Review of

Kildare Waste Management Plan

2005 – 2010

Appendices

Volume 4 of 4

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REVISION CONTROL TABLE

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Abstract: A Waste Management Plan for Kildare County Council was prepared in accordance with the 1996 Waste Management Act. The Plan is valid for the period of 2000 - 2005. Section 22 of the Act requires that the Plan be reviewed at least once every five years. Kildare County Council has appointed FTC to prepare the review of this Waste Management Plan for the period 2005 - 2010.

Kildare is not a member of any regional plan. The review assesses the various waste management options available to Kildare County Council. The review of the plan also assesses progress to date in the implementation of the 2000 – 2005 Waste Management Plan. It outlines specific goals and targets as well as the infrastructure that will be required for County Kildare to meet European and National waste targets.

This volume of the proposed review comprises the appendices to the main document.

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1. SUBMISSIONS

Kildare County Council advertised its intention to prepare a review of the waste management plan for County Kildare in early July 2004.

Since that date the Council has received 15 submissions, mainly from the commercial waste sector. These submissions have been summarised below with the various points highlighted. Aspects raised in each submission have been addressed where possible in the review of the Plan.

1.1. EPA Pre-submission

A pre-submission was made by the Environmental Protection Agency (EPA) on the 1st July 2004. The pre-submission highlights the EPA's views on general waste management plan issues and is not specific to the Kildare region. The principal points are as follows:

- the EPA points out that waste management plan reviews which commenced after the 21st July 2004 will be subject to strategic environmental assessment according to the SEA Directive 2001/42/EC
- the EPA stresses the requirement in the Waste Management (Planning) Regulations that all plans should outline proposals for monitoring the implementation of the plans, and generally improving data and information flows
- waste management plans should make specific provision to promote and otherwise implement measures towards achieving waste prevention; the Plan should have active links with the National Waste Prevention Programme
- the review of waste management plans should be used as an opportunity to fully incorporate all relevant provisions of the National Hazardous Waste Management Plan; in addition to this, all existing and proposed hazardous waste infrastructure should be appropriately acknowledged in waste management plans
- on the topic of illegal activities and enforcement, the EPA proposes that the scale of past and current illegal and unauthorized activities should be identified and information on enforcement actions and/or investigations undertaken or underway should be included in the Plan; the EPA notes the inter-regional aspects of this problem
- the EPA raises the issue of uncollected household waste which it believes leads to unsatisfactory practices such as backyard burning; it recommends that the scale of the problem be quantified in local and regional waste management plans, along with proposals to address the issue
- finally, the EPA recommends that the implications of the National Biodegradable Waste Strategy, the Waste Electrical and Electronic Equipment (WEEE) directive and the End-of-Life Vehicles directive should be considered in the Plan review

1.2. Strategic Policy Committee

A presentation on the Waste Management Plan Review was made to the members of the Strategic Policy Committee (SPC) for County Kildare on the 19th February 2005. A number of issues were highlighted by the SPC at this meeting:

- frequency of bin emptying should be increased by the local authority
- growth factors used in the plan to calculate future waste arisings should not decrease
- query on who decides whether a housing estate or apartment complexes should have bring banks (with regard to Naas Town Plan)
- query on the provision of organic/composting bins for rural areas
- query on the necessity for three landfills
- the need for more bring banks and litter wardens throughout the County
- C & D waste should be looked at in detail in the Plan

1.3. An Taisce

A submission from An Taisce was received on the 28th June 2004. Principally, An Taisce suggests that investigations be carried out in order to determine:

- the nature and extent of unauthorised waste disposal in Co. Kildare
- the tracking of waste generated in Co. Kildare, and determination of the current breakdown into constituent elements, and disposal/recycling methods

1.4. Department of the Environment, Heritage and Local Government – Heritage Service

A submission from the Heritage Service of the Department of the Environment, Heritage and Local Government (DoEHLG) outlining archaeological recommendations was received on the 3rd August 2004. It recommended that, where new or extensions to existing developments are proposed, an assessment of the impact of the development on the archaeological heritage should be carried out. The submission also states that the impact of developments on the setting and visual amenity of Recorded Monuments or Places should also be considered.

1.5. Office of the Minister for Environment, Heritage and Local Government

A submission from the Minister's office was received on the 4th August 2004. The submission stressed that flat charges for waste disposal are not acceptable, as they fail to inspire people to make a strong effort to recycle. The Minister expects to see a real commitment in the Plan to meaningful pay-by-use charging, whether weight or volume related.

1.6. Office of Public Works

A submission was received from the Office of Public Works on the 6th August 2004. The submission does not directly address the review of the Kildare Waste Management Plan. It stresses the importance of taking flood risk into account in the planning and development process.

1.7. Bord Na Móna

A submission was received from Bord Na Móna on the 10th September 2004. The submission reviews the various policy documents governing waste management in Ireland. The findings of the "National Overview of Waste Management Plans" document with respect to the Kildare region are noted. The submission also profiles the Bord Na Móna group with an emphasis on its waste management activities.

With regard to the review of the Kildare Waste Management Plan, the company principally recommends that the review:

- recognises the role of County Kildare as part of the Greater Dublin Area, and plans for new waste management infrastructure accordingly
- provides for inter-regional movement and management of waste
- provides for balance in the mix of waste management treatments proposed, taking account of improvements in technologies
- takes account of more recent data on current and likely future rates of waste generation, and verifies the accuracy (or otherwise) of reported commercial and industrial arisings
- considers the development of concentrated waste management infrastructure in suitable locations
- recognises the potential for development of concentrated waste management infrastructure in suitable locations
- recognises the potential for development in the County of waste management infrastructure of national strategic importance
- provides for the early and extensive roll-out of segregated collection of organic waste

1.8. Usk and District Residents Association Ltd.

A submission was received on the 13th September 2004 from O' Neill – Rave, Planning and Development Consultants, on behalf of Usk and District Residents Association Ltd. The submission outlines the association's concerns regarding proposals to develop a landfill at Usk, Co. Kildare.

The association requests that, in making or varying the Kildare Waste Management Plan, Kildare County Council:

- removes the subject site at Usk from any list of candidate sites for the location of a new, municipal landfill facility
- designates the site as being unsuitable for any future landfill facility whether proposed by a private company or any local authority

1.9. Wicklow County Council

A submission from Wicklow County Council was received on 30th July 2004. In the submission, the possibility of a joint Waste Management Plan being prepared by Kildare and Wicklow County Councils was raised. The submission noted the common issues facing the two counties including:

- closure of local landfills
- use of Arthurstown Landfill
- illegal dumping of Dublin waste
- waste collectors working in both counties
- illegal landfills at the Kildare/Wicklow border

1.10. Director of Services (Community & Enterprise) Kildare County Council

A submission was made by Mr. Des Page, Director of Services (Community & Enterprise), Kildare County Council, on the 30th July 2004. It raised queries regarding achieving the priorities set out in the "Kildare 2012" document. In addition to this, the submission noted issues raised by the "Vision for the Environment" document. Finally, the submission points out that the RAPID plan for Athy which contains environmental/waste management issues which need to be reflected in the Plan.

1.11. Irish Waste Management Association

A submission was received from the Irish Waste Management Association in August 2004. The principal issues are:

- to employ a realistic mix of waste management measures, e.g., prevention, reduction, reuse, recycling, recovery and residual landfill
- to recognise commercial and industrial waste infrastructural needs
- acknowledge the importance of high infrastructural and environmental standards in attracting investment from companies abroad, in the region, and in the country
- to recognise changes in waste arisings, and update the approach to waste management accordingly
- to recognise and create opportunities for inter-regional co-operation on movement and management of waste
- to recognise the role of the legitimate waste management industry in delivering the requirements of the Plan
- to engage the expertise and resources of the private sector in delivering the requirements of the Plan in a meaningful, transparent and measurable manner
- to outline the rules of engagement between the public and private sector
- to encourage a competitive market
- to strengthen enforcement
- to build prevention and minimisation capacity among the commercial and industrial waste producers through education and dialogue
- to market the plan and report successes to stakeholders under the banner of the "Race Against Waste" campaign.

