

Ireland's Biodegradable Municipal Waste

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A THESIS SUBMITTED FOR THE DEGREE OF MASTERS IN ENVIRONMENTAL
SYSTEMS,
AT THE SCHOOL OF ENGINEERING,
GALWAY MAYO INSTITUTE OF TECHNOLOGY, IRELAND



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SUBMITTED TO THE GALWAY-MAYO INSTITUTE OF TECHNOLOGY,
SEPTEMBER 2010



DECLARATION OF ORIGINALITY

SEPTEMBER, 2010

The substance of this thesis is the original work of the author and due reference and acknowledgement has been made, when necessary, to the work of others. No part of this thesis has been accepted for any degree and is not concurrently submitted for any other award. I declare that this thesis is my original work except where otherwise stated.

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Name of Supervisor
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Date: _____

Dedication

I would like to thank my family especially my parents for all their support both moral and financial throughout my time in third level education. Their support and guidance has seen me through my time at Galway Mayo Institute of Technology and Edinburgh Napier University. I also thank Anita whose patience and support were instrumental in my completion of third level education.

I would like to thank my supervisor John Hanahoe and the lecturing staff of the Engineering department at Galway Mayo Institute of Technology for his and their support and advice over the years.

I also thank fellow classmates as discussion amongst each other helped us all to complete our time at the institute.

Completion of this paper would not have been possible without gaining information from waste management and waste treatment companies throughout Ireland. I thank all the company representatives who took time from their busy schedules for interviews and phone calls with me as well as corresponding with me via e-mail. In no particular order I thank David Tobin, Declan Highland, Jane Hennessy, David Naughton and Steven Tonry.

Abstract

This project focuses on the EU Landfill Directive targets for Biodegradable Municipal Waste (BMW) specifically focusing on how the targets will affect Ireland and its waste management infrastructure. Research will consist of reviewing relevant literature, legislation and policies that will provide a comparable between Ireland and other nations. Planning processes which govern both the building structure and running capacities of treatment facilities is also necessary in order to predict amounts of waste diverted from landfill. The efficiency of these treatment plants also requires investigation. Another objective is to research further information on Ireland's organic 'brown' bin service, this will involve discovering the roll out of bins in the future over a defined time scale as well as the potential amounts of waste that will be collected.

Figures received from waste management and waste treatment companies will be combined with figures from the Environmental Protection Agency's (EPA) annual reports. This will give an indication to past trends and shed light on possible future trends. With this information annual waste volumes consigned to landfill can be calculated and used to determine whether or not Ireland can achieve the EU Landfill Directive targets.

Without significant investment in Ireland's waste management infrastructure it is unlikely that the targets will be met. Existing waste treatment facilities need to be managed as efficiently as possible. Waste streams must also be managed so waste is shared appropriately between companies and not create a monopolising waste treatment facility.

The driving forces behind an efficient waste management infrastructure are government policy and legislation. An overall and efficient waste management strategy must be in place, along with disincentives for landfilling of waste such as the landfill levy. Encouragement and education of the population is the fundamental and first step to achieving the landfill directive targets.

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Chapter 1

1.0 Introduction

1.1 Aims & Objectives

1.2 Hypothesis

1.0 Introduction

The purpose of this study is to review Ireland's approach to treatment and disposal of biodegradable municipal waste with an emphasis on how Ireland will meet EU landfill directive targets. In order to review Ireland's current and future status on the treatment and disposal of waste requires investigating legislation, directives and policies of both the EU and Ireland. It is widely accepted that approximately two thirds of the waste produced by homes and businesses comprise of organic or natural materials¹. Natural processes can break down these materials over time. The principal biodegradable components of municipal waste include paper, cardboard, food and garden waste.

In order to predict whether or not Ireland will meet the EU Landfill Directive² targets for Biodegradable Waste for the years 2010, 2013, 2016 requires studying past trends and waste forecasts. Ireland was once dependent on landfill as a means of waste disposal however at present due to advancements in management, processing and recycling techniques we now see landfill as a last resort as opposed to being the first option of waste disposal. The EU Landfill Directive requires a reduction in the amount of Biodegradable Municipal Waste ending up in landfill and supports the separate collection and sorting of Biodegradable Municipal Waste and also puts an emphasis on recovery and recycling.

Under EU Law there are two key pieces of Legislation that govern BMW. The first is the Waste Framework Directive (2008/98/EC), of which Article 22 governs the separate collection of bio-waste. The second EU directive is the Landfill Directive (1999/31/EC) which requires the diversion of BMW from landfill. The first of these requirements will come into place in 2010.

The targets under the Landfill Directive are as follows:

¹ National Strategy on Biodegradable Waste. Draft strategy report 2004.

² EU Directive 1999/31/EC, Official Journal, OJ L 182 of 16.07.1999

- By the 1st of July 2010 Ireland can only landfill a maximum 75% of the BMW generated in 1995.
- By the 1st of July 2013 Ireland can only landfill a maximum 50% of the BMW generated in 1995.
- By the 1st of July 2016 Ireland can only landfill a maximum 35% of the BMW generated in 1995.

From the 1995 figure of 1.2 million tonnes, we can generate the maximum quantity by weight of BMW ending up in landfill, table 1.

Target Year	Landfill Directive Target	Maximum Quantity to Landfill (Tonnes)
2010	75% of Quantity BMW Generated in 1995	916,000
2013	50% of Quantity BMW Generated in 1995	610,000
2016	35% of Quantity BMW Generated in 1995	427,000

Table 1: Maximum quantities of BMW reaching landfill (*tonnes*)

Overall municipal waste generation including biodegradable municipal waste has increased substantially since the baseline figure in 1995. Therefore actual amounts of biodegradable municipal waste that will need to be diverted over the period to 2016 represent a huge challenge to the Irish waste industry and will require urgent and sustained efforts all round to meet the Directive's targets. Ireland is at an important stage in the development of its waste management infrastructure in order to meet the EU landfill directive targets. By not exporting our waste to other nations³ for treatment and instead harnessing the energy of the waste could enhance Ireland's environmental, energy and economic status. Ireland exported 48% of hazardous waste in 2006³.

³ Finfacts Team- http://www.finfacts.ie/irelandbusinessnews/publish/article_1011726.shtml (2007)

As a result, Ireland's strategy puts forward a number of integrated options that will require implementation to minimise the environmental impacts of landfill of biodegradable municipal waste and to achieve the targets under the Landfill Directive. The most desirable option is preventing the creation of waste at the design stage of a product. The next desirable option is to reduce and reuse waste in an environmentally positive manner, which can be achieved by recycling, biological treatment, thermal treatment of residual waste with energy recovery. As a last resort, pre-treatment of the biodegradable fraction of residual waste followed by thermal treatment without energy recovery or disposal to landfill. All treatment strategies adhere to the waste hierarchy that can be seen in figure 1.

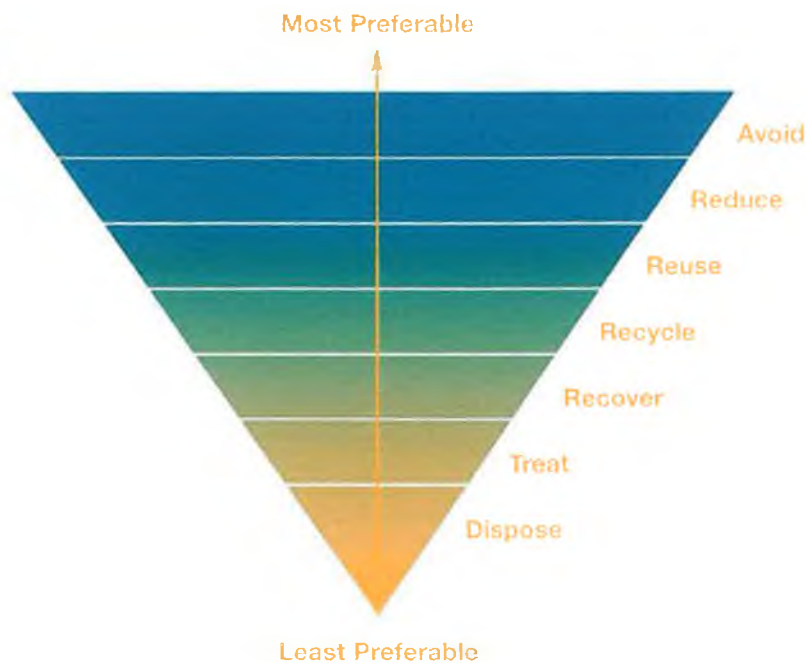


Figure 1: Waste management Hierarchy⁴

⁴ <http://www.golfenvironment.org/knowledge/answers/waste/recycling/>

1.1 Aims & Objectives

The aim of this paper is to examine Ireland's potential and ability to meet EU landfill targets for biodegradable municipal waste. Research will consist of reviewing relevant literature, legislation and policies which will provide a comparable between Ireland and other nations. Planning processes which govern both the building structure and running capacities of treatment facilities will be examined. These processes will be used to predict amounts of waste diverted from landfill. The efficiency of these treatment plants will be analysed. The final objective includes an investigation into Ireland's organic 'brown' bin service, this will involve discovering the roll out of bins in the future over a defined time scale as well as the potential amounts of waste that will be collected.

