Environmental RTDI Programme 2000 - 2006

A Strategy for Developing Recycling Markets in Ireland

Final Report

(Project: Assessment and Evaluation of Outlets for Materials that can be Recovered from Municipal Waste)

Prepared for the Environmental Protection Agency

by

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DISCLAIMER

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PREFACE

This report was developed as part of the medium scale project: *Assessment and Evaluation of Outlets for Materials that can be Recovered from Municipal Waste (2000-MS-8-M1)*. Other deliverables related to this project include a Synthesis Report and Fact Sheets on each material waste stream, as follows:

1. Glass	2. Textiles	3. Ferrous Metals	3. Paper
5. Cardboard	6. Plastics	7. Non – Ferrous Metals	
8. Aluminium	9. Wood	10. Composites (used beverage cartons)	

ABBREVIATIONS AND GLOSSARY OF TERMS

Altstoff Recycling Austria	Altstoff Recycling Austria AG (ARA) was was founded by Austrian trade and industry in 1993 to meet Austria's waste packaging obligations. ARA organises and finances the collection and recycling of packaging waste throughout Austria.
APC	American Plastics Council
ARA	Altstoff Recycling Austria AG
C&D	Construction and demolition
CFCs	Chlorofluorocarbons
Chemical Recycling	Chemical recycling means the reprocessing, other than organic recycling, of waste materials, into materials for the original purpose or for other purposes excluding energy recovery or disposal, by changing the chemical structure of the processed material.
DOELG	Department of Environment and Local Government
DSD	Duales Systems Deutschland
Duales Systems Deutschland	Duales Systems Deutschland (Dual System Germany) was founded in September 1990. It organises the collection, sorting and recycling of packaging in line with the specifications of the German Packaging Ordinance
ELV	End-of-life vehicle
Energy Recovery	Energy recovery in this report refers to the incineration of waste (usually by oxidation) that includes the recovery of the combustion heat generated.
EPA	Environmental Protection Agency
EPR	Extended Product Responsibility
ERTDI	Environmental Research, Technological Development and Innovation

Extended Producer Responsibility	Extended producer responsibility means that the responsibility of producers for their products is extended to the post-consumer stage and includes the full life-cycle of the product or packaging.
Feedstock Recycling	This involves recycling technologies employing various processes that convert mixtures of plastics into petroleum feedstocks or raw materials that can be used in refineries and petrochemical facilities for making new products.
HDPE	High density polyethylene (see Fact Sheet on Plastics, Appendix I for full description of different plastics).
IFFPG	Irish Farm Film Producers Group
Integrated Product Policy	IPP attempts to stimulate each part of a product's life cycle to improve its environmental performance. IPP includes measures such as economic instruments, substance bans, voluntary agreements, environmental labelling and product design guidelines.
IPP	Integrated Product Policy
MDF	Medium density fibreboard
Mechanical Recycling	Mechanical recycling means the reprocessing in a production process of waste materials for the original purpose or for other purposes excluding energy recovery or disposal, without changing the chemical structure of the processed material.
Materials Recovery Facility	A facility that receives materials (usually mixed) in a form unsuitable for recycling. The MRF separates, removes contamination, sorts, and stores the individual recyclable material types.
MRF	Materials recovery facility
MSW	Municipal solid waste
Municipal Solid Waste	Municipal solid waste means solid household waste as well as commercial and other waste, which because of its nature and composition, is similar to household waste.
NGO	Non-governmental organisation
PET	Polyethylene terephthalate
Recovery	The term recovery in this report is generally used to mean the collection or acceptance of material for reuse or recycling. It does not relate to energy recovery, or material collected for energy recovery.
Recycling	Recycling means the reprocessing in a production process of waste materials for the original purpose or for other purposes - in this report it excludes organic recycling (or composting) and it excludes energy recovery; it is usually synonymous with mechanical recycling.