1.12. Thorntons Recycling

A submission from Thorntons Recycling was received on the 1st September 2004. The submission briefly describes the company's existing waste management facilities in County Kildare and surrounding counties as well as facilities proposed by the company. The company points out that they have been operating for 25 years, before waste management plan boundaries were ever considered. Therefore, the company asks that the review recognise and facilitate their need to maintain economy of scale across regional boundaries.

The submission claims that a proposed composting plant at Kilbride (located in the Midlands Region) would have implications for the Kildare Waste Management Plan by virtue of the fact that it is only 11 km from County Kildare. A similar claim is made for their proposed civic amenity and recycling centre in Dunboyne Co. Meath.

1.13. Herhof Environmental

A submission from Herhof Environmental was received on the 2nd September 2004. The submission introduces the company and describes one of its two main products, i.e., mechanical-biological treatment (MBT) plants. The company outlines the technology and processes behind the system, and its experience in the provision of MBT technology. The company believes that the review of the Kildare Waste Management Plan must provide for the inclusion of MBT technology in the region's waste management infrastructure.

1.14. Greenstar

A submission was received from Greenstar on the 10th September 2004. The principal points of the submission are as follows:

- existing and predicted waste arisings must be amended to reflect the more up-to-date data contained in the National Waste Database Report for 2001
- the findings of recent DoEHLG reviews ("Taking Stock and Moving Forward," and "National Overview of Waste Management Plans") must be consulted during the review
- recognition of the private sector in their role in waste management now and in the future
- effective engagement with the private sector during the preparation of the review
- the implication of industrial waste should be highlighted in the Plan
- inter-regional movement and treatment of waste should be provided for in the revised Plan
- the Plan should contain up-to-date information on the remaining landfill capacity and proposed capacity in the region; the Plan should be considerate of proposals for residual landfill submitted by the private sector
- the Council (through the Plan) should promote source-segregation of biowaste, and encourage the establishment of biowaste treatment facilities in County Kildare
- the Plan should consider the implications of this report and forthcoming legislation to implement the WEEE Directive
- the Waste Management Plan should take into account the conclusions of the Sludge Management Plan for the County
- the Plan must be made in accordance with the Waste Management Act and the Waste Management (Planning) Regulations, S.I. No. 137 of 1997
- the Plan should set out a timetable for the provision of each of the elements contained in the Plan

The Greenstar submission also addresses the issues of public-private partnerships, exclusion zones for waste management facilities, and illegal dumping.

1.15. KTK Waste (now Greenstar)

A submission was received from Greenstar (formerly Celtic Waste). It is a proposal to Kildare County Council by KTK Waste entitled "An Integrated Waste Management Solution for County Kildare". The following summarises the details:

- The proposal consists of:
    - a recycling park at Osberstown, Naas, Co. Kildare
    - residual landfill developments at KTK Landfill and Usk
- KTK proposes to independently contract waste supplies from third party contractors and industrial concerns in the County.
- KTK will supply the capital costs to fund the project.
- KTK landfill will close in 2006, but Greenstar would like to have another landfill operational by then in Usk.
- The recycling park will have a recycling rate of around 30 % in year three of operation, and over 50 % after five years. The recycling park will require around 15 acres. The site selected has approximately another 25 acres if needed. The site is close to the N7, motorway, close to a large urban centre, and close to Osberstown Sewage Treatment Facility. It will accept household, commercial and industrial waste generated in County Kildare, segregated and unsegregated.
- The proposed capacity of the park will be 180,000 tonnes per annum, as follows:
    - circa 10,000 tonnes per annum –civic amenity
    - circa 50,000 tonnes per annum – composting
    - circa 50,000 tonnes per annum. – MRF
    - circa 70,000 tonnes per annum – C&D
- The composting unit will be run by a specialist German company. It will have a 100 % recovery rate, which will be sold or used as capping on landfills.
- The project is budgeted as follows:
    - total MRF € 18 m
    - residual landfill € 12 m
    - fees € 2 m
    - total € 32 m

1.16. Department of the Environment, Heritage and Local Government

A submission dated 11th June 2004 was received from the Department of the Environment. The following points were highlighted:

- Section 22(4) of the Waste Management Act 1996 requires the review of Waste Management Plans. A local authority may vary its previous Plan or replace it with a new, more up-to-date Plan.
- Section 22(6), 22(7) of the Waste Management Act 1996, and the Waste Management (Planning) Regulations, must be considered.
- Considerable attention should be given to assuring that data estimates are up-to-date, and that projections for future waste arisings combine ambition and realism.
- Particular regard should be given to the "National Waste Database Report" (2001) and the "National Overview of Waste Management Plans" (2004).

- The "National Strategy on Biodegradable Waste Draft Strategy Report" (April 2004) details the Government's landfill diversion targets. This strategy must be taken into account, particularly in terms of the further roll-out of segregated collection of household dry recyclables and organic wastes, and the provision of materials recovery/biological treatment infrastructure.
- The implications of the report of the WEEE Task Force on Producer Responsibility Initiatives (PRI) should be taken in to account, particularly in terms of capacity requirements to cater for WEEE at civic amenity sites.
- Under paragraph 5.2 of the Schedule to the Waste Management (Planning) Regulations 1997, plans should describe the respective roles of the local authority and private interests. It is important that the plans clearly set out the delivery mechanisms envisaged through public-private partnership arrangements or otherwise.
- Local authorities do not have a statutory responsibility to collect industrial or commercial waste, or to provide facilities for their disposal or recovery, but plans should address how this waste is to be managed. Plans need to state to what extent industrial/commercial waste will be accepted in existing facilities, so that additional infrastructure can be provided if required, and the roles of the public/private sectors can be identified.
- There should be effective engagement between the local authorities and the private waste industry.
- The IWMA will submit a waste industry input to the Plan if desired.
- Under paragraph 5.1(a) of the Schedule to the Waste Management (Planning) Regulations 1997, plans should set out proposals for monitoring plan implementation, and a timetable for the delivery of the range of waste infrastructure provided for in the plan.
- The Plan should set out the key actions to be delivered in each year of the Plan's life.
- Annual reports on the implementation of waste management plans are required within three months of the end of each year.
- The DoEHLG is preparing guidelines in relation to C&D waste management plans. These need to be taken into account in waste management plans.
- The reviews of the waste management plans should be completed as expeditiously as possible, while ensuring that public consultation requirements are observed, and a robust Plan is delivered.
- Under section 22(5) of the Waste management Act 1996, initial notice of intention to commence the review must be published no later than 30th June 2004. The final Plan should be completed by the end February 2005.

1.17. Eastern Health Board

A submission was received from the Eastern Health Board. A consultation meeting was also held in Dublin on the 22nd February 2004. The Board is interested in:

- establishing civic amenity/recycling centres in conjunction with the County Council at its health centres in County Kildare
- the establishment of two-and three-bin systems at its residential and health care facilities
- liaison with Kildare County Council in initiating other waste initiatives for hazardous health care waste

1.18. A1 Waste

The submission from A1 waste outlines details of the extensive facility which Neiphin Trading Ltd (part of the A1 Waste Group) operate at Kerdiffstown. In the first 18 months of operation, some 881,000 tonnes of C&D wastes were recovered at the facility. Additional capacity has been brought on-stream during 2005 which has increased the quantities of wood, stone and steel being recovered.

1.19. Ark Recycling

A submission was received from Arc Recycling on the 11th March 2005. This submission was entitled "Total Waste Recycling Process," in which the following was detailed:

- the company is promoting a mechanical-biological treatment process which achieves recycling rates of 98 % with no emissions
- this plant will overcome the problem of needing source separated waste
- only 2 % of the processed waste remaining goes to landfill
- plastic lumber is the main end product of this process; this can be used in manufacturing
- the plant will process the following waste:

Waste	Destination
timber, glass and metals	• removed for recycling
bricks and concrete	• re-use
organics	• compost
glass and textiles	• recycling
remaining plastic, paper & wood	• processed to produce plastic lumber
paper	• can be used as produce animal bedding or blended with a wood component to be sold as mulch

2. POLICY DEVELOPMENT

The principal aim of the review of the Waste Management Plan for County Kildare is to ensure that both European and National waste management policies can be met. In the preparation of this Plan, the different waste management techniques were reviewed. This review has been summarised in Volume 3 of this document.

