from waste encompassing the RDF output from MT/AD
7		<ul style="list-style-type: none"> • Mechanical separation of domestic residual waste with Anaerobic Digestion of the organic fraction

Note 1: For all scenarios, all residual wastes left after treatment processes are assumed to be disposed of to landfill. Where energy from waste is not included, RDF fractions are assumed to go to landfill. The landfill component in all scenarios was also modelled.

10.22 All scenarios would need to be supported by the active promotion of waste prevention as an integral element of the arc21 Municipal Waste Management Strategy. Active encouragement of householders to reduce waste production through education and awareness schemes will need to be a key element of the future management arrangements.

10.23 For each scenario, waste flows and performances against targets were calculated and an outline of the typical costs of providing the facilities derived. Outline costs for each treatment scenario (at year 2005 prices) were presented as the Net Present

Value (NPV £ millions) per year and as a total over the period 2005 – 2020 to the arc21 region. .

Step 4: Develop Scenarios

10.24 The eight scenarios were modelled under two sets of conditions:

- A meet target model – this identified whether the technology scenario was likely to divert sufficient BMW from landfill to meet the NILAS diversion requirements; and,
- An exceed target model – this identified the maximum potential of each scenario to treat residual household and commercial waste to identify how well each scenario could perform. This provides an indication of the potential for each scenario to treat additional waste if performance of kerbside recycling and composting schemes are not as high as anticipated and considers the ability to reduce landfill to below 25%.

10.25 These two sets of conditions were deemed to adequately cover the required outcome.

Summary of Performance of Scenarios, Deliverability and Costs

10.26 A summary of the key findings of the scenario assessment in terms of facility type, capacity, achievement of targets and costs is presented in Tables 10.2 and 10.2a. Table 10.2 details the source segregated elements of the scenarios and Table 10.2a presents the residual waste treatment elements. Performance of each Scenario against NILAS is provided in Figure 10.3.

10.27 Further discussion of the performance of each scenario is provided in Appendix 10A.

Table 10.2 Scenario Assessment – Summary of Key Findings

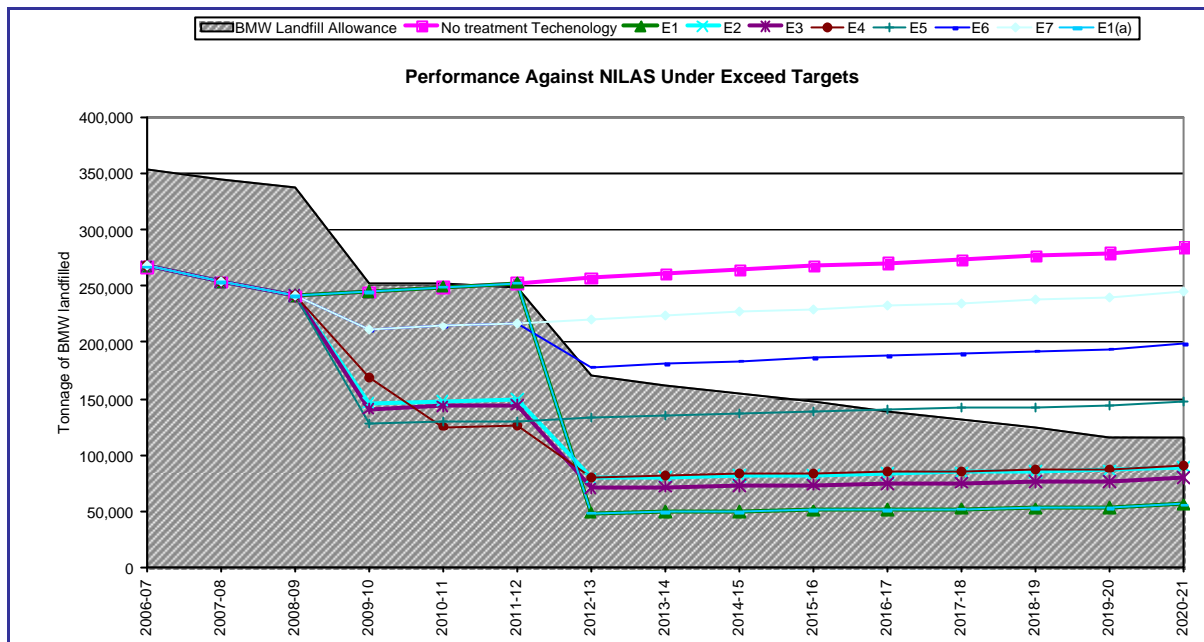
Facility Type	Year	Throughput (t)
Recycling	2010	113,568
	2013	116,516
	2020	127,636
Windrow	2010	34,565
	2013	36,229
	2020	39,560
In-vessel	2010	95,912
	2013	100,590
	2020	110,036

Table 10.2a Scenario Assessment – Summary of Key Findings Cont.