1.2 Hypothesis

The research of this paper is based on the hypothesis that 'Ireland will achieve EU Landfill Directive Targets for Biodegradable Municipal Waste by 2016'.

Chapter 2

2.0 Literature Review

2.0 Literature Review

This literature review will focus on the directives and legislation that dictate levels of biodegradable waste diversion from landfill as well as influencing advancements in waste treatment. Reviewing work, papers and reports by authors and experts in the field of waste management is also important for a detailed research background. The first directive that encouraged biodegradable waste diversion from landfill was directive 1999/31/EC⁵. This directive focused on the landfill of all waste. It set out to regulate the operations of landfill sites in order to prevent and reduce the negative effects of landfill activity on human health, the environment, water, soil and groundwater.

The directive outlined different categories of waste to include hazardous, non-hazardous, inert and municipal. With a clear classification system on waste, the directive outlined how to manage and control landfill sites in an environmentally friendly manner. The categorisation process applies to all landfill sites in the EU member states that are defined as waste disposal sites for the deposit of waste onto or into land.

Directive 1999/31/EC however fails to outline other waste disposal methods on land such as the spreading of sludges on soil, namely sewage and dredging sludges. The directive fails to apply its categorisation of wastes such as the treatment of mineral resources from quarry operations and the deposit of non-hazardous dredging sludges near small waterways. As the directive's principal purpose is to protect the environment, human health, water, soil and groundwater this seems somewhat of an oversight. Dredging, quarry works and spreading of sludges and slurries potentially pollutes soil and waterways, in turn damaging the environment and human health. This could be perceived by many as a contradiction of the directive aims and objectives thus would render the directive inefficient.

The directive places restrictions on certain types of waste to include flammable, explosive waste, oxidising, hospital and clinical waste. Tyres may not be deposited into landfill sites. All acceptable waste must be treated before being landfilled under the directive. The directive states that there are to be three types of landfill- hazardous, non-hazardous and inert. This applies to all member states. Hazardous and inert landfills must be used only for hazardous and inert waste respectively. Non-hazardous landfill sites must accept municipal and other non-hazardous waste, under the directive all waste must be treated before being sent to landfill, regardless of the category of waste.

Another significant change which directive 1999/31/EC introduced was the landfill permit system and the restrictions in being granted such permits. The permit applications must consist of a description and capacity of the site as well as the waste types, the identity of the applicant and/or operator and financial records of said applicants. Any issues arising from the proposed waste must also be clarified in the application such as operating, monitoring and control plans as well as methods of preventing pollution and abatement plans. The most sustainable, environmentally friendly approach which is undertaken in the application procedure is the detailed plans for closure of the landfill site and aftercare procedures for minimising the impact on the environment such as soil and groundwater pollution upon the permanent closure of a landfill site.

As a result of the stringent requirements for new landfill sites there are inevitable consequences for existing landfill sites. All member states must ensure that existing landfill sites comply with the directive at the earliest possible moment or risk fines, prosecution and/or closure. The directive sets out stricter obligations on national waste strategies for member states and provides continuous monitoring of strategies through a dedicated commission. Every three years the commission compiles reports on the

⁵ EU Directive 1999/31/EC, Official Journal, OJ L 182 of 16.07.1999

implementation of the directive. Directive 1999/31/EC not only provides guidance for the disposal of biodegradable municipal waste but also puts in place good practice guidelines for the landfilling of all waste.

Directive 1999/31/EC requires a reduction in the amount of biodegradable municipal waste ending up in landfill and supports the separate collection and sorting of biodegradable municipal waste and also puts an emphasis on recovery and recycling. The directive requires the diversion of biodegradable municipal waste from landfill. The first of these requirements will come into place in 2010. The targets under the directive from an Irish point of view are as follows:

- By the 1st of July 2010 Ireland can only landfill a maximum 75% of the biodegradable municipal waste generated in 1995.
- By the 1st of July 2013 Ireland can only landfill a maximum 50% of the biodegradable municipal waste generated in 1995.
- By the 1st of July 2016 Ireland can only landfill a maximum 35% of the biodegradable municipal waste generated in 1995.

From these points we can generate the maximum quantity, by weight, of biodegradable municipal waste ending up in landfill, table 2.

BMW Generation		Quantity generated (tonnes)
1995	Baseline figure	1,289,911
BMW landfilled- Recent trends		Quantity landfilled (tonnes)
2004		1,304,426
2005		1,307,570
2006		1,422,432

Table 2: Recent trends for BMW reaching landfill (tonnes)⁶

⁶ National Waste Database, a Report for the Year 2006. EPA 2007

A second directive, 2006/12/EC⁷ establishes a legal framework for the handling of waste in the community. As in directive 1999/31/EC, this directive sets out clear definitions on waste. It also defines methods, responsibilities and best practices in the recovery and disposal of waste. Unlike the 1999 directive, 2006/12/EC establishes roles for waste management plans and controls. Directive 2006/12/EC requests that all EU member states must produce national waste management plans to establish an overall waste management infrastructure for the EU as well as making national waste management plans more efficient.

There is some overlap between directive 1999/31/EC and 2006/12/EC as is to be expected. The item from the 1999 directive which established more holistic background checks on applicants applying for landfill licences is to become even more important under directive 2006/12/EC. The newer directive requires all personnel and companies who undertake waste management operations must have a permit or be registered to do so. Directive 2006/12/EC reiterates the primary objective of the 1999 directive, that is the handling of waste must not have a negative impact on the environment or human health. It also uses the waste hierarchy (*figure 1*) as the backbone to all waste treatment techniques with prevention of waste being most important in waste control and management.

A major evolution from the 1999 directive is the polluter pays principle. This is a requirement that states the cost of disposal of waste is borne by the holder of the waste, by previous holders of the waste or by the producers of products from which creates waste. Directive 2006/12/EC was a necessary document in relation to updating the somewhat dated and unclear 1999 directive. It not only acted as a more up to date version of the 1999 directive but as it turns out provided a quality stepping stone for the development of

⁷ EU Directive 2006/12/EC, OJ L 102 of 11.4.2006

directive 2008/98/EC⁸. Directive 2008/98/EC repeals the 2006 directive, as a result there is recurrences between the 1999 and 2006 directives in the newer 2008 version such as the definitions related to waste management and waste management principles such as the 'polluter pays principle' and the 'waste hierarchy'.

The 2008 directive established a legal framework for community waste management and waste treatment. Its aims remained the same as earlier directives, wherein the protection of the environment and human health were paramount and could not be compromised by waste disposal and waste treatment activities. The directive falls short as with the more dated versions on the matter of a total waste management infrastructure and implementing treatment plans for all kinds of waste. This can be highlighted with the fact the 2008 directives does not apply to waste such as animal by products, radioactive waste, faecal matter and by products from mineral resources to name a few.

Directive 2008/98/EC reiterates the same message as the previous directives in relation to the waste hierarchy. It states that EU member states can implement legislative measures with a view to reinforcing the waste treatment hierarchy while ensuring that waste management and waste treatment does not endanger human health or the environment. This statement is a recurring theme throughout the document and the repetitive nature seems to be deliberate in the writing style in as much that it will alter opinions of the importance of waste management in relation to the environment and human health.

As far as waste management is concerned, directive 2008/98/EC encourages member states to co-operate with one another in order to establish a complete EU waste management network. This complete EU waste network must allow for the independence of the European Union with regard the treatment of waste. The directive also asks that all dangerous waste must be stored and treated in suitable conditions and separate from other

⁸ EU Directive 2008/98/EC, OJ L 312 of 22.11.2008

waste either hazardous or non-hazardous. So called dangerous or hazardous waste must be packaged and labelled accordingly with community and international regulations. As stated in previous directives, waste treatment activities can only be carried out after receiving a waste permit from the relevant authorities. One aspect of the directive that breaks the trend of repeating itself is with relation to incineration. The directive explains that incineration activities aimed at energy recovery must only be carried out under conditions of high efficiency. This seems to highlight measures required for a more sustainable approach to waste treatment and not just carrying out waste treatment activities for the sake of it.

As the rate of waste generation in the European Union increases it is very important to highlight a legal framework and EU network of waste treatment. Although most of the 2008 directive repeats the earlier directives it is still a very necessary document in order to update and modernise waste management in all EU member states. Its main aim is to organise a more efficient waste network as well as more efficient waste treatment plans.

Not all literature on biodegradable municipal waste and waste treatment are based under the EU umbrella, there are certain documents and reports which treat Ireland as an individual state and not as one of the member states. The annual 'Environmental Protection Agency, National Waste Reports' are documents which focus exclusively on Ireland. The Environmental Protection Agency (EPA) is responsible for producing reports and statistics about waste management and indeed waste generation in the Republic of Ireland. For the purpose of this research, 'The EPA, National Waste Report 2008'⁹ be used. This document provides information, figures and targets for biodegradable municipal waste in Ireland.

⁹ Environmental Protection Agency, National Waste report 2008, (2009) ISBN 978-1-84095-336-7

The foremost recommendation of the 2008 National Waste Report was to reduce, as much as possible, the amount of food wastes that was ending up in landfill. This diversion of food from landfill "is a priority that must be addressed"⁸. The report also highlights the 2008 and currently ongoing economic difficulties our country is experiencing. As a result of this the report explains how businesses must reduce their waste generation and therefore the costs associated with waste disposal. Some of the key points made in the 2008 report are everyday practical solutions to reduce biodegradable waste and aid the diversion of such waste from landfills.