The selected policies of this Plan must be realistic and attainable, as well as acceptable environmentally and economically. An assessment of these criteria has been carried out in Section 7 of Volume 2 of this document.

This section of the Plan outlines the scenarios that were examined with the aim of determining a comprehensive waste management solution for waste arisings in County Kildare. The scenarios consist of components (different waste management techniques) which are part of an overall integrated waste management system.

2.1. Scenario Components

Three waste management scenarios are examined for County Kildare. These are:

- Scenario One: full recycling/recovery with residual to landfill only
- Scenario Two (a): full recycling/recovery with residual to mechanical-biological treatment facility and landfill
- Scenario Two (b): full recycling/recovery with residual to mechanical-biological treatment facility and thermal
- Scenario Three: full recycling/recovery with residual to thermal and landfill

The scenarios consider the three main sources of municipal waste:

- household
- commercial
- industrial

The three scenarios are identical with regard to their collection systems (three-bin system) and treatment systems (recycling/recovery). The materials which are collected from the three-bin systems and network of bring centres and civic amenities will be processed as follows:

- dry recyclable collection: recycling/recovery of recyclable material in dry material recovery facilities (MRFs); sorting and picking lines separate the waste into paper, cardboard, ferrous metals, non-ferrous metals, and plastic fractions
- organic waste collection: this is biologically treated, and re-used beneficially
- residual collection:
  - residual landfill (without further processing)
  - pre-treatment in a mechanical biological treatment (MBT) facility prior to landfill disposal
  - recovery in a thermal (waste to energy) facility, with landfill for non-combustible waste streams

The scenarios vary in the options available for the treatment or disposal of the residual waste originating from the three-bin collection system which will be provided to the household and commercial sectors.

Figure 2.1 outlines the different pathways for each of the three bins.

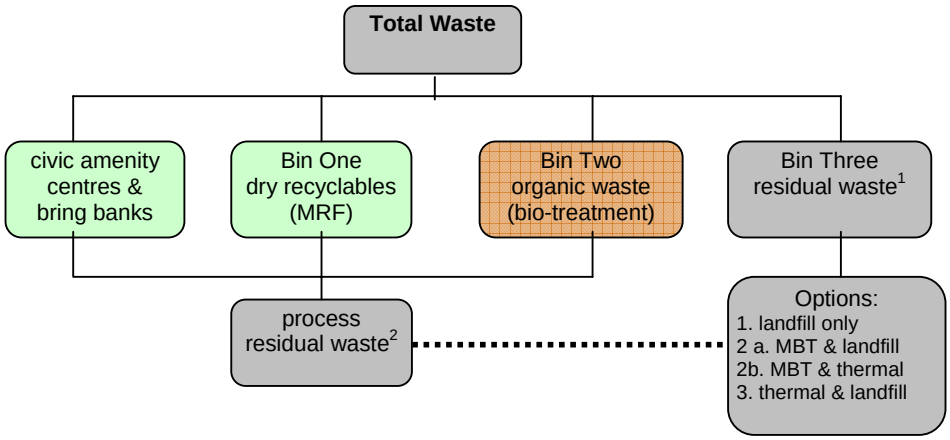

Figure 2.1: Pathways for the Treatment and Disposal of Waste from the Three-Bin System

[1] This residual waste is waste that cannot be recycled/recovered or composted economically, or at all
[2] Process residual waste arises after the processing of waste at a material recovery facility, bring banks, biological treatment facilities. This is waste that has been placed in the wrong bin, or which is contaminated and cannot be recycled, e.g., dirty paper, composite materials, etc.

The tonnage for the design year of the main components of the system (i.e. material recovery systems (MRF), the thermal treatment facility etc.) is 2009. The year 2009 was chosen to coincide with the next major Landfill Directive target in 2009.

The scenario assessment does not account for the portions of waste categories such as industrial waste which, at present, are managed by the industries themselves, and so do not enter the normal collection/disposal regime.

2.1.1. Scenario One – Full Recycling/Recovery with Residual to Landfill Only

This scenario assumes that the existing two-bin system of dry recyclables and residue is expanded to a three-bin system, where an extra bin is added for organic waste collection. The waste infrastructure required to the treat the waste collected by the three-bin system in this scenario is as follows:

- home composting
- network of bring banks and civic amenities
- transfer station(s)
- biological treatment facility(s)
- dry material recovery facility(s)
- residual landfill(s)

Garden waste from households is assumed to be brought by the public to civic amenities for subsequent treatment at a biological treatment plant. The garden waste would then be treated together with the organic waste from the household and commercial sectors.

Scenario One assumes that all waste originating from the residual bin is landfilled. Figure 2.2 outlines the pathways for each of the three bins in Scenario One.

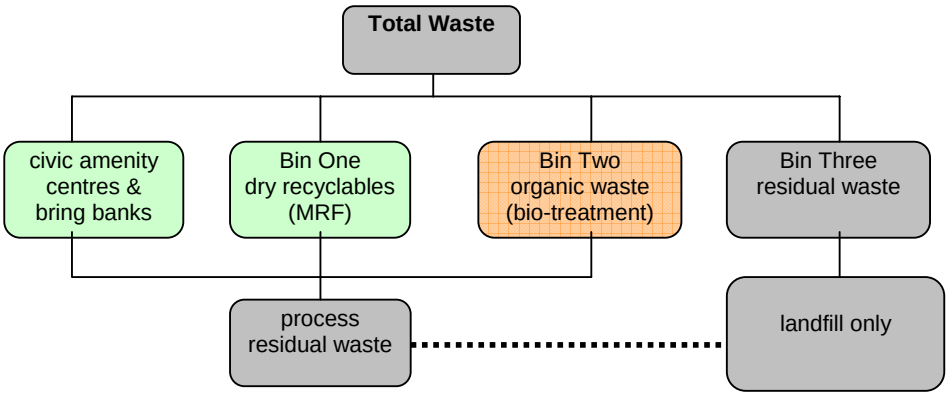

Figure 2.2: Pathways for the Treatment and Disposal of Waste from the Three-Bin System in Scenario One

2.1.2. Scenario Two (a) and (b) – Full Recycling/Recovery with Residual to mechanical biological treatment and landfill or Residual to Mechanical-Biological Treatment and thermal

This scenario assumes that the residual waste collected in Bin Three is processed at a mechanical-biological treatment (MBT) facility. The waste that is processed through these facilities plant is not 100 % recoverable/recyclable. This results in a residue from the process, which is termed "dross." This is a combination of glass, textiles, paper/cardboard, metals, etc., which is not suitable for further recycling/recovery. This dross can be either landfilled (Scenario Two (a)) or thermally treated (combustible products only) (Scenario Two (b)). The waste infrastructure required to the treat the waste collected by the three-bin system in this scenario is as follows:

- home composting
- network of bring banks and civic amenities
- transfer station(s)
- biological treatment facility(s)
- dry material recovery facility(s)
- mechanical-biological treatment facility(s)
- residual landfill(s)
- Thermal treatment

Figure 2.3 outlines the pathways for each of the three bins in Scenario Two (a) and (b).