Facility Type	Year	Throughput (t)	Performance NILAS (Shortfall/ Excess)	Summary Performance against targets	Costs NPV for arc21
No Treatment Technology	2010	0	6,720	A no treatment technology scenario does not meet targets in any years from 2010	£ 469,534,000
	2013	0	-86,432		
	2020	0	-163,493		
1 EfW+ Landfill	2010	0	6,720	This Scenario does not meet targets until 2012/13 as it assumed that it will not be possible to commission the facility before this date. Thereafter targets are exceeded.	£ 306,326,000
	2013	295,817	121,498		
	2020	322,096	62,908		
1a EfW with pre-sort	2010	0	6,720	This Scenario does not meet targets until 2012/13 as it assumed that it will not be possible to commission the facility before this date. Thereafter targets are exceeded	£ 309,954,000
	2013	295,817	121,498		
	2020	322,096	62,908		
2: BMT+ EfW	2010	279,889	105,795	This scenario meets targets in all key years	£ 402,067,000
	2013	295,817	91,057		
	2020	322,096	29,763		
3: BMT+IVC+EfW	2010	279,889	110,726	This scenario meets targets in all key years	£ 436,103,000
	2013	295,817	99,790		
	2020	322,096	39,271		
4: MBT (IVC)+ EfW	2010	279,889	83,130	This scenario meets targets in all key years	£ 391,672,000
	2013	295,817	89,698		
	2020	322,096	28,282		
5: MBT (IVC)	2010	279,889	124,274	This scenario exceeds targets until 2015 but does not meet targets from 2015/16 onwards	£387,920,000
	2013	295,817	37,812		
	2020	322,096	-28,213		
6: MT + AD+ EFW	2010	279,889	41,093	This scenario meets targets in 2010 and does not meet targets from 2012/13 onwards	£390,872,000
	2013	295,817	-8,047		
	2020	322,096	-78,146		
7 MT + AD	2010	279,889	41,093	This scenario meets targets in 2010 and does not meet targets from 2012/13 onwards	£391,008,000
	2013	295,817	-50,103		
	2020	322,096	-123,937		

Note: Scenarios NTT, 1 and 1a are below 10% buffer and therefore are assumed to not meet target in 2009/10

Figure 10.3 – Performance of Treatment Scenarios against NILAS



Sensitivity Analysis

10.28 Each scenario was subject to a series of sensitivity factors to assess the reliability the when conditions changed. The factors that were varied in the waste model were:

- Participation and segregation rates anticipated for kerbside segregated collections of dry recyclables and organic wastes.
- The end market for stabilised outputs generated at the non energy from waste treatment technologies. The base models had assumed a worse case situation whereby stabilised materials would be landfilled due to a lack of markets. During the sensitivity analysis it was assumed that a market could be found and therefore material would be diverted from landfill
- Costs of landfill were increased.

10.29 Landfill costs were assumed to increase by 25% and 50% from the anticipated date that a new landfill contract would be operational.

Step 5: Identify Decision Criteria

10.30 In conjunction with the technical modelling, detailed decision criteria were applied to the evaluation process, incorporating factors based on the objectives of the NI BPEO and SEA Framework:

- **Technical Performance** – covering the potential of each scenario to divert sufficient biodegradable municipal waste from landfill in 2010, 2013 and 2020

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- **Environmental** – including environmental factors that are considered through the SEA process, such as cultural heritage, biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets and landscape
 - **NI BPEO** – covering the potential consistency with the NI BPEO framework for municipal wastes
 - **Local Amenity** – covering effects on employment and transport
 - **Deliverability** – including the technical feasibility, flexibility, operational robustness and likely planning and performance
 - **Economic** – the overall financial cost and benefit

10.31 A summary of the decision criteria are presented in Appendix 10A. The overall methodology for selecting the criteria was based on guidance provided in the UK by the Public Private Partnerships Programme (4P's)². The criteria were slightly adapted for arc21 to take account of the local conditions and particular circumstances that exist in the region and NI.

10.32 To compare the scenarios against all the criteria in a consistent manner and apply the qualitative aspects of the decision criteria, a scoring system was prepared based on the approach recommended by 4P's². This is detailed in Appendix 10A.

Step 6: Weighting

10.33 To apply the decision criteria and scoring system at the scenario evaluation workshop, weightings for each decision criteria were prepared, discussed and updated. In this manner weightings were applied to the various criteria to balance protection of the environment and resources as well as consistency within a NI context and cost.

10.34 The output weighting from the workshop is summarised in Appendix 10A.

Step 7: Evaluate Scenarios

10.35 The results of workshop evaluation are presented in Table 10.3. The average scores represent the average over the workshop groups on a scale of 0 to 10.

² Waste Management Procurement Pack, Public Private Partnerships Programme, July 2004

Table 10.3 Summary of Assessment

Criteria Definition	No Treatment Technology		1: EfW		1a: EfW		2: BMT + EfW		3: BMT + IVC + EfW		4: MBT (IVC) + EfW		5: MBT (IVC)		6: MT + AD + EfW		7: MT + AD	
	NTT		1		1a		2		3		4		5		6		7	
	Ave Score	Weighted Score	Ave Score	Weighted Score	Ave Score	Weighted Score	Ave Score	Weighted Score	Ave Score	Weighted Score	Ave Score	Weighted Score	Ave Score	Weighted Score	Ave Score	Weighted Score	Ave Score	Weighted Score
Weighted Criteria																		
Addresses short term and long term NILAS Targets, minimising potential NILAS liability	0.0	0	10.0	25	10.0	25	7.0	18	7.0	18	7.0	18	0.0	0	0.0	0	0.0	0
Achieves sustainability against environmental factors that are considered through the SEA process	0.0	0	2.3	4	3.3	5	3.0	5	6.0	9	7.0	11	9.3	14	2.0	3	4.0	6
Demonstrates consistency with the NIBPEO Framework	0.0	0	2.0	3	2.0	3	2.0	3	2.0	3	2.0	3	0.0	0	1.3	2	0.0	0
Impact on Local Economy and Local Amenity	6.7	3	8.0	4	8.0	4	6.7	3	6.7	3	7.7	4	5.0	3	2.3	1	3.0	2
Deliverability	0.0	0	0.0	0	0.0	0	4.0	8	6.0	12	8.0	16	1.3	3	4.3	9	2.3	5
Financial Cost	1.7	3	9.3	19	9.3	19	5.0	10	3.0	6	7.0	14	7.0	14	7.0	14	7.0	14
Total		6		55		56		47		51		66		34		29		27
Ranking		9		3		2		5		4		1		6		7		8