Key to these points are promoting the need for food waste prevention, the introduction of segregated waste bins and encouraging 'at source' recycling of biodegradable waste such as composting in household gardens. The national approaches necessary are items such as developing outlets for the end products of biodegradable waste treatment such as compost. Ireland must ensure that improved and adequate infrastructure is in place to treat the large quantities of organic waste produced. Infrastructure such as waste collection services and the availability of waste to energy plants are part of the national need for reducing the amounts of biodegradable waste ending up in landfill.

The national waste report 2008 provides the reader with general estimated figures and statistics about all waste generation in Ireland. In terms of biodegradable municipal waste some of the important figures include home composting increased by 7% from the year 2007, almost forty thousand tonnes of biodegradable/organic waste were collected at household 'kerbsides' and that 57% of the two million tonnes of biodegradable waste generated was consigned to landfill.

The national waste report inevitably mentions the EU directives and the EU approach to developing an overall waste infrastructure between all member states. The report merely repeats the key points which were made in previous directives. It seems as if all the

literature associated with biodegradable municipal waste in Ireland and the EU seems to bypass the basic steps towards targets. The literature appears to leave out the fundamental steps to reducing organic wastes that are necessary to make biodegradable waste disposal more efficient. Instead of this approach the literature seems to concentrate on an overall national and European waste infrastructure and expecting treatment facilities to be in place over night.

For instance, the directive in 1999 should have set out the basics and created realistic targets in order for all EU member states to reach the same levels of performance in terms waste treatment quality and efficiency. It would perhaps have proved more beneficial if it outlined methodologies and advice on how to treat biodegradable waste and promoting the benefits of such treatments. The literature highlights the benefits of waste to energy plants and other sustainable treatment options. In order for any policy to be effective it relies on people power, educating and teaching the population of the benefits of a policy. In relation to biodegradable municipal waste, EU policies encourage 'at source' composting but when it comes to household composting provides little on how to compost efficiently and effectively. While literature is available on this topic the EU directives overlook it. In order for Ireland to meet the landfill targets set out by the EU perhaps it is necessary for the Irish government to provide the population with information on the issues associated with biodegradable waste treatment. This would in all probability be a lot more beneficial than updating, revising and publishing yet more repetitive journals and legislation. The literature available makes it difficult to understand the main drivers influencing waste management and waste treatment in Ireland.

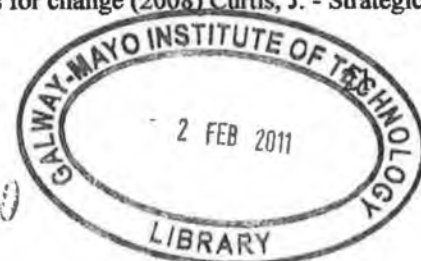
There are other forms of literature available on biodegradable municipal waste moving away from EU directives such as a discussion paper on behalf of the Office of Environmental Assessment. The paper is entitled 'Hitting the targets for biodegradable

municipal waste: Ten options for change'¹⁰. The paper is designed to stimulate discussion over the important environmental issue of waste management. The objective is to create a more environmental outcome to the way Ireland treats and disposes of waste. According to the Curtis, Ireland is behind schedule in delivering the targets set by the EU landfill directive targets and the National Biodegradable Waste Strategy targets. The paper estimates that Ireland will miss the 2016 target and must develop its waste management infrastructure in order to stop this from happening.

In reviewing the way Ireland manages the organic fraction of biodegradable municipal waste, it is suggested Ireland's public policy interventions will encourage changes in waste management practices. Ireland must broaden the public discussion on waste treatment rather than focus on narrow topics such as technologies, the paper aims to encourage the public discussion. In the document two key points are asked. Should organic waste be managed centrally or 'at source' either by home composting or using on-site composting systems in commercial premises? The report discusses the advantages and disadvantages of both 'at source' composting and central management of waste.

It is viewed that 'at source' composting is the more efficient option due to avoiding the use of a collection service, treatment and disposal of the waste¹⁰. Even if 'at source' composting is the more efficient option there are some household and businesses that do not have enough available space to start 'at source' composting. Although advocating the use of 'at source' composting the report also highlights the associated problems with such a scheme and compares these problems with items related to central management techniques. The discussion paper recommends that local composting workshops should take place within communities as well as providing dedicated staff to visit households and businesses to educate them on composting issues. While such a service would have associated costs it would be a relatively small expenditure in comparison to providing the

¹⁰ Hitting the targets for biodegradable municipal waste: Ten options for change (2008) Curtis, J. - Strategic



initial capital and running costs of a centralised treatment system. Composting at source probably represents the lowest cost and most environmentally sustainable option for treating the organic fraction of biodegradable municipal waste¹⁰ but putting the system into practice can cause issues. Such options need educational tools to teach households and businesses how to compost efficiently as well as highlighting the advantages of doing so.

Centrally managing the organic fraction of biodegradable municipal waste is part of the much bigger picture of an integrated municipal waste stream. The paper discusses the complexities of a centralised management system and the variety of collection and treatment options available to the nation. It discusses one, two and three bin collection services and their roles within the waste management infrastructure. Starting with the one bin service Curtis discusses the main treatment options for such collections are landfill, incineration and mechanical biological treatment (MBT*) being the most desirable option. MBT is increasingly being used as the preliminary treatment option for municipal waste according to Curtis. Although MBT of a one-bin collection service offers the opportunity to recover materials such as wood and metals, due to soiling and contamination in the one bin system there are few options for reuse and recycling according to Curtis. This is fair and accurate assessment and is the reason that a one-bin collection system is rarely used either by business or households. Curtis does not suggest that MBT can divert biodegradable municipal waste from landfill entirely but disincentives to landfill are necessary. Such considerations may include increasing landfill levies specifically for the landfilling of organic biodegradable municipal waste.

Policy Research Unit- Office of Environmental Assessment.

* MBT- mechanical biological treatment is used as the umbrella term for all types of mechanical biological treatment concepts. MBT involves mechanical sorting and segregation of the waste into an organic biodegradable stream, which is sent to a biological process yielding stabilised biowaste and into other separate waste streams such as recycling.

An interesting point made in the 'ten options' document is that there is considerable uncertainty facing waste contractors in developing much needed infrastructure due to the lack of an integrated plan that outlines detailed infrastructure requirements. Due to this point Curtis recommends the part financing and/or financial aid for the initial capital cost of developing a waste facility and associated infrastructure. The absence of an integrated national waste management plan creates uncertainty in regional waste management plans that in turn can deter investors from developing the necessary infrastructure. The paper requests that there should be a detailed waste management plan developed with responsibility for delivery clearly defined. Unnecessary restrictions in waste management proposals that limit waste movement across regional boundaries should also be removed according to the author. In order to enhance prospects of future investments into Ireland's waste management infrastructure the paper suggests a guidance document on site selection as well as more detailed and holistic planning guidance. Such guidance would help ensure uniform rules across planning authorities.

Although the paper highlights the need for improvements to Ireland's waste management infrastructure it highlights that it would be unwise to invest in expensive treatment technologies to produce end products. Such products need new market research to investigate the true potential of biodegradable municipal waste products. The discussion also calls for the need to develop nationally recognised standards for waste products derived from biodegradable municipal waste. Marketing campaigns and other initiatives are also needed to stimulate demand for products derived from biodegradable municipal waste. Such suggestions are more practically based rather than just legislation and policy. The recommendations if implemented correctly could dramatically improve Ireland's approach to waste treatment and disposal. They could also ensure that Ireland would meet EU landfill directive targets.

Chapter 3

3.0 What is Biodegradable Municipal Waste?

3.0 What is Biodegradable Municipal Waste?

Biodegradable municipal waste is the biodegradable portion of municipal waste, which is commonly referred to as organic waste. A breakdown of the composition of household waste is shown in Figure 2. The biodegradable portion of waste includes natural materials such as plant, animal, food, paper, cardboard and wood waste. Other biodegradable waste includes human waste, manure and slaughterhouse waste, if this category of waste is not treated effectively it can have an impact on soil and water quality as well as an overall environmental impact. Biodegradable wastes can breakdown naturally when interacting with the living environment in a process known as biodegradation. Organic waste can be broken down either with or without oxygen, aerobically or anaerobically.

Anaerobic digestion occurs in oxygen free environments such as in a landfill or bog where bacteria breakdown the organic waste. Biogas produced is typically a mixture of methane and carbon dioxide and can be recovered and used as a heat and energy source. Aerobic digestion is the name given to the bacterial breakdown of organic waste with the presence of oxygen. Bacteria consume the organic matter and convert it into carbon dioxide. Aerobic digestion can be used as a final treatment stage to the anaerobic digestion process.

There are global warming issues associated with the treatment of biodegradable waste. The gases produced from the treatment of such waste, specifically under uncontrolled landfill conditions, generates gas which if not harnessed correctly can escape into the atmosphere. This gas commonly contains methane and carbon dioxide, which are potent greenhouse gases and can have a negative environmental impact.