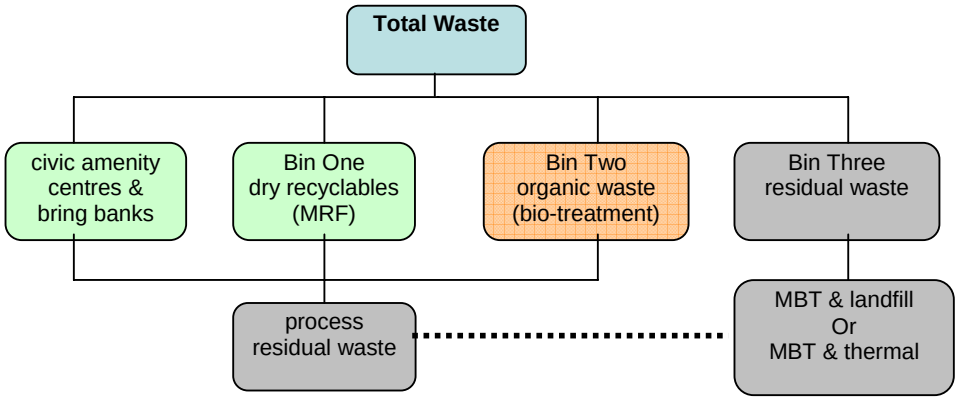

Figure 2.3: Pathways for the Treatment and Disposal of the Three-Bin System in Scenario Two

2.1.3. Scenario Three – Full Recycling/Recovery with Residual to Thermal Treatment and Landfill

Scenario Three is similar to both Scenarios One and Two, except the residual combustible waste fraction (Bin Three) is thermally treated. The waste infrastructure required to the treat the waste collected by the three-bin system in this scenario is:

- home composting
- network of bring banks and civic amenities
- transfer station(s)
- biological treatment facility(s)
- dry material recovery facility(s)
- thermal treatment(s)
- residual landfill(s)

Figure 2.4 outlines the pathways for each of the three bins in Scenario Three.

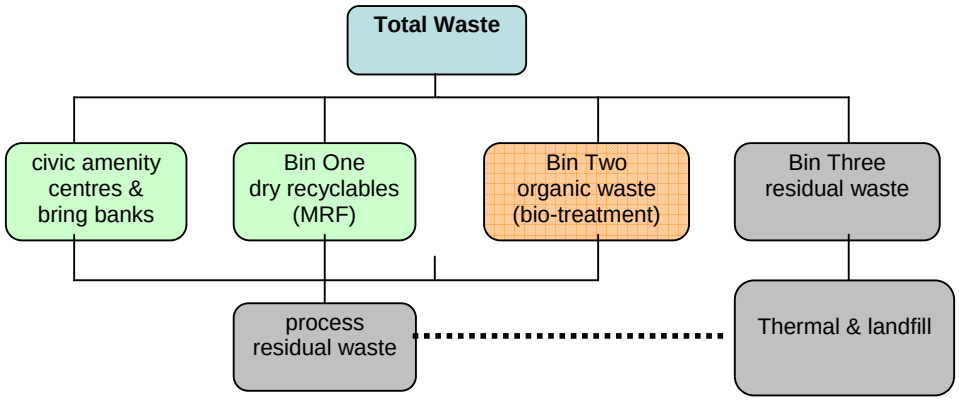

Figure 2.4: Pathways for the Treatment and Disposal of Waste from the Three-Bin System in Scenario Three

2.2. Recycling and Collection Efficiencies of Waste

The three scenarios are identical as regards collection systems (three-bin system) and treatment systems (recycling/recovery) of the dry recyclables. The waste stream collected in the three bins can be broadly divided into the following waste fractions:

- glass
- paper and cardboard
- metal including drink cans
- plastics
- textiles
- organic waste – this includes both garden or green waste and biowaste, e.g., food waste
- other waste

Collected waste from the household, commercial and industrial sectors will be treated using various techniques as outlined in Scenarios One to Three. The quantity of waste that will enter the different waste management routes will be defined by the following factors:

- composition
- collection efficiency
- recycling efficiency

Tables 2.1 and 2.2 outline the different composition, collection and recycling efficiencies of household, commercial and industrial waste airings.

Table 2.1: Collection and Recycling of Household Waste

Waste Fraction	Composition %	Suggested Frequency (per annum)	Waste Accounted for %	Collection Efficiency %	Recycling Efficiency %
glass	4	bring banks	-	70	95
paper & cardboard	22	26	100	60	75
metal incl. cans	4	26	100	70	95
plastic	12	26	100	70	70
textiles	4	2	100	40	60
organic waste	35*	26	100	50	80
other waste	19	26	100	100	0
total	100				

To explain Table 2.1 and the other tables which follow, the example of "paper and cardboard" is taken from Table 2.1:

- waste fraction - refers to the generic waste fraction for that element, expressed as a percentage of the total household waste stream
- composition - 21 % of the household waste stream is paper and cardboard including magazines, packaging, etc.
- frequency - 26: the number of collections per year (in this case fortnightly)
- waste accounted for - 100 %, in this case all types of paper/cardboard used in the household is collected, (however some may not be in the right bin or is not recyclable, e.g., soiled, etc.)
- collection efficiency - 60 %: only 60 % of the paper/cardboard fraction ends up in the correct bin; the remaining 40% is assumed placed in the residuals bin and goes to pre-treatment and or disposal
- recycling efficiency - 75 %: only 75 % of the collected paper/cardboard is recyclable; the remaining 25 % is dross/soiled/rejected and is sent for disposal (to landfill)

* 4 % of this total is assumed to be home-composted

The frequency of collection specified in Table 2.1 reflects the amount of waste expected. Organic waste is collected weekly in order to avoid odour nuisances from decomposing waste, especially in the summer season. The frequency can be reduced to once a fortnight in the winter due to lower ambient temperatures and less garden waste.

Textiles are to be collected only twice a year through special campaigns, and glass is brought to the nearest bring centre/civic amenity.

The separate collection will require a three-bin system. The three bins are for dry recyclables, organic/green waste and residual waste.

The three fractions paper/cardboard, metal and plastic are placed in the bin at the household for "dry recyclables". These need to be kept segregated from other material to avoid contamination.

It is assumed that not all recyclables are correctly disposed in the three-bin system, and some recyclables will be unfit for recycling, e.g., soiled paper. This explains figures of less than 100% collection efficiency.

The "organic waste" (garden and household organic) is assumed to be biologically treated. It is assumed that 4 % of the total organic waste is home-composted and thus is not included in the overall organic composition for household waste.

Other waste, which is not collected for recycling, obviously will have a recycling rate of zero in a disposal-only scenario.

Trade and commercial industry are assumed to have slightly higher collection frequencies and recycling efficiencies than those of household waste. Organic waste that is not collected is assumed to end up in the residual waste fraction.

The collection frequency is not considered relevant for these sectors with the exception of organic waste, which should be collected frequently to avoid nuisance issues (at least weekly). These sectors use existing waste collection schemes, organised by the private sector. Table 2.2 shows the generation and treatment of both commercial and industrial waste.

Table 2.2: Generation and Treatment of Commercial and Industrial Waste

Waste Fraction	Composition %	Frequency (per annum)	Waste accounted for %	Collection Efficiency %
glass	7	commercial collections*	80	95
paper and cardboard	49	commercial collections	60	75
metal including cans	3	commercial collections	80	95
plastic	10	commercial collections	75	80
textiles	1	commercial collections	50	60
organic waste	21	commercial collections	80	85
other waste	9	commercial collections	100	0
total	100			

* or bring banks

3. POLICY DECISION-MAKING CRITERIA

The formulation of the waste management policy for County Kildare is based on the following criteria:

1. environmental assessment of recommended waste management scenarios
2. ability to meet European and National waste management targets
3. financial cost

3.1. Environmental Assessment of Recommended Waste Management Scenarios

An environmental assessment was carried out to assess the relative environmental impacts of each of the waste management scenarios. This assessment follows broadly the methodology for a life-cycle-assessment (LCA) as laid down in ISO 14040 - 14043.

The LCA systematically addresses the environmental aspects of the systems from material acquisition to final disposal. In this case, the product system is the waste management process. The goal of the study is to identify the environmental aspects of waste management scenarios under examination as part of the review of the Waste Management Plan. The purpose of the assessment is to allow a critical comparison of the environmental performance of the waste management system scenarios, to assist in the decision-making process.