Summary of assessment at 2005

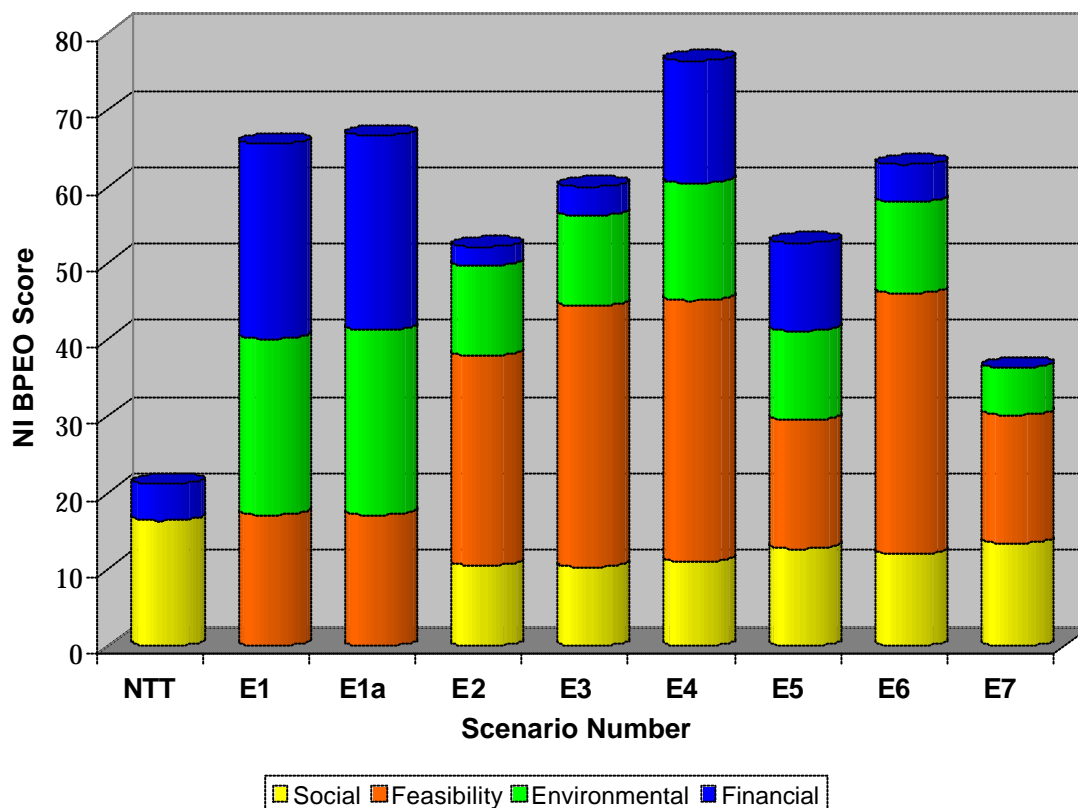
10.36 All the scenarios demonstrated some weaknesses with regards to benefits and there is a risk with each. Overall the consistency of scoring for Scenario 4 demonstrated that it could deliver across the range of key decision criteria whereas others might score higher on particular aspects but overall carried a risk of failure which was not present in Scenario 4. Scenario 4 has a lower energy from waste capacity than 1 and 1a and therefore is more likely to be deliverable, particularly in relation to acceptance by the public. The evaluation suggests that a solution based around Scenario 4 would be the preferred scenario.

Step 8: Identify the Preferred Scenario

10.37 It was decided to conduct a similar exercise in order to validate the preferred scenario for arc21, and give further consideration to the needs of arc21 within the whole of Northern Ireland. To achieve this, a similar exercise utilising the NI BPEO model that was developed for the DOE. Details of the assessment are provided in Appendix 10A.

10.38 Scenario 4 was identified as the preferred scenario because it scores well against all four criteria. It is the most preferred scenario against one of the criteria - feasibility - but it generally performs well against the other three as well. .

Figure 10.4 Summary of NI BPEO Model scores for Scenarios



Note: Scenario reference E1 – E7 refers to “exceed model” run as part of technical assessment.