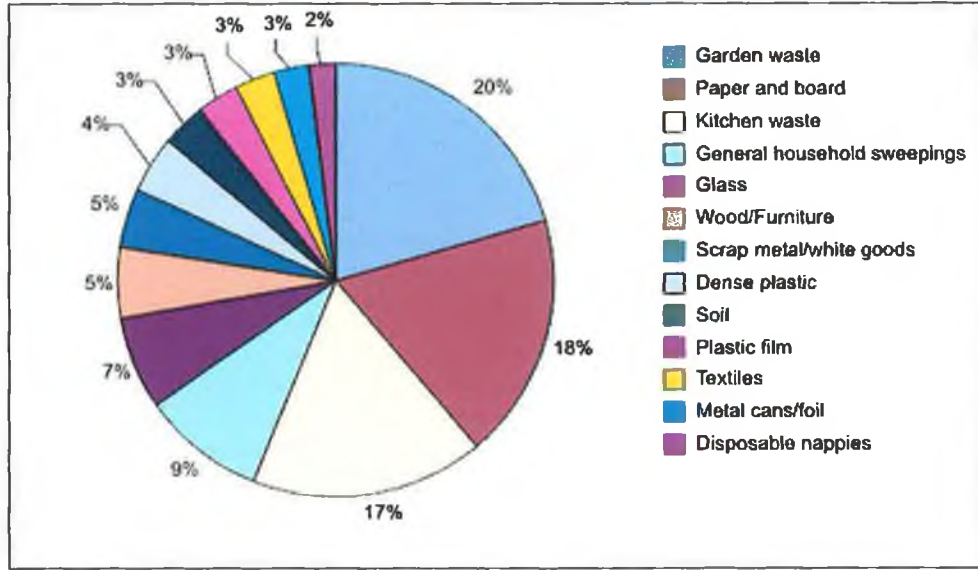


Figure 2: Composition of household waste¹¹

Chapter 4

4.0 Ireland's approach to BMW treatment

4.1 Indaver

4.2 Irish Cement

4.3 Quinn Cement

4.4 Lagan Cement

4.5 Barna Waste

4.7 The Covanta incinerator

¹¹ Department for Environment Food and Rural Affairs-
<http://www.defra.gov.uk/evidence/statistics/environment/waste/kf/wrkf18.htm> (2006)

4.0 Ireland's approach to BMW treatment

In order for Ireland to reach the proposed EU Landfill Directive targets requires developing the waste management infrastructure in the country. This includes the closure of some existing and dated landfill sites. Developments such as including more efficient recycling facilities, mechanical biological treatment (MBT) plants, using Solid Recovered Fuels (SRF^{**}) in cement production and improved energy recovery treatment plants should enhance Ireland's waste management infrastructure. This section will give a brief description of existing and proposed companies and facilities in Ireland capable of treating biodegradable waste and harness energy from such waste.

As a result, Ireland's strategy¹² puts forward a number of integrated options that will require implementation to minimise the environmental impacts of landfill of biodegradable municipal waste and to achieve the targets under the Landfill Directive. The most desirable option is prevention/reduction and reuse followed by materials recycling and biological treatment, thermal treatment of residual waste with energy recovery and as a last resort, pre-treatment of the biodegradable fraction of residual waste followed by thermal treatment without energy recovery and finally disposal to landfill. The most traditional route for waste is through collection services from businesses and households, a service provided by a number of companies nationwide. Traditionally a one-bin system was used where all wastes would simply be placed into one bin regardless of waste category. The population's mindset has changed to accept a second bin for recyclables only as part of our everyday lives. This source segregation of waste has allowed Ireland's waste management infrastructure become even more efficient and

^{**} SRF- Solid Recovered Fuel designs, builds and operates facilities to convert municipal solid waste to clean, efficient, renewable synthesis gas.

potentially more profitable. Over recent years some waste collection companies have introduced a third bin for organic biodegradable waste such as food waste, grass cuttings etc. Although in the early stages of development in Ireland there is considerable potential for creating composts and also acting as an energy source. Figure 3 shows how one, two and three bin collection system operates and the waste stream created by each system.

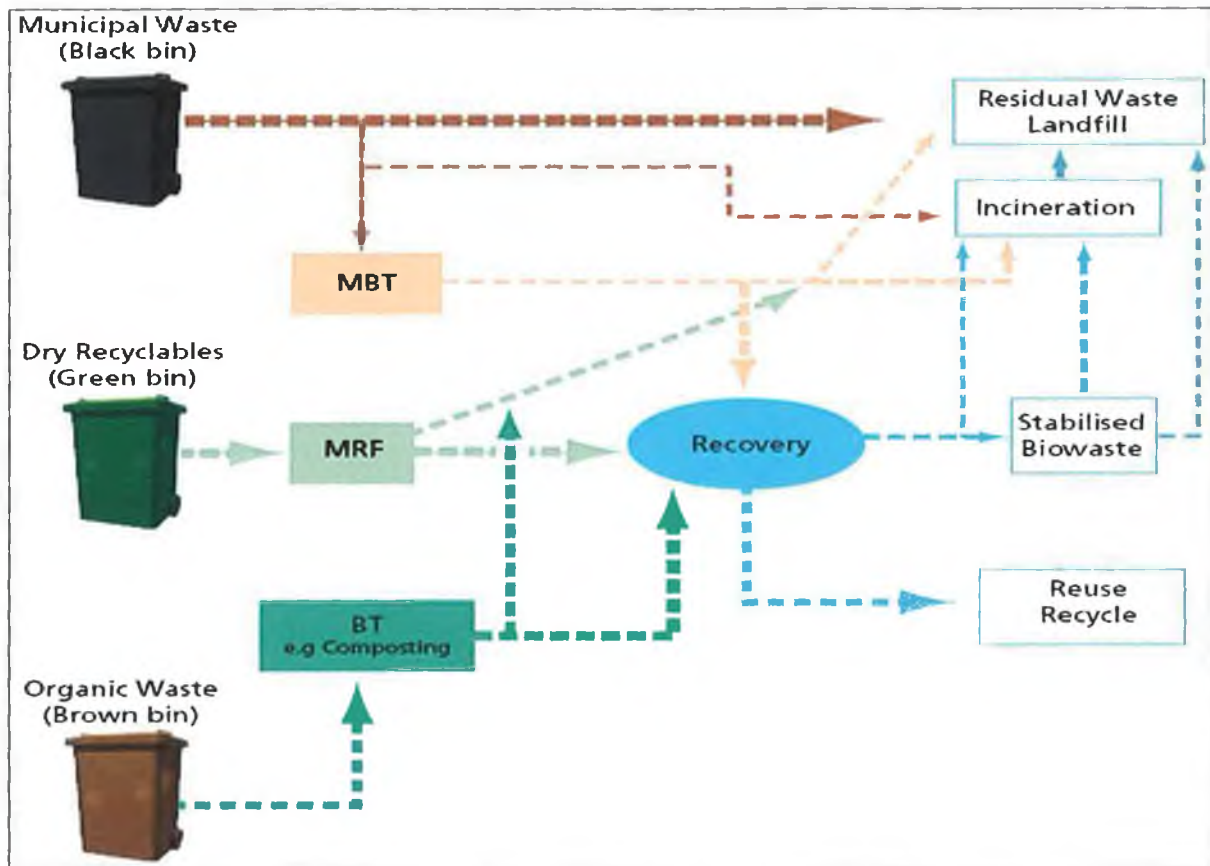


Figure 3: Treatment options for one, two and three bin collection systems¹³

¹² Energy White Paper 2007-Delivering a Sustainable Energy Future for Ireland, The Energy Policy Framework 2007 - 2020

¹³ Hitting the targets for biodegradable municipal waste: Ten options for change (2008) Curtis, J. - Strategic Policy Research Unit- Office of Environmental Assessment.

4.1 Indaver

Indaver's Waste-to-Energy facility in Meath will use some of the most advanced available technology to process 200,000 tonnes of residual waste annually. The waste-to-energy facility is designed to meet stringent operating standards and maximise electricity production. It will generate enough electricity to power 20,000 homes¹⁴.

Indaver are currently developing a number of waste management infrastructure projects to ensure local and secure outlets for waste. The export of hazardous waste is unsustainable and therefore they have proposed the development of a waste-to-energy facility in Ringaskiddy that is capable of treating hazardous wastes.

Indaver are constructing Ireland's first waste-to-energy facility in County Meath. Valued at €130 million, the facility represents the largest ever-single investment in waste management infrastructure in Ireland. The facility is scheduled to be fully operational by the year end 2011.

Construction is almost complete and 200,000 tonnes of residual waste per annum will be accepted into the facility from 2011. Common wastes such as residual household waste, commercial waste, sludges and industrial waste will be treated at the facility. According to Indaver it is thought that 120,000 tonnes of this waste will be biodegradable waste. Waste-to-energy is a sustainable process that harnesses the energy embedded in the waste and converting it to energy in the form of electricity. This means that waste-to-energy is a recovery operation, unlike other residual waste management facilities. Such facilities have their drawbacks, they are expensive to build and operate as well as requiring specialised

¹⁴ Indaver representative- Jane Hennessey (Interviewed 12/7/10)

skilled personnel to operate and maintain the facility. If not well maintained such facilities can be unsightly, create smell and attract vermin.

4.2 Irish Cement

Irish Cement are set to use two SRF facilities, one in Louth which is set to be fully operational by year end 2010 and a second which has a planning permission and a waste licence granted in Limerick and is predicted to be operating by year end 2015. Irish cement will use SRF facilities in their cement kilns during their production processes.