It should be noted that a life cycle assessment is an environmental management tool used to understand and compare the environmental burdens of an integrated waste management system. It does not represent a complete environmental assessment of any waste management system, technology or specific proposal. The assessment takes no account of site specific or regional risk factors. These are taken account of during the statutory environmental impact assessment and/or planning procedures prior to the implementation of specific facilities.

For this environmental assessment, the system boundary for each scenario commenced at the waste collection point and finished when the waste was recycled, treated and/or deposited. The material is in the system once it is collected at the household or premises or from the civic amenity sites. The end point of the system is when the waste regains value as a raw material, product or when the material is deposited to landfill.

The emissions generated during the treatment and disposal of the waste were considered. Avoided emissions, for example, electricity generated by burning landfill gas or thermal treatment, were also considered in this study. An environmental burden is defined as “energy and raw materials used, and waste released to air, water and land”. The model is based on the calculation of the relative environmental burdens associated with each of the waste management activities. The replacement of energy to the environment by electricity generation, for example thermal treatment or burning landfill gas, is taken into account as emission credits. The environmental burdens are classified into environmental impact categories.

The selection of impact categories for the waste management assessment follows from the goal and scope of the assessment. The major environmental impact categories have been considered as well as toxicity impact potentials. In the assessment the emissions have been categorised into six environmental impact categories:

- acidification
- photochemical ozone creation
- eutrophication
- human toxicity potential
- ecological toxicity potential
- global climate change

Table 3.1: Summary of Environmental Performance Indicators used in Assessment*

Environmental Effect	Expressed in Terms of	Environmental Performance Indicator	Reference Chemical
acidification	acidifying effect on the ecosystem	AP acidification potential	SO_2
photochemical smog creation	the change in ozone concentration due to a change in the emission concentration of a chemical	POCP photochemical ozone creation potential	ethylene
eutrophication	contribution to the creation of aquatic biomass	EP eutrophication potential	phosphate (released to water)
global climate change	heat-radiation absorption capacity	GWP Global Warming Potential	CO_2
ecological toxicity potential	toxicity for the aquatic (freshwater) ecosystem resulting from dispersion in the environment	ETP ecological toxicity potential	1,4-dichlorobenzene (emission to water)
human toxicity potential	toxicity for humans resulting from dispersion in the environment	HTP human toxicity potential	1,4-dichlorobenzene (emission to atmosphere)

The data-gathering philosophy for the study was to use published sources of data where possible. Estimation or calculation of emissions was avoided in favour of measured emissions. It is felt that this approach will reduce the scope for inaccuracy or error in the study.

* source: VNCI, Guideline Environmental Performance Indicators for the Chemical Industry – the EPI – Method Version 1.1, Table, Page 8

3.1.1. Results of the Assessment

There is no waste management scenarios that performs the best in all environmental impact categories. The interpretation of the results therefore requires consideration of the reasoning behind the results and the explanations why the scenarios perform as they do in each of the categories analysed. The results of the assessment are illustrated in Figure 3.1 to Figure 3.7. In each of the diagrams, Scenarios One to Three represent the following:

Scenario One:	full recycling/recovery with residual to landfill only
Scenario Two (a):	full recycling/recovery with residual to mechanical-biological treatment and landfill
Scenario Two (b):	full recycling/recovery with residual to mechanical-biological treatment and thermal
Scenario Three:	full recycling/recovery with residual to thermal with energy recovery, and ash to landfill

3.1.2. Acidification Potential

The acidification potential results in Figure 3.1 show the least impact potential resulting from the thermal treatment options, with the pure thermal option coming out slightly better than WR/SF with thermal treatment of the residual waste stream. The emissions avoided through the generation of electricity from the waste stream, and the credits gained from recycling, result in a benefit from all scenarios. The greatest savings are through the avoidance of electricity generation in traditional power plants.

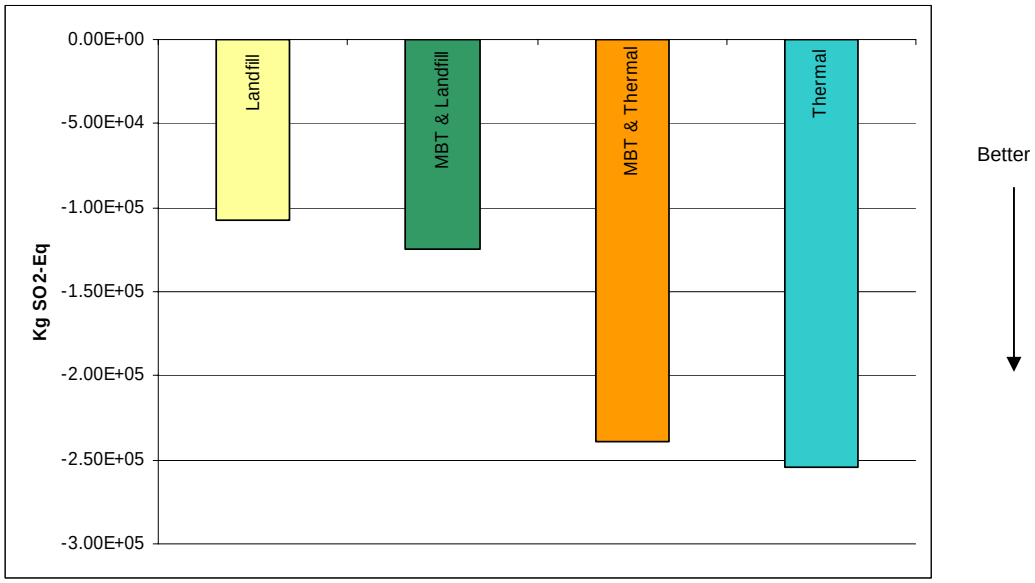

Figure 3.1: Potential Impact on Acidification*

* kg SO_2-eq is where sulphur dioxide (SO_2) is used as an indicator compound (eq) for all other potential acidification compounds

3.1.3. Photochemical Ozone Creation Potential

The results of the analysis shown in Figure 3.2 show that the three scenarios have a 'credit' impact on the emission of potentially photochemical ozone (PDCP) creating substances. The recycled material that is recovered from each of the scenarios results in significant credits for the avoidance of emissions of POCP substances.

The scenarios which include thermal treatment also gain credit for the energy recovery from the waste and will result in further credits for these scenarios. There is also a small credit for avoided emissions associated with the energy generated from recovered landfill gas.

The results show that the scenarios with thermal treatment included as a waste option perform particularly well. This is due to the displacement of electricity generation emissions.

The thermal treatment of the residual waste is deemed to be the most environmentally advantageous option, followed closely by the option of pre-treatment of waste in a WR/SF plant prior to submission to a thermal treatment plant. The treatment of the residual waste in a MBT prior to disposal to landfill is next after the thermal options. The scenario of sending residual waste direct to landfill fares worst in terms of POCP.

It is noted that photochemical ozone creation potential category is not a highly important category in Ireland. Ireland has low concentrations of ground level ozone, and photochemical smog is not a large problem in this country. However the category has been included as an interpretation category, in the main to allow comparison to other LCA studies.