Step 9: Confirm the Preferred Scenario

10.39 The preferred scenario is based on the following:

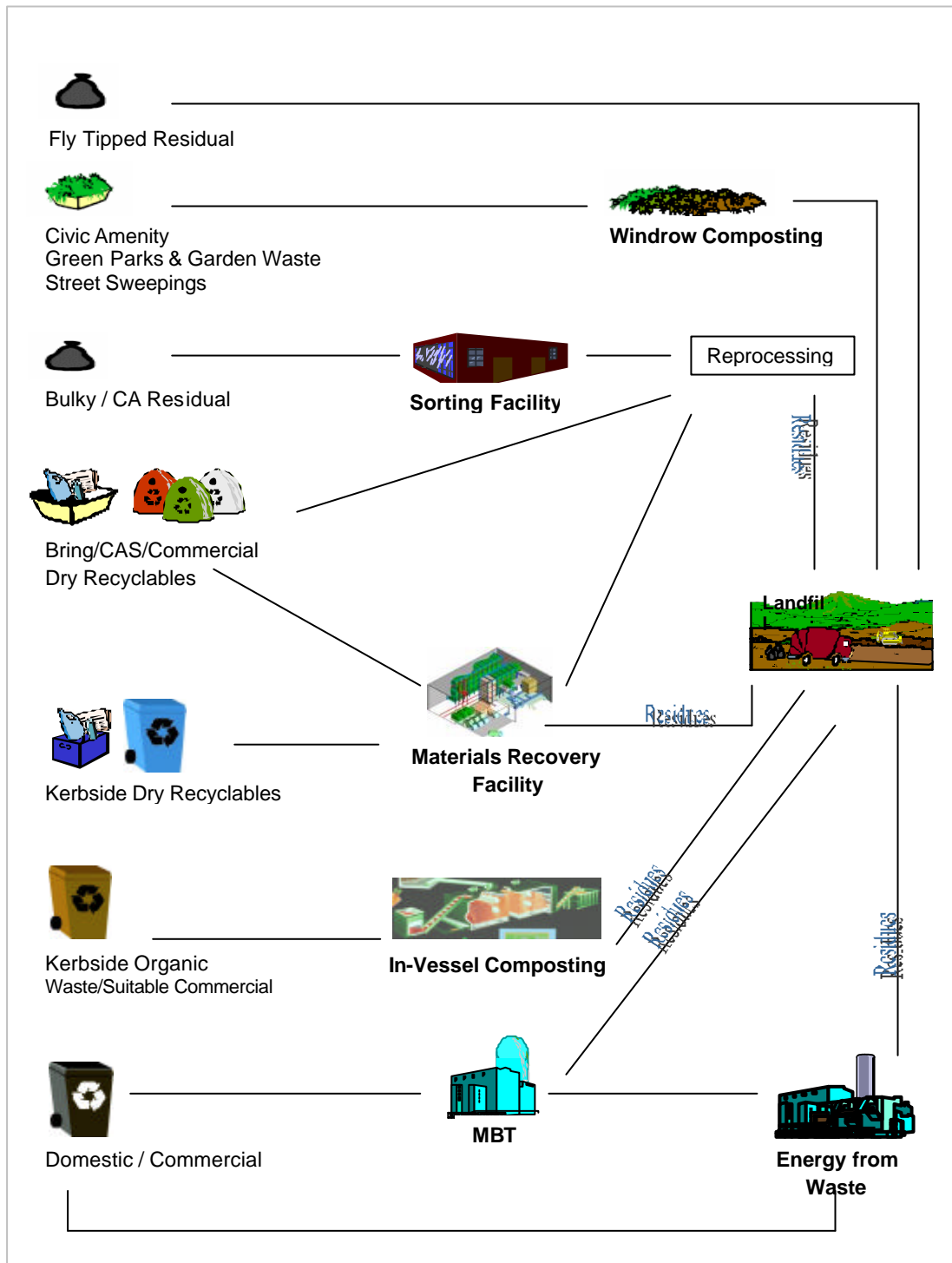
- Promote waste prevention throughout the arc21 region and lead by example through the development of action plans to reduce levels of waste produced by arc21 Council activities. Communication Strategy to promote waste prevention. The initiatives being considered are outlined in Chapter 6.
- Education and awareness raising programme to promote re-use and recycling and increase participation in recycling. Awareness to also educate the public on recognition of materials for recycling. The initiatives being considered by arc21 as part of this programme are outlined in Chapter 6 and 12 and described further in the Implementation Plan.
- Complete implementation of the three-stream collection of organics, dry recyclables and residual wastes to be provided to suitable households as identified by arc21 Councils.
- The preferred method for collecting dry recyclable materials remains a multi-material co-mingled kerbside collection. Dry mixed recyclables to be sorted and/or bulked at a materials recovery facility.

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- Additional recycling and composting initiatives to target commercial waste collected by Councils; initiative to be offered as an opt-in scheme to all commercial customers and materials collected to cover dry recyclables and organic wastes.
 - Additional recycling and recovery of bulky household wastes.
 - Additional recycling and composting of street sweepings and litter collected by District Councils.
 - Segregated garden waste collected at kerbside to be treated by windrow composting up to 2007 and then by in-vessel composting with the addition of kitchen waste at kerbside, to be introduced during 2007.
 - Refurbishment of existing CA sites to provide for greater segregation of materials for recycling and green waste for composting, or the development of new purpose built household waste recycling centres.
 - Sorting of residual CA/HWRC site waste at a suitable facility to recover additional recyclables and compostable material (health and safety issues would need to be carefully considered).
 - Windrow composting of green waste collected at the CA sites;
 - Treatment of residual wastes from households/commercial premises at a mechanical biological treatment facility from 2009 (the facility to sort recyclables, organic materials to be composted at the facility and where appropriate sort a suitable range of calorific value materials) with due regard to relevant targets;
 - An energy from waste facility for a suitable range of calorific value materials from either/or both MBT and residual wastes from 2013 with due regard to relevant targets; and
 - Any balance of residual wastes and residues from waste treatment processes to continue to be disposed to landfill with due regard to relevant targets.

10.40 Materials to be collected in the dry recyclables collection include: paper, plastics, metal (cans) and textiles. Glass is collected at glass banks and increased provision of bring and glass banks is required to provide 100% householder access to glass banks and for optimum provision of recycling collection points for those households not able to participate in kerbside collection.

10.41 Figure 10.5 shows the system diagrammatically.

Figure 10.5 Illustration of Preferred Solution



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- 10.42 In terms of the solution shown, it should be noted that in accordance with recognised Procurement Best Practice, arc21 plans to continue to invite tenders on the basis of the prevailing Business Case applicable at that particular time and to presume in favour of performance specifications for specific waste streams and fractions.
- 10.43 Accordingly, the final solution presented is subject to the outcome of a Business Case and Procurement Process which may have an affect on the detail e.g. waste flows, relative capacities, contract bundling and proprietary technologies offered.
- 10.44 The overall indicative costs for the preferred scenario are summarised in Table 10.4 and Table 10.5. The risks associated with placing total reliance on one method of secondary treatment are reduced through the preferred scenario whilst ensuring the targets are met.