Not only does such a facility divert waste that would otherwise end up in landfill but it also eliminates the need to import fuel for cement production. Such a waste stream has benefits financially and environmentally. The facility in Louth has a licence permitting the use of 120,000 tonnes of alternative fuels, 90,000 tonnes will be Solid Recovered Fuel, at present the facility operates close to 70% capacity. A very small portion of this waste is biodegradable municipal waste, estimated in the region of 2-3% according to Irish Cement. The facility in Limerick has a licence permitting the use of 80,000 tonnes of alternative fuels, 50,000 tonnes will be Solid Recovered Fuel. Again a very small portion of this waste is biodegradable municipal waste, estimated in the region of 2-3%. This means that only 2,700 tonnes of potential 'useful' biodegradable municipal waste will be utilised in the Louth facility and about 1,500 in the Limerick facility.

In order for the quantities of 'useful' biodegradable municipal waste to be used efficiently depends on the improvement of waste treatment technologies in Ireland, this will also rely on government policies.

4.3 Quinn Cement

Quinn Group is currently on the shortlist on the SWaMP2008^{***} waste infrastructure projects and proposes to implement MBT based technology to produce SRF that will be used in the cement process. Waste Collection activities under this project will remain under the control of the constituent councils. Quinn Cement will be in a position to accept SRF from waste operators in Ireland in 2011/2012. The facility is licenced to use 127,000 tonnes of alternative fuels, similarly to other facilities only about two thirds of this alternative fuel will be biodegradable and only about 2-3% will be biodegradable municipal waste.¹⁵

4.4 Lagan Cement

Lagan cement use Solid Recovered Fuels in their cement kiln. The facility has been online since January 2009 and has a licence for the burning of 95,000 tonnes of alternative fuels every year. At present the facility uses between 50,000 and 60,000 tonnes. The alternative fuel referred to is the end product of the MBT process and contains around 60% biodegradable materials such as paper, wood and cardboard, as with Irish cement only a very small portion of this waste comes from biodegradable municipal waste streams.

A representative of Lagan cement¹⁶ highlighted the following, 'the quality of biodegradable waste is a major issue and that Ireland has not become accustomed to efficient segregation of waste to develop a high quality fuel for their facility.'

^{***} SWaMP2008 is a public body representing eight different Councils based in the southern region of Northern Ireland. SWaMP2008's overall aim is to implement sustainable waste management plan that will also contribute to the region's economic development

¹⁵ Quinn Cement representative- Steve Tonry (Interviewed 13/7/10)

¹⁶ Lagan Cement representative- David Tobin (interviewed 11/7/2010)

4.5 Barna Waste

This Galway based company supplies a waste bin collection service to many homes and businesses in the Connacht region. Barna Waste provides a 3-bin collection service, recyclables, general municipal waste and an organic/biodegradable waste bin. At present 3,500 customers have access to a 3-bin service with a view to increase these figures to 8,000 by year end 2013 and further again to 12,000 by year end 2016. The current annual intake of biodegradable waste is estimated to be in the region of 4,500 tonnes.

Barna offer a facility for Aerobic Digestion treatment at Headford Road, Galway. This facility is currently in the early stages of existence and no end use for their product can be finalised until Department of Environment testing has been carried out. Compost produced at the facility can potentially be used for landfill cover and for some other landscaping instances. Ideally Barna Waste intend to provide existing customers with compost suitable for gardening needs.¹⁷

4.6 Panda Waste

Panda waste offers similar services to Barna Waste for the Dublin and Eastern region of the country. Panda currently supply 1,000 customers of their 40,000 customers with a 3-bin service collecting 2,500 tonnes of organic waste annually. Panda Waste hopes to reach 4,000 customers by the year end 2013 and doubled further to 8,000 customers by year end 2016. If predictions for 2016 are correct there will be 20,000 tonnes of organic waste collected and treated in 2016. This will make in roads towards EU landfill directive targets.¹⁸

¹⁷ Barna Waste representative- Declan Highland (Interviewed 6/7/2010)

¹⁸ Panda Waste representative- David Naughton (Interviewed 6/7/2010)

4.7 The Covanta incinerator

Finally there is the issue of the controversial Poolbeg, 'Waste to Energy' facility. There are a few controversial issues surrounding the facility such as the cost, government planning, and probable monopolisation of the waste management infrastructure, Dublin city council planning and protesting of local residents. The incinerator is perceived as a threat to local residents and the community. This however is largely due to the negative connotations associated with the idea of incineration. The reality of incineration is far less daunting than past landfill site design of placing a pipe in the ground and releasing untreated methane. This type of landfill design was once common practice and was largely unopposed by the population.

The 'Poolbeg Waste to Energy' facility is something that is dividing opinions in how it will aid Ireland's waste management infrastructure to reach EU landfill directive targets. The methodology by which the facility will be run is something that has to be met with scepticism. Dublin City Council entered into the Public Private Partnership (PPP) with Covanta in 2007 after the original consortium withdrew from the project.

The project has been met with scrutiny since day one over planning issues, design issues and running methods. In 1997 Dublin City Council chose incineration over MBT in order to treat waste. The cost analysis was flawed with crucial cost details being omitted from the projections¹⁹. Basic cost elements such as the cost of land, disposing of bottom & fly ash and the cost of generating CO₂ emissions were all omitted

The primary item of concern is the so called 'put or pay' contract between both parties. Normally a Public Private Partnership means that the private company bears the risk in the

¹⁹ Irish Times- Costs of incinerator a burning issue (Jennings.V, McCarthy.J, 2008)

venture, in the case of the Poolbeg Incinerator this is not so. Instead Dublin City Council, backed by the Irish government and bank rolled by the taxpayer have invested heavily. Dublin City Council has taken responsibility to provide Covanta with a 25 year guarantee of 320,000 tonnes of waste annually. If Dublin City Council does not provide this waste then they must pay Covanta the equivalent losses in gate fees thus removing the risk factor to the private investor. If we apply an €80 gate fee per tonne to this waste figure it would generate a healthy profit for Covanta of over €25 million plus a potential profit of €11 million through electricity generation. By the same token if Dublin City Council fail to meet their 'put or pay' contract agreement they are liable to penalties of anything up to €14 million²⁰. Obviously this bill will be paid primarily by the taxpayer that are the main protestors against the project. At the present time, confidence in political parties and organisations is at very low levels. Proposals set out in the Poolbeg project have not and will not do anything to instil confidence in public organisations.

Financial problems aside, Dublin City Councils planning seems short-sighted. As stated earlier, incineration was chosen as the waste disposal method for Dublin over MBT under flawed analysis and hidden cost. The reality of the situation is that MBT would probably work out cheaper for Dublin City Council when all variables are cost reviewed and life cycle analysis is carried out²¹. MBT would also be a more environmentally friendly way to treat waste than incineration. As for the planning of the incinerator seeming short-sighted one must ponder over the following. Would a series of MBT plants located strategically around Co.Dublin be more beneficial to the general public, waste collection services, the community and the local environment? A series of plants would reduce transport distances of waste rather than transporting waste to one single location. The general public would be happy that there isn't an incinerator located in their comfort zone.

²⁰ <http://www.irishtimes.com/newspaper/opinion/2010/0412/1224268138237.html> (September 8th 2010)

²¹ Irish Times- Costs of incinerator a burning issue (Jennings.V, McCarthy.J, 2008)

The incinerator could endanger Ireland's waste management infrastructure by monopolising waste streams. The Poolbeg project has a total running capacity of 600,000 tonnes be it by accident or design it is oversized. As discussed earlier the penalties are enforced if the plant does not receive 320,000 tonnes of waste, just over half the total capacity. For this reason Covanta can offer the excess capacity at any price they dictate. This situation has the very real danger of undercutting other waste collection and waste treatment companies. The more environmentally friendly methods of waste disposal would be overlooked in favour of the much cheaper option of the oversized incinerator. This issue is not just a thoughtless prediction, there is precedence for similar events occurring in the US also under the Covanta name. If similar events happen in Ireland we can condemn our waste management infrastructure to the more apt title of waste disposal plant. As for the EU landfill directive targets, with incineration it can be accepted that Ireland would be more than capable of meeting the targets. Ireland would meet the targets but at what cost? It is not possible to predict exactly what percentage of waste the incinerator would lure away from other waste management companies. For the purpose of this paper the predictions will not include the Poolbeg incinerator project. This is mainly to discover could Ireland meet the target using more environmentally friendly techniques as well as to discover if the Poolbeg project is unnecessary.

At the time of going to print certain aspects of the 'put or pay' contract have become public knowledge through various media and news reports. Although not 100% confirmed it appears that there may be a break clause for either party in the project by the 5th September 2010 and the duration for a break period has now been extended until May 2011. Contract discussions are presently ongoing but it looks as if Dublin City Council and the Irish government may be able to break the agreement of the initial contract.

Chapter 5

5.0 Predictions and Assumptions

5.1 Predictions for 2010

5.2 Predictions for 2013

5.4 Predictions for 2016

5.5 Implications of not meeting the targets

5.0 Predictions and Assumptions

In 2008, a total of 3.22 million tonnes of municipal waste was generated in Ireland, a decrease of 5 per cent since 2007. The amount of municipal waste generated per capita has been reducing since 2006, and is reported that waste generation was 729 kg per capita in 2008²². The quantity of municipal waste recovered in 2008 increased by 1% on that reported in 2007, while the landfill of municipal waste decreased by the same amount²³. The recovery rate continues to exceed the national target of 35% recycling by 2013.