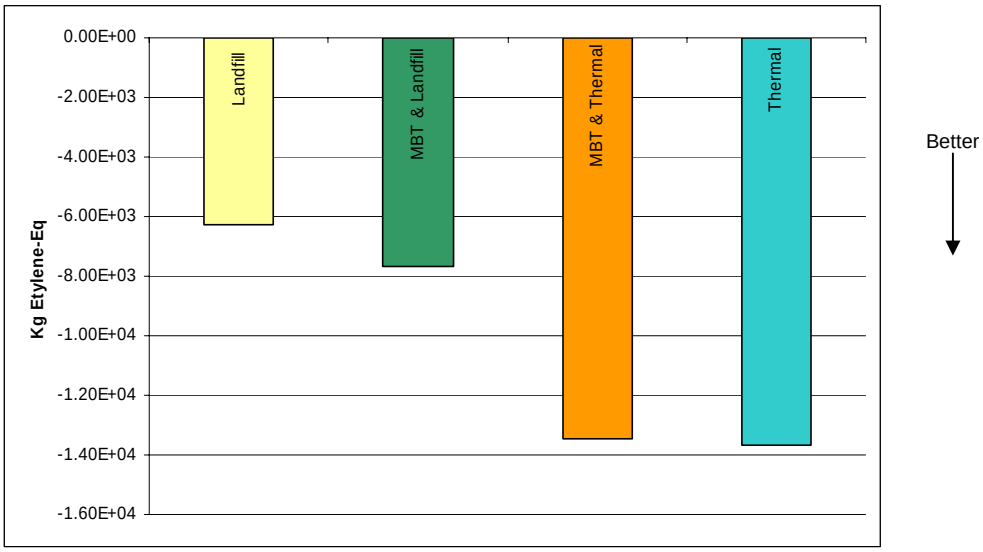

Figure 3.2: Potential Impact for Ozone Creation*

* kg ethylene-eq is where ethylene is used as an indicator compound (eq) for all other potential ozone-creating compounds

3.1.4. Eutrophication Potential

Eutrophication potential results from the emission of nutrients to natural waters is shown in Figure 3.3. The scenarios with high landfill volumes show the highest potential for eutrophication causing emissions. The options with thermal treatment fair better than the landfill options in the assessment. The thermal treatment performs best. WR/SF pre-treatment prior to thermal treatment performs second-best.

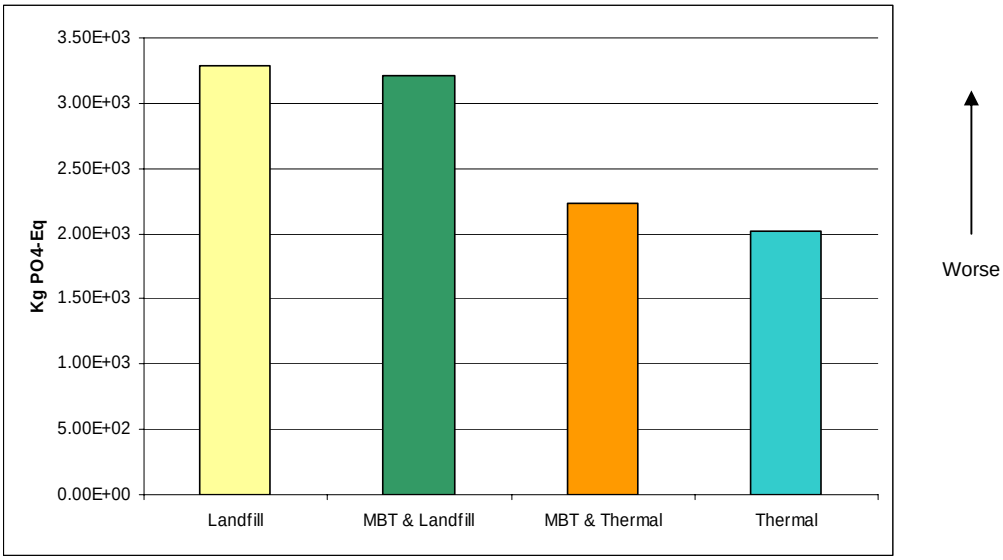

Figure 3.3: Potential Impact for Eutrophication*

3.1.5. Global Climate Change

The emission of global warming gases is greatest from the scenarios which depend heavily on landfill as a disposal option. As methane has a global warming potential 21 times greater than carbon dioxide, waste management options that would result in a lowering of methane emissions, for example thermal treatment, will have a lower impact on global warming. The results of the analysis are shown in Figure 3.4. Taking account of credits for recycling and from energy recovery, the thermal treatment options have the lowest potential for emission of global warming gases.

If there was greater energy recovery from the waste streams in the thermal treatment options – such as through the use of heat energy – this would increase the credits gained from avoided emissions for energy generation. Typically energy recovery with electricity alone is in the order of 30 %, whereas with electricity plus heat recovery, this can increase to the region of 70 - 90 % energy recovery.

* kg PO_4-eq is where phosphorous is used as an indicator compound (eq) for all other potential eutrophication-creating compounds

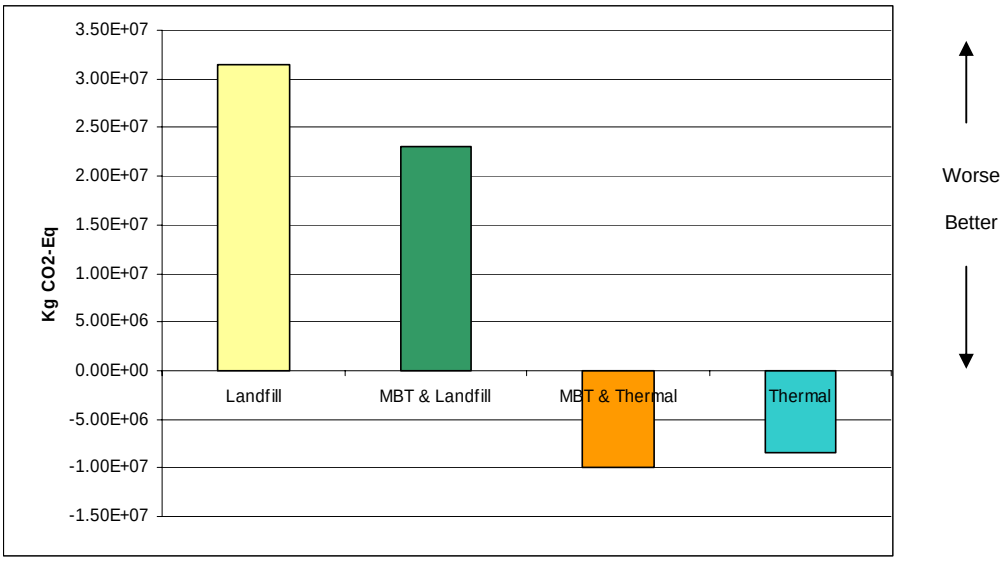

Figure 3.4: Potential for Global Warming[*]

3.1.6. Ecological Toxicity Potential

A review of the data shown in Figure 3.5 shows that the WR/SF and thermal treatment option has the lowest ecological toxicity potential. Because the thermal treatment is strictly regulated and emissions tightly controlled, the emissions to air and water are minimised. Consequently the ecological toxicity potential is lower than the scenarios containing the landfilling option.

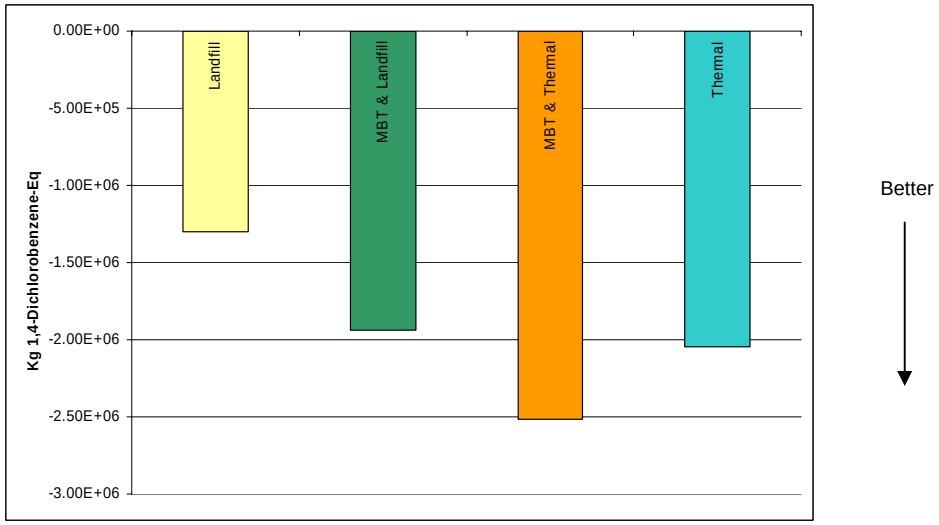

Figure 3.5: Potential Ecological Toxicity[†]