Table 10.4 Preferred Solution – Summary of Key Findings – Collection

Facility type	Costs		
	Collection Cost £/Household		
	2005	2010	2020
Clean MRF	£116.00	£73.74	£70.43
Compost – windrow			
Compost – in vessel			

Costs based on existing data held by arc21

Table 10.5 Preferred Solution – Summary of Key Findings – Treatment

Facility type	Costs		
	Treatment Cost (Totals)		
	Treatment NPV	Landfill NPV	Total NPV
MBT	£165m	£226m	£392m
EFW			
Landfill			

Cost estimated based on data for existing plants capital and operational cost for MBT and EFW. Costs include sorting and treatment costs as well as landfill gate fee and landfill tax.

10.45 Table 10.6 shows the baseline and projected waste management costs in the arc21 Region for the 'Do Nothing' Scenario up to 2009/10. Table 10.7 and 10.8 shows the projected costs for the Preferred Solution up to 2019/20. The baseline costs are for 2001/2002, which was recognised as the start point for modelling purposes as this predates the start of implementation of the preferred solution. All costs presented are in 2005/06 prices and exclude inflation. Therefore the costs of service in Table 10.5 are projected from 2001/02 but at present (2005/06) prices.

Table 10.6: Baseline and Projected Waste Management Costs of 'Do Nothing' Scenario

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11-2019/20 Total
Number of Households	352,893	359,245	365,712	372,295	378,996	4,176,229
Cost of Municipal Waste Collection	£17,354,976	£17,563,236	£17,773,995	£17,987,283	£18,203,130	£194,488,429
Collected £/household	£49.18	£48.89	£48.60	£48.31	£48.03	£46.60
Tonnes Municipal Waste Arising	592,091	602,433	612,752	623,039	633,288	6,859,281
Tonnes Municipal Waste Diverted	45,759	46,546	47,333	48,114	48,893	528,204
Tonnes Municipal Waste Disposed	546,332	555,887	565,419	574,925	584,395	6,331,076
Cost of Municipal Waste Disposal	£15,860,183	£16,132,978	£16,405,625	£16,676,318	£16,946,474	£183,077,610
Disposal £/tonne	£29.03	£29.02	£29.01	£29.01	£29.00	£28.95

Table 10.7: Baseline and Projected Waste Management Costs for the Preferred Solution - Collection

	2005/ 06	2006/ 07	2007/ 08	2008/ 09	2009/ 10	2010/ 11	2011/ 12	2012/ 13	2013/ 14	2014/ 15	2015/ 16	2016/ 17	2017/ 18	2018/ 19	2019/ 20	Total
Number of Households	353,000	359,000	366,000	372,000	379,000	386,000	393,000	400,000	407,000	414,000	421,000	428,000	435,000	443,000	449,000	6,005,000
Cost of Municipal Waste Collection (£ ,000)	17,355	17,563	17,774	17,987	18,203	18,422	18,643	18,866	19,093	19,322	19,554	19,788	20,026	20,266	20,509	283,371
Additional capital costs (£ ,000)	16,315	7,487	15,239	2,734	989	1,359	1,214	1,949	819	1,054	874	899	1,194	1,214	2,114	55,453
Additional operational costs (£ ,000)	7,240	7,811	9,991	9,549	8,757	8,594	8,627	8,675	8,724	8,787	8,836	8,870	8,920	8,970	9,035	131,387
Total Cost (£ ,000)	40,910	32,861	43,005	30,270	27,949	28,375	28,483	29,490	28,635	29,163	29,264	29,558	30,140	30,450	31,658	470,211
Collected£/ho usehold	£115.90	£91.47	£117.5	£81.31	£73.74	£73.54	£72.52	£73.76	£70.35	£70.45	£69.51	£69.04	£69.22	£68.76	£70.43	£74.62
Baseline Total Cost (£ ,000)	17,355	17,563	17,774	17,987	18,203	18,422	18,643	18,866	19,093	19,322	19,554	19,788	20,026	20,266	20,509	283,371
Baseline Collected£/ho usehold	£49.18	£48.89	£48.60	£48.31	£48.03	£47.75	£47.47	£47.19	£46.91	£46.68	£46.45	£46.22	£45.99	£45.77	£45.63	£47.64
Total Difference (£ ,000)	23,555	15,298	25,231	12,283	9,746	9,953	9,841	10,624	9,542	9,841	9,710	9,769	10,114	10,184	11,149	186,840
Difference £/household	£66.75	£42.58	£68.99	£32.99	£25.71	£25.80	£25.06	£26.57	£23.44	£23.77	£23.07	£22.82	£23.23	£23.00	£24.80	£26.80

Table 10.8: Baseline and Projected Waste Management Costs for the Preferred Solution - Treatment