In order to predict if landfill targets will be met, we must first estimate the amount of municipal waste that Ireland will generate up until 2016. By using 2008 EPA figures and predictions of municipal waste generation and population growth, we can assume that 2009 had a reduction of the same amount of 5% in waste volumes we can get a figure for 2009 municipal waste generation. For 2010 we will assume a further 5% reduction upon 2009 figures. For years after 2010 we will assume overall municipal waste volumes remain at 2010 levels. The reason 2010 levels will be used for 2013 and 2016 figures is that with increased awareness, companies are beginning to make their products with less packaging. This not only reduces waste but reduces production costs to the company. Another factor for keeping waste generation levels static is due to the economic downturn that fewer products are being bought meaning less waste is generated. Landfill levies also have the power to encourage people to become more aware of how they dispose of waste.

²² Environmental Protection Agency (2010), <http://www.epa.ie/environment/waste>

²³ Environmental Protection Agency, National Waste report 2008, (2009) ISBN 978-1-84095-336-7

Municipal Waste	2008	2009	2010	2013	2016
Household Waste (tonnes)	1,677,338	1,593,471	1,513,798	1,513,798	1,513,798
Commercial Waste (tonnes)	1,477,397	1,403,527	1,333,351	1,333,351	1,333,351
Cleansing Waste (tonnes)	69,546	66,069	62,766	62,766	62,766
Total Municipal Waste (tonnes)	3,224,281	3,063,067	2,909,915	2,909,915	2,909,915

Table 3: Total annual municipal waste predictions

By using EPA figures from 2008 we can determine the current recovery rates of BMW consigned to landfill. This will give a baseline figure for further predictions from 2010 to 2016. These recovery rates can be applied to the total figures in Table 3 for each period.

Managed Municipal Waste Source Stream	Available Biodegradable Waste Portion	BMW Content Residual Consigned to Landfill	Recovery Rate (%)
Household Waste (tonnes)	906,302	581,037	64
Commercial Waste (tonnes)	1,140,550	570,150	50
Cleansing Waste (tonnes)	44,857	44,857	100
Total (tonnes)	2,091,709	1,196,044	

Table 4: BMW content of managed household waste streams reported in 2008 (EPA)

From the 2008 National Waste Report it was established that a 3-bin service was provided to 21% of serviced households resulting in a total collection of 180,571 tonnes, the quantity of organic waste collected had doubled from the previous year to 38,000 tonnes. By December 31st 2010, 40% of households must have a segregated organic collection system (government target). Therefore for 2009, it was estimated that this target would be at least 50% in its progress, consequently it was estimated that 30% of households would be using the 3-bin service.

The National Waste Report for 2008 also stated that home composting increased by 7%. Based on these figures it was estimated that there would be another 7% increase due to

public awareness of the benefits of home composting and the 'pay by weight' system that will be introduced by various waste collection companies throughout the country.

For the 1st of January 2009 there was a target of 50% diversion of commercial organic waste from landfill, with a diversion target of a 100% for the 1st of January 2010. These targets were unrealistic and unachievable for the status of the Irish waste management infrastructure. It is also estimated that the progress of the waste management infrastructure may be significantly impacted due to the economic downturn. Therefore, a more realistic figure of a 5% increase in the recovery of commercial organic waste is estimated. With the advancements in large scale composting facilities, such as that at Barna Waste in Galway, we can expect this figure to rise in the near future.

From the 2008 National Waste Report it can be established that a 100% of cleansing waste was consigned to landfill. It is estimated that from the waste strategies set out in the various regional Waste Management Plans that there would be a recovery rate of 2% for 2009.

Assumptions and predictions are estimated upon the key figures published in the EPA National Waste Report 2008 and from figures received from relevant companies who are apart of the national waste management infrastructure. Some key figures are as follows:

- A total of 3,224,281 tonnes of municipal waste was generated, a 5% reduction from 2007
- Home composting increased by 7% from 2007 to an estimated 36,713 tonnes
- Household waste generation dropped by 5% to 1,677,338 tonnes
- The recovery of municipal waste increased by 1% to yield an overall recovery rate of 37.5%.
- The disposal of municipal waste to landfill decreased by a corresponding 1%.
- The quantity of organic waste collected from 'kerbsides' doubled to 37,920 tonnes

5.1 Predictions for 2010

If we use some of the EPA figures²⁴ and key figures from companies within Irelands waste management infrastructure we can establish a reasonable estimates as to whether or not Ireland will make 2010 EU landfill directive targets²⁵ for year end. As stated earlier it is a government target that by December 31st 2010, 40% of households must have a segregated organic collection system. This will be an increase from the 30% estimated in 2009. A 5% increase in the recovery of commercial organic waste was estimated for 2009 and with the opening of new composting facilities, such as those at Barna Waste servicing the Connacht region, this appears a reasonable assumption. For cleansing waste we will assume an increase in recovery of a further 2% from 2008 through 2009, making the 2010 recovery of cleansing waste at 4%.

So how are private companies going to help meet the first EU landfill directive target? SRF cement kilns that are operating in 2010. Irish cements Louth facility can operate at 90,000 tonnes with 63,000 tonnes biodegradable waste estimated. Lagan cement also has a facility that is capable of dealing with 36,000 tonnes of biodegradable waste. These two facilities are the only such facilities online in 2010 and must carry the 'burden' of helping Ireland reach the first EU landfill directive target.

Waste collection services are also important but remain under developed in terms of organic waste treatment for 2010. Composting facilities are still in the early stages of development with research and sample screening still on going. The two main companies who will ensure these developments are Barna and Panda Waste covering the western and eastern regions of the country respectively. Combined their estimated collection of organic 'brown' bins will accumulate to 7,000 tonnes of waste from 4,500 organic 'brown' bins. Table 5 calculates what might happen for the year 2010.

²⁴ Environmental Protection Agency, National Waste report 2008, (2009) ISBN 978-1-84095-336-7

²⁵ EU Directive 1999/31/EC, Official Journal, OJ L 182 of 16.07.1999

Managed Municipal Waste Source Stream	Available Biodegradable Waste Portion	BMW Content Residual Consigned to Landfill (tonnes)
Household Waste (tonnes)	815,672	(64% recovery) 522,030
	Subtracting: At source composting for 2009(7%)+7% Increase 2010	42,033
	Brown Bin Roll Out: Barna Waste (3,500 bins) – 4,500 tonnes Panda Waste (1,000 bins) – 2,500 tonnes Others- 37,920 tonnes (EPA National Waste Report 2008)	44,920
	SRF in cement kilns: Irish Cement; Louth facility – 63,000 tonnes Lagan Cement – 36,000 tonnes	99,000
	Total	336,077
	Commercial Waste (tonnes)	975,170
	Subtracting: 5% increase in the recovery of commercial organic waste	24,380
	Total	463,205
Cleansing Waste (tonnes)	38,353	38,353
	Subtracting: 4% increase on recovery (2% increase in 2008 & 2009)	1,534
	Total	36,819
Total Content Residual Consigned to Landfill		836,101
Progress to 2010 EU Landfill Target (916,000-836,101)		79,899

Table 5: Estimated BMW volumes consigned to landfill in 2010 & comparison with targets

As we see from table 5, Ireland is on target to meet 2010 goals of 916,000 tonnes by 79,899 tonnes. This figure relies on the efficiency of SRF cement kilns as well as the quality of segregation of biodegradable waste used as a fuel source. This figure also relies heavily on the assumption that past trends of waste recovery will continue at a steady or greater rate to previous years. The roll out of organic 'brown' bins has an important role to play. Companies such as Panda and Barna Waste can act as an exemplar to similar waste companies such as Keywaste, Greenstar and Oxigen who wish to be a part of Irelands waste management infrastructure. As crucial as such facilities are to meeting the landfill directive targets it becomes even more important that Irelands waste treatment technology grows accordingly to keep up with development of facilities.

It is worth noting that the deadline for the 2010 target has now passed. As of yet no figures have been published for public use in order to discover whether or not Ireland was successful in achieving the proposed target. It was widely reported that Ireland would not achieve the targets and as of yet there is no evidence available to the contrary.

5.2 Predictions for 2013

As with the predictions for 2010, we will use some of the EPA figures and key figures from companies within Irelands waste management infrastructure to establish a reasonable estimate as to whether or not Ireland will make 2013 EU landfill directive targets for year end. The EPA estimates that 'at source' composting levels of 7% will continue annually in the period 2011 to 2013 as there will be large scale composting facilities fully operational along with an emphasis of public schemes to encourage composting at source. For commercial waste it is predicted that a 5-8% increase in recovery will occur annually. For the purpose of this report 2011-2013 recovery estimates will be 6.5% annually, culminating in a total of 19.5% for the 3 years. For cleansing products we will assume the same 2% recovery trend will continue as of 2010 for the period 2011 to 2013.