[*] kg CO_2-eq is where carbon dioxide (CO_2) is used as an indicator compound (eq) for all other global warming compounds

[†] kg 1,4-dichlorobenzene-eq is where 1,4-dichlorobenze is used as an indicator compound (eq) for all other potential ecologically toxic compounds

3.1.7. Human Toxicity Potential

The waste management scenarios which depend on landfilling as a disposal option are shown to have a greater human toxicity potential than a thermal treatment option. This is given in Figure 3.6. This is due to a combination of:

- strict environmental controls associated with a thermal treatment option, e.g., air scrubbing devices and filters
- strict European and National legislation on allowable emission levels
- avoided environmental burdens from the production of energy

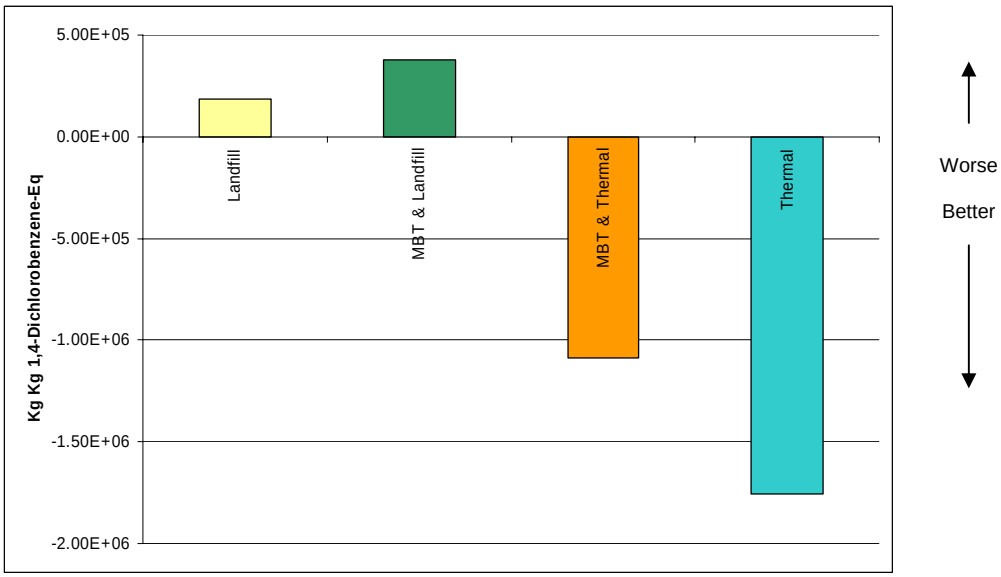

Figure 3.6: Potential Human Toxicity*

The full recycling/recovery with residual to WR/SF and thermal with energy recovery scenario - Scenario Two (a) - involves another stage of recycling and this has associated environmental burdens, for example, energy usage for WR/SF.

The landfilling and MBT scenario has a combination of environmental burdens associated with energy usage in MBT and long-term emissions from landfilling operations. While landfilling is "credited" with avoided emissions for gas utilisation for energy production, the quantities produced would not be as great or as sustainable as from a thermal treatment plant.

3.1.8. Conclusion

All waste management scenarios have some form of recycling associated with them. The LCA shows that in the majority of cases, the recycling and electricity generation means that environmental burdens are avoided. Hence they are expressed on the charts as a beneficial environmental impact potential. The environmental burdens associated with landfill and options containing landfilling have the greatest impact on global warming potential and eutrophication. This is a combination of the high global warming potential of methane (generated from the biological breakdown of organic matter in landfills) from landfills and leachate. While carbon dioxide emissions (another greenhouse gas) from thermal treatment options are elevated, their impact is much less because of the lower global warming potential of carbon dioxide relative to methane. In addition, energy production from thermal treatment facilities avoids air pollutants emitted during most forms of power production, for example such as coal burning.

When the environmental burdens associated with the different waste management scenarios are examined for local impacts, options containing the thermal treatment are preferred. In all environmental impact categories examined, the thermal treatment options resulted in avoided environmental burdens.

The inclusion of transport emission data, and the recycling targets sensitivity analysis performed, did not alter the ranking of the options.

A waste management scenario with a thermal treatment option is the preferred option from an environmental perspective.

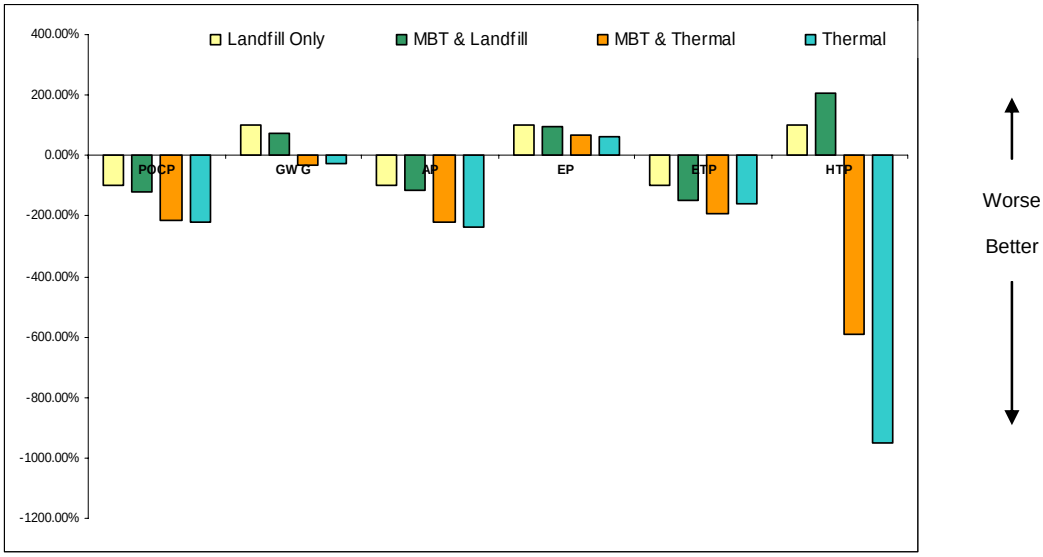

Figure 3.7: Summary of Relative Environmental Impact Potential

3.2. Ability to Meet European and National Waste Management Targets

Recycling is defined as minimising waste generation by recovering and reprocessing usable products that might otherwise become waste (e.g., recycling of aluminium cans, paper bottles, etc.). These materials are often recovered from the dry recyclable collection, the organic collection, and from the recyclable fraction obtained through the MBT processes.

Materials recovery is defined as the removal of usable material from waste for re-use, recycling, or use for a new purpose. Materials recovery includes waste-to-energy, and stabilised material going to co-combustion, or waste-to-energy facilities after MBT. Recovery also includes composting.

Materials for disposal are those residues which are not recycled or recovered through mechanical-biological treatment facilities and/or thermal facilities. This may include low quality stabilised compost from mechanical biological treatment systems.

Table 3.2 outlines the percentage of recycling, recovery and landfill for each of the scenarios.

The recycling and recovery rate is approximately the same for Scenario One and Scenario Two (a), i.e., 49 % and 54 % respectively.

For Scenario Two (a) and Scenario Three, the recovery percentage is considerably higher than the recycling percentage. This is because energy (electricity and heat) that is produced during the thermal process can be recovered. Waste that cannot be recycled or recovered can be thermally treated and therefore the percentage of residual waste going to landfill (7 % and 11 %) is much lower than Scenario One and Scenario Two (a) - 48 % and 32 % respectively.

Table 3.2: Recycling, Recovery & Landfill Rates for Each Scenario

Scenario	Scenario One	Scenario Two (a)	Scenario Two (b)	Scenario Three
	Landfill	WR/SF & Thermal	MBT & Landfill	Thermal
recovery	49 %	89 %	65 %	85 %
recycling	49 %	54 %	54 %	49 %
landfill	48 %	7 %	32 %	11 %
disposal outside of county (hazardous fly ash)	0 %	1.0 %	0 %	1.3 %
disposal outside of county (dross from recycling)	2 %	2 %	2 %	2 %

Table 3.3 sets out the primary targets for the diversion of biodegradable waste from landfill in the Landfill Directive, and other national targets. These diversion targets are based on waste arisings for the baseline year of 1995. The degree of achievement of these targets is also given.