All costs in Thousands £	Total	2005/6	2006/7	2007/8	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
CAPITAL																
MBT Capital Expenditure	71,536			35,768	35,768	0	0	0	0	0	0	0	0	0	0	0
EfW (Fluid) Capital Expenditure	40,320				10,080	10,080	10,080	10,080	0	0	0	0	0	0	0	0
Total Capital	111,856				0	0	0	0	0	0	0	0	0	0	0	0
OPERATING																
MBT Operating costs	78,039	0	0	0	0	6,503	6,503	6,503	6,503	6,503	6,503	6,503	6,503	6,503	6,503	6,503
EfW (Fluid) Operating costs	31,752								3,528	3,528	3,528	3,528	3,528	3,528	3,528	3,528
Landfill Disposal cost	133,870	11,644	10,466	10,281	10,181	10,471	8,444	8,689	6,451	6,611	6,769	6,927	7,083	7,237	7,389	7,540
Landfill tax	151,412	8,384	8,704	9,675	10,672	12,075	10,605	11,460	8,424	8,547	8,665	8,779	8,888	8,991	9,090	9,183
Total Operating	395,074	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
REVENUE																
MBT Third party revenue	3,899	0	0	0	0	724	636	540	470	402	336	273	213	155	101	49
EfW (fluid) Energy revenue	11,833	0	0	0	0	0	0	0	1,393	1,368	1,343	1,317	1,291	1,266	1,268	1,285
EfW (fluid) Third party revenue	3,004	0	0	0	0	0	0	0	877	718	562	408	257	113	46	22
NILAS Fines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	18,736	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUMMARY COST																
Total Capital Cost	111,856	0	0	35,768	45,848	10,080	10,080	10,080	0	0	0	0	0	0	0	0
Total Operating Costs ³	109,791	0	0	0	0	6,503	6,503	6,503	10,031	10,031	10,031	10,031	10,031	10,031	10,031	10,031
Total landfill cost (incl Tax)	285,283	20,028	19,170	19,956	20,853	22,545	19,049	20,149	14,875	15,157	15,434	15,705	15,970	16,228	16,479	16,723
Total Revenue	18,736	0	0	0	0	724	636	540	2,739	2,487	2,241	1,999	1,762	1,535	1,415	1,356
Net cost (CORE)	488,194	20,028	19,170	55,724	66,701	38,404	34,997	36,192	22,168	22,701	23,225	23,738	24,240	24,724	25,096	25,398
SUMMARY NPV																
Present value	0	20,028	18,522	52,019	60,160	33,467	29,467	29,442	17,424	17,240	17,041	16,828	16,603	16,362	16,046	15,690
Net present cost (NPV)	391,672															

³ Not including Landfill charges

10.46 Additional costs will also be incurred for prevention initiatives and education/ awareness programmes that will accompany the implementation of the Preferred Solution. Some basic education and awareness costs have been included in the collection costs of implementing the kerbside and bring proposals for the preferred solution (refer to Tables 10.6 and 10.7).

Summary of Preferred Scenario

10.47 The preferred solution has been assessed against the decision criteria and priorities, and validated through a separate NI BPEO assessment. This has confirmed that this represents the preferred scenario.

10.48 The preferred scenario analysis has been conducted for the arc21 Region taking into account:

- the NI BPEO framework;
- the current and estimated future arisings of municipal waste;
- existing collection and recycling arrangements; and
- housing characteristics of the sub-region.

10.49 The outcome therefore represents the preferred solution for arc21 as a whole; if the appraisal was conducted at individual council level the same outcome may not have resulted.

10.50 The preferred solution must allow flexibility in how it is implemented. This is necessary for a number of reasons:

- Given the variation in housing types and population density there will need to be some flexibility in how the recycling collection systems are implemented in different areas.
- The success of recycling/composting will determine the requirements for secondary treatment capacity. Higher recycling and composting than assumed by this analysis will mean that the requirement for secondary treatment will reduce over the Plan period compared to what has been assumed. This may become apparent as a result of efforts to meet the long term NI BPEO targets for recycling and composting.
- The actual growth rate for municipal waste - if the waste prevention measures prove more successful and the rate of growth is even less than assumed, then the need for treatment and processing capacity will be reduced. If the rate of growth is higher then more or larger capacity facilities will be required.

-
- Residual waste treatment technologies are developing rapidly and a greater range of options, for both Mechanical/Biological and energy from waste options, are likely to become commercially viable.
 - The Plan does not specify exact sites for residual waste treatment facilities and there will need to be some flexibility in how Councils deliver residual waste for treatment; and
 - It is likely that the arc21 Councils will seek to procure services from the private sector. It will not be in the interests of Best Value to be prescriptive on specific technologies and systems to be implemented. The private sector will have its own views on how the preferred solution for residual waste treatment might be implemented and this should be sought during the tendering process. Any variants should be tested against evaluation criteria that give due regard to this assessment during the tendering process.

FACILITIES ASSOCIATED WITH PREFERRED SOLUTION

10.51 The conclusions of Chapter 5 together with the output from the preferred solution appraisal has identified the need for new waste facilities for the management and disposal of all non-hazardous controlled wastes produced in the arc21 Region. Tables 10.9, 10.10, 10.11 and 10.12 summarise key capacity requirements and hence the likely number of facilities that may be required. Clearly at this stage there remains some flexibility over how the capacity requirements will be provided. Total capacity requirements for the preferred solution for municipal waste are provided in Table 10.9.

Municipal Waste Management Facility Requirements

10.52 A critical mass assessment was under taken to identify whether arc21 Councils were likely to generate sufficient residual municipal waste to make development of a treatment facility feasible.

10.53 Based on the assessment, a combination of centralised and additional facilities located around regional population centres is likely to offer the most potential for arc21 municipal waste needs as follows:

- One EfW located in the greater Belfast Area;
- One MBT (IVC) facility located in the central area to serve the Councils in the Greater Belfast Area;
- One MBT (IVC) facility located in the north area to serve the Councils in the north of arc21, and

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- One MBT (IVC) facility located in the south area to serve the Councils in the south of arc21.

10.54 The combination of arc21 Councils feeding into these facilities provides sufficient waste arisings to make facilities feasible in the areas described. It is also considered reasonable that facility sizes could accommodate waste from third party sources if appropriate.

10.55 The ultimate energy from waste capacity requirements for arc21 depends on a number of factors not yet determined. In particular, it may be in the public interests to take advantage of any economies of scale accruing from third party sources. Other factors which will influence final EfW capacity are likely to include:

- The procurement vehicle chosen e.g. joint venture, public private partnership, PFI;
- Finance arrangements including: on/off balance sheets; project finance; prudential borrowing; and capital grant;
- The packaging of the contract e.g. DBFO, O&M etc., and
- The contract period. Under normal circumstances this is likely to extend beyond the planning period (given the experience in other jurisdictions) and this will effect the ultimate capacity of the plant in the context of growth projections, the influence of prevention, legal and other drivers within and beyond the Plan period.