Indaver are scheduled to be fully operational by year end 2011. According to their representative (see Section 4.1) the facility should be running at 75% its full 200,000 tonnes capacity for 2012. By year end 2013 the facility should be running at 85% of its capacity. Of the 200,000 tonnes of waste entering the plant it is estimated that 120,000 tonnes is biodegradable so we can apply the earlier percentages to this figure to predict how much biodegradable waste will enter the facility and more importantly be diverted from landfill.

The only other new and significant waste management facility that is scheduled to open in the period 2011-2013 is the SRF cement kilns of Quinn Cement. The facility is licenced to use 127,000 tonnes of alternative fuels, similarly to other facilities only about two thirds of this alternative fuel will be biodegradable and only about 2-3% will be biodegradable municipal waste. As with other such facilities we can assume that full capacity will not be achieved and an initial running figure of 70% full capacity is a reasonable estimate.

Facilities that were operating in 2010 should be operating in 2013 at predicted levels should nothing unusual occur in the period 2011-2013. Lagan cement should be capable of using 70,000 tonnes of its 95,000 tonnes capacity by year end 2013, as with 2010 estimates it is estimated that 60% of these figures will be biodegradable waste. Irish cements Louth facility should be operating at full capacity by 2013.

Barna and Panda Waste have predicted an increased roll out of their organic 'brown' bins. Barna Waste have set a target of supplying eight thousand customers with a brown bin by year end 2013 which should collect in the region of 9,500 tonnes of waste annually. Panda Waste is said to be on track to quadruple their brown bin supply from one thousand to four thousand customers. Although this figure is half the amount that Barna have forecast, Panda estimate an annual collection of 10,000 tonnes of organic waste. When questioned on their figures it was explained that the Panda Waste collection service operates primarily in Dublin and its commuter belt where people tend to have smaller gardens, reducing the possibility of at source composting. It was also stated that the population of this region not to own pets, whereas Barna Waste are based in the western region of the country where it is common place for the population to own pets or farm animals. Although pet ownership seems to have little if anything to do with waste management it is a valid point. Feeding ones animals the leftovers or peelings of food is quite common especially in the more rural parts of Ireland and therefore these same people are less likely to put food in the bin when their animals can be fed effectively free. This is a shared opinion between both Panda and Barna Waste upon being questioned about the seemingly incomparable figures. We will assume that similar smaller companies increase their collection by 5% annually from the EPA figures²⁶.

²⁶ Environmental Protection Agency, National Waste report 2008, (2009) ISBN 978-1-84095-336-7

Managed Municipal Waste Source Stream	Available Biodegradable Waste Portion	BMW Content Residual Consigned to Landfill (tonnes)
Household Waste (tonnes)		(64% recovery) 522,030
	815,672	
	Subtracting: At source composting increase by 7% per annum on 2010 figures	51,492
	Brown Bin Roll Out: Barna Waste (8,000 bins) – 9,500 tonnes Panda Waste (4,000 bins) – 10,000 tonnes Others- 43,897 tonnes	63,397
	SRF in cement kilns: Irish Cement; Louth facility – 90,000 tonnes Lagan Cement – 46,000 tonnes Quinn Cement- 53,340 tonnes	147,940
	Waste-to-Energy Plant Indaver: Meath facility (60% biodegradable waste at 75% running capacity)	54,000
	Total	205,201
Commercial Waste (tonnes)	975,170	487,585
	Subtracting: 6.5% increase in the recovery of commercial organic waste annually (2011-2013).	89,033
	Total	398,552
Cleansing Waste (tonnes)	38,353	38,353
	Subtracting: 6% increase on recovery (2% increase annually 2011-2013)	2,301
	Total	36,052
Total Content Residual Consigned to Landfill		639,805
Progress to 2013 EU Landfill Target (610,000-639,805)		-29,805

Table 6: Estimated BMW volumes consigned to landfill in 2013 & comparison with targets

According to estimated predictions for the period 2011-2013 and 2013 in particular there will be significant improvements to Ireland's waste management infrastructure. In comparison to 2010 figures there will be a reduction of about 200,000 tonnes of waste being consigned to landfill. Although the predictions show some significant improvements in the next three years there is still concerns over meeting the 2013 EU landfill directive target of 610,000 tonnes.

Even if predictions are accurate there will be a shortfall of almost 30,000 tonnes in meeting the target. This figure is relatively small but is very much dependent on the controversial waste to energy plant in Meath being on line and running at close to full capacity.

The 2013 estimate is also largely reliant on the development of SRF cement kiln facilities. According to the respective companies their facilities will be online and working at the capacities predicted with little or no problems associated. The cement kiln facilities will potentially be responsible for the diversion from landfill of almost 150,000 tonnes by 2013 showing that such facilities will be instrumental for Ireland to meet any of the EU landfill directive targets.

5.4 Predictions for 2016

As with the predictions for 2010 and 2013, we will use the same EPA figures and key figures from companies within Ireland's waste management infrastructure to establish a reasonable estimate as to whether or not Ireland will make 2016 EU landfill directive targets for year end. The EPA estimates that 'at source' composting levels of 7% will reduce to about 5% annually in the period 2014 to 2016 as there will be large scale composting facilities fully operational along with an emphasis of public schemes to encourage composting at source. For commercial waste it is predicted that a 7-10% increase in recovery will occur annually. For the purpose of this report 2014-2016

recovery estimates will be 8.5% annually, culminating in a total of 25.5% for the 3 years. For cleansing products we will assume the same 2% recovery trend will continue as of 2010 and the period 2011 to 2013 for the period 2014 to 2016.

Companies within Ireland's waste management and waste treatment circles should be well developed and working efficiently by 2016. The waste to energy facility (Indaver) in Co. Meath will be running at full capacity resulting in the use of 200,000 tonnes of alternative fuels, 120,000 tonnes biodegradable waste. These are performance figures expected by Indaver.

Irish cement will have two SRF cement kilns online by 2016. The Louth facility (online in 2010) will be responsible for using 90,000 tonnes of biodegradable waste. The second facility is scheduled to commence operations in 2015 in Limerick. The Limerick project has a licence permitting the use of 80,000 tonnes of alternative fuels of which 50,000 tonnes of biodegradable. As with all such projects there is expected teething problems and the facility will probably be running at 70% capacity in 2016. Lagan and Quinn cement do not have any new projects in the pipelines and will rely on their facilities that were online in 2010 and 2011. These facilities are expected to be running at full capacity by 2016 meaning that Lagan will use 63,000 tonnes of biodegradable waste and Quinn Cement will use 76,000 tonnes of biodegradable waste.

As regards to waste collection services especially organic 'brown' bin collection Barna and Panda Waste can act as exemplars to smaller companies such as Greenstar, Keywaste and Oxigen. By 2016 Barna Waste predict a collection service of 12,000 brown bins culminating in an overall collection of 14,500 tonnes of biodegradable waste. Panda waste is predicting a collection of 20,000 tonnes by year end 2016. Both company's collection services are crucial in Ireland's target meeting potential. As with 2013 we will assume that similar smaller companies increase their collection by 5% annually from the EPA figures²⁷.

²⁷ Environmental Protection Agency, National Waste report 2008, (2009) ISBN 978-1-84095-336-7

Managed Municipal Waste Source Stream	Available Biodegradable Waste Portion	BMW Content Residual Consigned to Landfill (tonnes)
Household Waste (tonnes)	815,672	(64% recovery) 522,030
	Subtracting: At source composting increase by 5% per annum on 2013 figures	59,608
	Brown Bin Roll Out: Barna Waste (12,000 bins) – 14,500 tonnes Panda Waste (8,000 bins) – 20,000 tonnes Others- 50,816 tonnes	85,316
	SRF in cement kilns: Irish Cement; Louth facility – 90,000 tonnes Irish Cement; Limerick Facility – 35,000 tonnes Lagan Cement – 63,000 tonnes Quinn Cement- 76,000 tonnes	264,000
	Waste-to-Energy Plant Indaver: Meath facility	72,000
	Total	41,106
	Commercial Waste (tonnes)	975,170
	Subtracting: 8.5% increase in the recovery of commercial organic waste annually (2014-2016).	113,721
	Total	373,864
Cleansing Waste (tonnes)	38,353	38,353
	Subtracting: 6% increase on recovery (2% increase annually 2014-2016)	2,440
	Total	35,913
Total Content Residual Consigned to Landfill		450,883
Progress to 2016 EU Landfill Target (427,000-450,883)		-23,883

Table 7: Estimated BMW volumes consigned to landfill in 2016 & comparison with targets

Once again it is predicted that Ireland will fail to meet EU landfill directive targets for the year 2016. Close to 24,000 tonnes represents this margin of failure that would be a huge blow to Ireland's efforts at developing an efficient and effective waste management infrastructure. As with predictions for 2013 there are significant improvements in waste diversion from landfill but due to EU landfill directive targets evolving to lower and lower levels. It becomes difficult to achieve these targets especially when trying to play catch up from years of not treating and disposing of our waste effectively and efficiently.

5.5 Implications of not meeting the targets

If Ireland do not achieve the targets for waste diversion under the EU landfill directive, the Irish government faces financial penalties for such failure. The power for enforcing directives and imposing fines is set out under the Maastricht treaty²⁸. Under the treaty if any member state does not respect its obligations under EU law the European Union can take legal action against that member state.

If Ireland fails to reach the targets for biodegradable municipal waste diversion from landfill, under the landfill directive the EU commission can bring Ireland to the European court of justice for breaching EU law. At this point the court upon the state can impose a periodic penalty or a lump sum fine²⁹.