Table 3.3: Primary Targets for the Diversion of Biodegradable Waste from Landfill

Bio-degradable Waste Target	Scenario One	Scenario Two (a)	Scenario Two (b)	Scenario Three
	Landfill	WR/SF & Thermal	MBT & Landfill	Thermal
compliance with 25 % target (2006)	×	✓✓	✓✓	✓✓
compliance with 50 % target (2009)	××	✓✓	✓✓	✓✓
compliance with 75 % target (2016)	××	✓✓	✓✓	✓✓
diversion of 50 % of overall household waste away from landfill (2013)	×	✓✓	×✓ borderline	✓✓
minimum 65 % reduction in biodegradable waste consigned to landfill (2013)	××	✓✓	✓✓	✓✓
35 % recycling of municipal waste (2013)	✓✓	✓	✓✓	✓

× does not meet targets
×× high exceedance of targets
✓ meets targets
✓✓ exceeds targets
✓✓✓ highest exceedance of targets

It is clear from the tables that the landfill-only option for residual wastes (Scenario One) will not achieve compliance with the Landfill Directive, and accordingly, further treatment of the materials collected in the residual bin is required.

3.3. Financial Assessment

A financial assessment has been carried out on the various waste management scenarios for the County. They have been carried out over a twenty-year period and include the operating and capital costs for the primary components of each scenario. They do not include the operator's profits, risk, or procurement and design costs. The capital and operating costs for each scenario are presented for the target years of 2009 and 2016 for comparative purposes.

3.3.1. Financial Modelling Assumptions

The basic assumptions made in carrying out of the financial assessments are:

- capital and operating costs are based on the year 2004, and are indicative planning figures
- the model estimates an average cost per tonne for various scenarios, which is used to compare different solutions; however, it should be noted that certain cost elements cannot be addressed until a later stage of development

Such costs elements include the following:

- The costs used are net costs. If contracted under a Design & Build contract the D&B contractor will charge a fee to provide this service/take this risk. This fee could well be 10 - 20 % of the overall capital expenditure.
- Furthermore, if the plant is contracted through a DBFO-type contract, the DBFO contractor will normally add an additional fee to the D&B contract price and the annual operating costs. These fees will depend on risk allocation and the competitive situation when bidding.
- The technical risk of energy-from-waste (EfW) is low, and this is expected to reduce the risk premium for this type of facility vis-à-vis more untested ones.
- The financing mechanism is unknown, and this could have a significant impact on overall costs.
- The facility is equipped with a turbine/generator with a view to exporting electricity from the plant. The provision of combined heat and power is not assumed. Excess heat is cooled from the facility on site. However, if the heat can be sold, then treatment costs could be reduced.

A twenty-year planning period has been assumed, covering the period 2006 - 2026.

The analysis is calculated using fixed costs, assuming energy prices, operation costs and investment costs remain constant throughout the twenty-year period. This assumption does not significantly affect final results.

The real interest rate has been fixed at 5 % per annum, and is assumed valid for financing investments.

Generated electrical power, delivered from a waste facility to the public grid. A sales price of 6.2 cent/kWh has been assumed. No allowance has been made for green credits in the power sales price. Electrical supply power is typically in the range of 8 – 8.5 c/kWh. A price of 8.5 c/kWh has been assumed.

Miscellaneous consumables used in areas such as thermal treatment plants, landfills and mechanical biological treatment facilities are included in the operational cost estimates.

The cost of dry materials recovery has been assumed at € 83 per tonne. This price excludes Repak subsidies and the value of recyclables as these are subject to fluctuation. In the case of recyclables, they could have positive or negative values. As the dry recyclable component of each scenario is similar, the financial impact is not significant.

A landfill tax of € 15 per tonne until the year 2006 is assumed, rising to a maximum of € 25 per tonne by 2008. Thereafter, the landfill tax is assumed to remain stable at € 25 per tonne. Increases beyond this figure will have a negative impact on scenarios with larger quantities for landfill disposal.

3.3.2. Waste Arisings

Waste arisings in the County are described in detail in Section 2 of Volume 2 of this document. Projected waste arisings are discussed in section 6 of Volume 2. The annual waste streams for the base year of 2004, and the target years of 2009 and 2016, are shown in Table 3.4.

Table 3.4: Waste Arisings for County Kildare

Waste Source	2004	2009	2016
household	70,428	84,386	93,501
commercial/industrial	70,791	80,459	89,267
other*	1,982,371	2,172,984	2,439,842
total	2,123,590	2,337,829	2,622,610

3.3.3. Financial Model Components

The financial model calculates the operational and capital expenditure costs for the primary components of the waste scenarios as set out in Table 3.5.

Table 3.5: Financial Model Components

Process Elements	Financial
provision of bins at households	yes
provision of bins to non-households	no
collection at households	yes
collection at commercial/industrial waste producers	yes
transfer costs of dry recyclables, all sectors	yes
bring systems, including bring banks and civic amenity sites	yes
transfer stations	yes
home composting	no
bio-treatment	yes
dry materials recovery facilities	yes
mechanical biological treatment facilities	yes
thermal treatment	yes
landfill	yes
landfill taxes	yes

* "other waste" includes the non-municipal fraction of household, commercial and industrial waste such as agricultural wastes and sludges etc.

The investment and operational costs assumed for each process element are set out in Table 3.6.

Table 3.6: Investment and Operation Costs

Facility	CAPEX €/t	OPEX €/t	Transfer €/t
civic amenity	25	82	-
bring site	20	146	-
dry materials recovery	-	83	7
biotreatment	26	46	-
MBT	26	23	-
landfill	20	30	-
three-bin collection	-*	150	-
thermal	26	25	-

3.3.4. Financial Evaluation

The financial model calculates the operational and investment costs for each year of the twenty-year period and also gives an average annual waste management cost for comparative purposes. These costs are set out for the two target years of 2009 and 2016. These target years have been chosen as they correspond to two of the three target years for the diversion of biodegradable waste to landfill. It has also been assumed that by the year 2009 all of the components of the waste management scenarios would be in place. The costing from the financial model for the residual waste stream is set out in Table 3.7.

Table 3.7: Annual Costs

	Scenario One	Scenario Two (a)†	Scenario Two (b)	Scenario Three*
Facility	**Landfill**	**WR/SF & Thermal**	**MBT & Landfill**	**Thermal**
€ million 2009	7.6	6.3	7.2	4.0
€ million 2016	8.1	6.8	7.6	4.4

The financial calculations show that Scenario Three, the thermal treatment option, is the most cost effective. However, this option relies on access to a thermal treatment facility outside of the County, as Kildare does not have sufficient waste quantities to generate the economies of scale required to make thermal treatment an option at this point. Similarly Scenario Two (a) is also reliant on the availability of co-combustion‡ or a thermal treatment facility.

* it is assumed that the cost of providing a three-bin system to each household in the County is approximately € 2 million

† A power sales price of 6.2 c/kWh has been assumed for energy generated from scenarios involving thermal treatment. A typical range for power sale is 3 – 6.2 c/kWh. A sensitivity analysis has shown that for every 1 c/kWh change in power price, the change in operating costs is approximately € 800,000 per annum per 100,000 t waste.

‡ co-combustion with conventional fuel, in a conventional power plant

4. NEW INITIATIVES – CIVIC AMENITIES

Kildare County Council will look at installing an upgraded bring facility within the County as a pilot project. One possibility is the installations of innovative bring centres. Figures 4.1 and 4.2 show examples of an underground site and a Tomra Recycling Centre.

Figure 4.1: Under Ground Civic Amenity Site in Kildare Town

Figure 4.2: Tomra Recycling Centre