10.56 Accordingly for waste management planning purposes it is considered appropriate to plan for a range of capacities up to a maximum of 370,000 tonnes per annum to ensure flexibility. This capacity is reflected in all Tables with a reference to Energy from Waste. Similar comments are pertinent to the MBT capacity identified.

10.57 It is also pertinent to plan for the thermal capacity of the EfW facility. The ultimate thermal capacity is likely to be influenced by a number of factors not yet fully determined. It is considered appropriate to plan for an overall total energy of 43MWe per year to ensure flexibility with regards thermal capacity.

10.58 Overall the facilities required for MSW are as indicated in Table 10.9. It should be noted that the proposal, in terms of residual waste, will be subject to the outcome of a Business Case and Procurement Process which may have an affect on the detail e.g. waste flows, relative capacities, contract bundling and proprietary technologies offered.

Table 10.9 Summary of Capacity and Facility Requirements for MSW

Facility	By 2010	By 2020
Clean Materials Recovery	One facility Total capacity c60,000 tpa	One facility Total capacity c60,000 tpa
Sorting Facility/Reprocessors¹	Total capacity c80,000 tpa	Total capacity c90,000 tpa
In-vessel composting	One to three facilities : in-vessel compost Total capacity c100,000 tpa	One - three facilities : in-vessel compost Total capacity c110,000 tpa
Composting (Windrow)	Three facilities Total capacity c35,000 tpa	Three facilities Total capacity c40,000 tpa
MBT	Three facilities Total capacity c285,000 tpa	Three facilities Total capacity c325,000 tpa
Energy from waste	No facility	One facility Total capacity c 43 MWe / 370,000 tpa
Landfill – major facilities	Two – Three sites for non-haz waste Total capacity requirement: Municipal waste: 320,000 tpa	Two – Three sites for non-haz waste Total capacity requirement Municipal waste: 265,000 tpa

Notes: 1: Sorting Facility/reprocessors is assumed to include existing reprocessors. Further sorting facilities may be required. Facilities in 2010 and 2020 denotes the total number required by that date.

ASSESSMENT OF REQUIREMENTS FOR OTHER WASTE STREAMS

Commercial and Industrial wastes

10.59 The conclusions reached in Chapter 5 identified that an estimated 400,000 tonnes of commercial and industrial wastes arisings were present in the arc21 Region. Of this an estimated 161,000 tonnes was landfilled. Remaining capacity at landfill sites for disposal of these wastes is extremely limited. This Plan supports the NI BPEO objective of increasing recycling levels to around 40% by 2010, 50% by 2012 and a long term target of 60% by 2020. For arc21, this means that approximately 300,000 tonnes will require recycling by 2020 (see Table 10.10). Additionally the NI BPEO identifies biological treatment from 2010 and energy from waste from 2013 for commercial and industrial wastes. To meet NI BPEO objectives by 2020, an additional 100,000 tonnes of these wastes will need to be diverted from landfill (against a base year for the plan of 2004/05).

Table 10.10 Summary of Commercial and Industrial NI BPEO Requirements for arc21

Technology	NI BPEO %	Estimated requirement for arc21 Region
Recycling and Composting	60%	295,680
AD	5%	24,640
MBT	6%	29,568
Thermal	16%	78,848
Landfill	13%	64,064

Total estimated arisings in 2020 = 492,800 see Table 5.24, Chapter 5

10.60 There are a number of opportunities for the co-treatment and disposal of commercial and industrial wastes with municipal wastes within the arc21 Region. These include:

- **Materials Recovery Facilities:** source segregated materials suitable for recycling such as paper, card and plastics from commercial/industrial sources can be delivered to materials recovery/sorting facilities handling municipal wastes.
- **Mechanical Biological Treatment:** Commercial wastes of similar composition to MSW may be suitable for this type of facility (in particular those from retail and business premises). This has the opportunity to produce large quantities of additional recyclable materials. Mixed waste arisings from hotels and restaurants may also be appropriate with the organic content contributing towards RDF or stabilised compost production.
- **Landfill Disposal:** as new landfill capacity is developed in the arc21 Region and in NI as a whole then municipal and commercial/industrial wastes that are similar in type will continue to share disposal facilities. Therefore, in assessing future requirements for landfill capacity the needs of both waste streams must be accommodated.
- **Energy from Waste:** Should energy from waste capacity be available as anticipated, there may be opportunities to provide capacity at any plants for suitable light industrial wastes and commercial wastes. Most combustion technologies are sufficiently flexible to handle a range of waste types. To date gasification/pyrolysis technologies are proven for wastes of high carbon/organic content (e.g. wood wastes) and as such are more suited to single waste streams that are more characteristic of industrial activities than for mixed municipal wastes.

Construction and Demolition wastes

10.61 Chapter 5 concluded that approximately 1.2 million tonnes per annum of construction and demolition wastes are disposed to landfill in the arc21 Region. Again, this Plan

supports the NI Waste Management Strategy objective to reduce the quantity of these wastes disposed to landfill to 75% of overall arisings in 2020.

- 10.62 The opportunities for co-managing these wastes with other controlled wastes are limited. A number of economic instruments are now in place nationally to encourage greater reuse and recycling of construction wastes and the use of secondary aggregates (i.e. Landfill Tax, Aggregates Tax). Facilities may be required for the sorting/crushing/processing of these materials. These tend to be best located either at existing landfill sites or at minerals excavation works. Mobile equipment is also available and can be temporarily located at construction/demolition sites.
- 10.63 There will remain a need for landfill capacity for the disposal of those wastes that are not recovered or recycled. For the early part of the Plan period this requirement will be in the order of 1.2 million tonnes reducing to 550,000 tonnes per annum. To meet the requirements of the NI BPEO, a reduction of 635,000 tonnes per annum in waste landfilled is required by 2020.