The periodic penalty is a penalty by day of delay after delivery of judgement under article 228 of the Maastricht treaty and the lump sum fine is imposed for the continuation of the infringement between judgement for non-compliance (under article 226) and the aforementioned judgement under article 228. The amount payable is generally calculated on a flat rate multiplied by coefficients such as seriousness of the

²⁸ The Maastricht Treaty (1992)- <http://www.eurotreaties.com/maastrichtec.pdf>

²⁹ Paper for Greenstar Ltd.- Potential fines for non-compliance with the EU landfill directive (2009)

infringement or the duration of the infringement. The fine is also calculated to reflect a member states GDP and the number of votes it has on the European council³⁰.

An independent report commissioned for waste operator Greenstar and carried out by Eunomia, estimated that Ireland could face fines of between €180-270 million per year for failing to comply with the EU landfill directive³¹.

³⁰ Paper for Greenstar Ltd.- Potential fines for non-compliance with the EU landfill directive (2009)

³¹ 'We face €500,000-a-day EU fines in landfill clampdown' – Irish Independent 7/10/2008 (Melia, P)

6.0 Conclusions and Recommendations

Due to predicted population increase between now and 2016 it is imperative that Ireland's waste infrastructure is constantly being updated and monitored in order to meet the pressures that will be put upon it. Investment from the private sector is a vital component of an efficient integrated waste management system.

Year	EU Landfill directive targets (tonnes)	Predicted BMW Residual Content Consigned to Landfill (tonnes)	Difference (tonnes)
2010	916,000	836,101	79,899 (on target)
2013	610,000	639,805	29,805 (over target)
2016	427,000	450,883	23,883 (over target)

Table 8: Difference in predicted content consigned to landfill and EU targets

Table 8 shows a breakdown of predicted BMW residual content consigned to landfill in comparison to EU landfill directive targets for year-end 2010, 2013 and 2016. Although the first target of July 1st 2010 has already been passed, figures are yet to be published to confirm if Ireland have met the EU landfill directive of 916,000 tonnes. If predictions are correct Ireland should be well on the way to reaching the first target by almost eighty thousand tonnes by year-end 2010. This is probably more to do with the somewhat generous preset target rather than Ireland's waste management infrastructure or improvements in available waste treatment technologies.

Even with the introduction of the waste-to-energy plant in Meath in 2011 and the increased capacity available in Ireland's SRF cement kilns Ireland will fail to meet the 2013 target according to predictions in tables 6 & 8. According to the EU landfill directive Ireland can only landfill a maximum 50% of the BMW generated in 1995 resulting in a target of 610,000 tonnes. This significant drop in the allowable amount of BMW ending

up in landfill of 306,000 over 3 years means that Ireland will miss the target by almost thirty thousand tonnes. Despite the efforts of companies to improve their waste treatment facilities and increase capacities the target seems too much for Ireland waste management infrastructure. The additional roll out of a 3-bin collection service has little impact in helping to reach the target of 2013.

The trend continues into 2016, missing the target by almost twenty-four thousand tonnes. Although additional capacity for waste will be available in 2016 the reduction in the allowable amount consigned to landfill seems too great an obstacle for Ireland's waste management infrastructure to overcome. The controversial Poolbeg incinerator would help Ireland meet the targets but it is still unclear as to whether or not the project will go ahead and if so how much waste will be taken away from the waste streams of smaller waste treatment facilities.

The slow down in the Roll out had a minimal effect on figures generated when the difference is calculated. The fact is that organic 'brown' bins are a good idea for city and town living but not so much in rural Ireland. It must be considered that in rural Ireland that a majority of people reuses their organic waste to feed animals. Food waste is generally given to a pet dog or cat, many households are based on farms and may have chickens or horses that will eat vegetable peels and grass cuttings. While such activities means that organic waste is not going to landfill it also means that 100% roll out of bins will prove ineffective.

It is unrealistic that Ireland will meet EU targets without efficient incinerators and SRF facilities. As stated previously, private sector in these fields is crucial along with investment in biological and thermal treatment plants. This will not only be an advantage to Ireland in the form of reduction of BMW going to landfill but also has the potential to be a source of renewable energy if appropriately planned. While this report states that targets will not be met it only takes minor investment in the next couple of years in order to be on target. This investment could be a new project or an expansion to an existing

waste treatment facility. Investment is not necessarily the only obstacle, the EPA hold a lot of cards when it comes to licensing such facilities. In order for the Ireland to reach EU targets then the EPA and Irish government must closely liaise with one another to best plan Ireland waste management infrastructure and also realise the potential of renewable energy sources.

It is important for Ireland to meet the EU landfill directive targets for a sustainable, environmentally friendly future. The EU landfill directive targets act as a driver to encourage more efficient waste treatment by imposing financial penalties to a member states government. More efficient waste treatment is an activity that should have been carried out in Ireland over the past few decades and not just because of the introduction of the landfill directive targets. With hindsight it is a lot easier to make such a statement than making bold predictions. Ireland cannot criticise the EU landfill directive targets but instead embrace them for the good of the nations future wellbeing. The targets need to be met so as not to incur the potential penalties for failure, this is not as important as the bigger picture of meeting the needs for an improved waste management infrastructure and more waste treatment options in Ireland. By improving the efficiency and cost of Ireland's waste management infrastructure we can eliminate the need to export our waste to other nations such as exporting hard plastics to China³². Waste is a resource in the wrong place and if Ireland can maximise the potential of such a resource it can improve the national economy as well as creating an improved environment and a more sustainable future.

³² Finfacts Team- http://www.finfacts.ie/irelandbusinessnews/publish/article_1011726.shtml (2007)

7.0 References & Bibliography

- 3.2** Total acreage of Athlone borough 1831-1901, including separate acreage totals for Athlone, Co. Westmeath and Athlone, Co. Roscommon.
- 3.3** Population proportions by religious denomination, Athlone town, Athlone Co. Westmeath and Athlone Co. Roscommon.
- 3.4** Population change by religious denomination in Athlone 1861-1901, Athlone, Co. Westmeath 1861-1901, Athlone, Co. Roscommon 1861-1901
Overall trend by religious denomination Athlone, Athlone Co. Westmeath and Athlone Co. Roscommon 1861-1901.
- 3.5** Proportion of Athlone's religious denominations by sex 1861-1901.

APPENDIX 4: POLITICS

- 4.1** MPs elected for Athlone Borough 1837-1885.
- 4.2** MPs elected for the constituencies of South Roscommon and South Westmeath 1885-1900.

APPENDIX 5: MISCELLANEOUS

- 5.1** Map of Athlone showing a number of important structures.
- 5.2** Additional photographs and images.
- 5.3** Information relating to Athlone Union Workhouse.
- 5.4** Census form used in the compilation of housing statistics.

7.1 References

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Supervisor/Student meeting sheet

Date	Meeting /Location	Subject	Student Signature	Supervisor Signature / comments
April 21 st '10	GMIT	Discussing topic selection and approach to research	CN	
May 6 th '10	e-mail from CN to JH	Discussed research proposal	CN	
May 19 th '10	e-mail from CN to JH	Requesting advice on research proposal. Setting out deadlines	CN	
June 1 st '10	e-mail from CN to JH	Submitted research proposal	CN	
June 3 rd '10	e-mail from JH to CN	Amendments to research proposal	CN	
June 8 th '10	e-mail from CN to JH	Research proposal final draft submitted	CN	
June 14 th '10	e-mail from CN to JH	Requesting advice for approach to Literature review	CN	
June 15 th '10	Phone. JH & CN	Advice on literature review. Progress to date. General discussion. Deadlines set	CN	
June 21 st '10	e-mail from CN to AB	Informing summer supervisor of progress to date as of her request	CN	AB
June 21 st '10	e-mail from AB to CN	Replied with advice on improving my research	CN	AB
June 29 th '10	e-mail from AB to CN	Requesting update on progress. Given me contact information	CN	AB

* CN – Colm Noone (student) ** JH – John Hanahoe (supervisor) *** AB – Attracta Brennan (summer supervisor)

Supervisor/Student meeting sheet

Date	Meeting /Location	Subject	Student Signature	Supervisor Signature / comments
June 30 th '10	e-mail from CN to AB	Further update on progress	CN	Here, you said that you would be in contact when you had more work done, but I heard nothing until 2 months later - AB
July 2 nd '10	Phone. JH & CN	Update on progress. Feedback on work submitted. Advice on future approach	CN	
July 12 th '10	Phone. JH & CN	Literature review hand up. Discussed about main body of work	CN	
Aug 10 th '10	Phone. CN to JH	(voicemail-no reply) updating current status	CN	
Aug 30 th '10	Email to JH & AB	An initial draft sent as well as meeting sheet	CN	
Sept 6 th '10	Email to CN from JH	Draft read and returned with comments and advice	CN	
Sept 10 th '10	Email to JH from CN	Potential Final draft	CN	
Sept 13 th '10	Email from JH to CN	Draft read and returned with comments and advice	CN	
Sept 14 th '10	Email from CN to JH	Corrective actions and submission details	CN	

* CN – Colm Noone (student) ** JH – John Hanahoe (supervisor) *** AB – Attracta Brennan (summer supervisor)