Table 10.11 Summary of Construction, Demolition and Excavation NI BPEO Requirements for arc21

Technology	NI BPEO %	Estimated requirement for arc21 Region
Reuse and Recycling	75%	1,661,708
Landfill	25%	553,903

Total estimated arisings in 2020 = 2,215,610t see Table 5.25, Chapter 5

Table 10.12 Summary of Capacity and Facility Requirements for C & I & C, D&E Waste

Facility	By 2010	By 2020
Recycling and Composting Facilities (e.g. Clean MRF Facility/In Vessel Composting Facility)	Two – four facilities Total capacity C&I Waste c.260,000 tpa CD&E waste c.1,500,000 tpa ¹	Two – five facilities Total capacity C&I Waste c.295,000 tpa CD&E waste c.1,600,000 tpa ¹
AD	One facility Total capacity C&I Waste c.22,000 tpa	One facility Total capacity C&I Waste c.25,000 tpa
MBT	One facility Total capacity C&I Waste c.30,000 tpa	One facility Total capacity C&I Waste c.26,000 tpa
Energy from waste	No facility	One facility Total capacity C&I Waste c. 43MWe / 370,000 tpa
Landfill – major facilities²	Two – three sites for non-inert waste Total capacity requirement: C & I waste: c.57,000 tpa ³	Two – three sites for non-inert waste Total capacity requirement C & I waste: c.64,000 tpa
Landfill – inert waste disposal²	Capacity requirement for C & D waste: c.500,000 tpa	Capacity requirement for C & D waste: c.554,000 tpa

Note:

1. It is assumed that the majority of C, D & E capacity will be achieved through mobile facilities for on site sorting and recycling at suitable large scale projects. No facility provision is made in this table.
2. Annual landfill requirements assume achievement of NI BPEO targets for diverting C & I and C & D wastes from landfill. C&I figure does not include requirements for disposing of sewage sludge. Incinerator residues assumed to be 12,000 tpa
3. Indicative facility sizes are based on market research data and are estimates only.

10.64 Table 10.13 shows the predicted requirements for waste streams in the arc21 Region up to 2010 with an estimate of the potential longer term requirements.

Table 10.13 Summary of Capacity and Facility Requirements

Waste Stream		Requirement by 2010	Estimated Long term requirement (2020)	Options/Facilities
MSW	Recovery	c315,000	c360,000	One - two MRFs One - three In-vessel composters Three Windrow composting facilities Waste minimisation initiatives Materials direct to re-processor
			c 43MWe / 370,000	One Energy from Waste Facility (EfW)
	Treatment	c285,000	c325,000	Three Facilities (MBT)
	Disposal	c320,000	c265,000	Two new landfills
C & I	Recovery	c262,000	c296,000	Two - five additional MRFs and IVCs Existing recycling facilities Waste minimisation initiatives
			c 43MWe / 370,000	One Energy from Waste Facility (EfW)
	Treatment	c52,000	c51,000	One Anaerobic Digester One MBT
	Disposal	c57,000	c64,000	Existing landfill facilities Utilise disposal at new MSW landfills
C D & E	Recovery	c1,500,000	c1,662,000	Re-use at all landfills Re-use in construction (additional mobile crushers required) Waste minimisation initiatives Existing recycling operations
	Treatment	-	-	-
	Disposal	c500,000	c554,000	Existing landfill facilities Disposal at the two new MSW landfills Four – six new inert landfill facilities and other projects which qualify as activities exempt from requiring a Waste Disposal (Management) Licence
Batteries	Recovery	c1,800	c2,000	Two existing recycling facilities
	Treatment	-		Five additional recycling facilities estimated
	Disposal	c600	c660	Export for disposal to GB
WEEE	Recovery	c14,000	c18,000	Existing recycling facilities & new recycling facilities One – two new white goods re-processors Waste minimisation facilities
	Treatment	-		
	Disposal	c5,000	c6,000	Disposal at the two new MSW landfills
ELV	Recovery	c45,000	c72,000	Four existing Recycling Facilities
	Treatment	c52,000	C83,000	Eight - ten new de-polluting sites
	Disposal	c7,000	c11,000	Disposal at MSW landfills
Tyres	Recovery	c10,000	c11,000	Waste minimisation initiatives Re-use for e.g. playground surface, cement kiln fuel
	Treatment	-		

	Disposal	-		
Healthcare	Recovery			National contract for all Island
	Treatment			Existing transfer and treatment facilities.
	Disposal	-		
Sewage Sludge	Recovery	-		
	Treatment	c31,800	c32,000	Existing incinerator. Anticipated that additional capacity will become available.
	Disposal			

10.65 Despite the desire to move away from landfill to more sustainable waste management practices, bringing new integrated waste facilities on stream will not happen particularly quickly. In the short term, landfill disposal requirements will remain a significant component of the waste management system. In the long term safe disposal of residues from other waste processes means that while reliance on landfilling will reduce, it will not be possible to operate without landfill sites completely.

10.66 In implementing the facility requirements that represent the preferred solution for the arc21 Region, sufficient flexibility should be retained to enable capacity to be shared with the adjoining sub-regions where such sharing would still represent the preferred solution. This applies in particular to:

- integrated waste management facilities and non-hazardous landfills for the recycling, recovery and/or disposal of commercial and industrial waste arisings;
- integrated waste management facilities for the recycling, recovery and/or disposal of municipal waste in accordance with the proximity principle and to make best use of economies of scale;
- dedicated hazardous landfill facilities for the disposal of particular hazardous waste streams where disposal represents the preferred solution; these should be considered on a regional rather than sub-regional or local basis as discussed in Chapter 8.