REPAK	REPAK was established in 1996 as Irish Industry's response to the obligations placed on Ireland by the *EU Directive on Packaging and Packaging Waste (94/62/EC*) and is currently the only Approved Body under the *Waste Management (Packaging) Regulations 1997*.
Reuse	Reuse means the reuse of waste material without reprocessing, for the original purpose or other purposes – usually this reuse is for the original purpose.
RPS	REPAK payment scheme
UBC	Used beverage carton (NB: also used in Fact Sheet on Aluminium in relation to used beverage cans)
URW	Urban recycled wood
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
Waste Arisings	Actual amounts of waste arising
Waste Available	Amounts of waste made available for collection and recovery
WEEE	Waste electrical and electronic equipment

EXECUTIVE SUMMARY

Introduction

Ireland's current performance regarding the reuse and recycling of waste, in particular household waste, leaves a great deal of room for improvement. Furthermore, recent trends show that current growth rates in the quantity of arisings greatly outstrip the growth rates in the quantity of amounts recycled.

These increases in arisings in turn have created a greater dependence on the use of landfill, which is currently the only disposal option in Ireland for material that has not been recovered.

This study aimed to identify, assess and evaluate existing and potential outlets for materials that can be recovered (for reuse or recycling) from municipal waste, both in Ireland and abroad. The following waste streams were considered for study:

- Paper
- Cardboard
- Glass
- Plastics
- Ferrous Metals
- Non-ferrous metals (excluding aluminium)
- Aluminium
- Textiles
- Wood
- Used Beverage Cartons (UBCs)

Another objective was to evaluate the potential of tools and instruments to stimulate such markets and the development of a strategic approach applying such tools for the creation of adequate, reliable and stable markets and other outlets for the recovery of useful materials from municipal waste.

The overall aim of the project was to aid a significant increase in municipal recycling rates in Ireland.

Waste Arisings in Ireland

In 1998 almost 2 million tonnes of commercial and domestic waste were collected for disposal or recovery in The Republic of Ireland. Of this total, 1,163,216 tonnes (or 62.8%) came from the household or domestic sector and 689,234 tonnes (or 37.2%) came from the commercial sector.

The characterisation of this waste shows that the main streams of consideration in this study are paper (including cardboard) at 35%, plastic at 11% and glass at 6% of the total amounts available.

Waste Recovery in Ireland

Current solid waste recovery levels in Ireland are far below national targets, especially for household waste, and they are also much less than those being achieved by many of our EU partners.

While the current level of waste arisings in Ireland has not been quantified in this study, information was acquired regarding the amounts reported recovered by recyclers and contractors in the year 2000. This is given in the following table:

Material	Amounts Recovered year 2000
Glass	40,500
Textiles	7,538
Ferrous metals	307,300
Paper	82,027
Cardboard	72,900
Plastics	15,000
Non-ferrous metals	29,500
Aluminium	16,890
Wood	50,000
UBCs	N/a
Total:	**621,655**

Amounts (in tonnes) of waste streams reported recovered in year 2000

Current Outlets

All the material waste streams considered in this study (except used beverage cartons) currently have outlets available to them. All the waste container glass and wood that is collected in The Republic of Ireland is recycled on the island of Ireland. Apart from those two materials and cardboard, the majority of the other material streams are exported for processing abroad. Currently there is no Irish facility for recycling ferrous metal waste or non-ferrous metal waste (except lead). Similarly with paper, only a small percentage of which is recycled in Ireland. Plastics and aluminium wastes are processed successfully both in Ireland and abroad.

It is clear, therefore that there is a major dependence on overseas facilities for the processing of Irish waste. This is not so problematic in the case of metals, for which there seem to be stable outlets (although transport costs are higher for export). However, in the cases of paper and cardboard, the necessity to export is a major barrier to increased levels of recycling.

Potential New Outlets

In order to stimulate higher recovery levels of Municipal Solid Waste (MSW), current outlets need to be exploited fully and new outlets need to be identified and developed. This is especially important because of the fact that Ireland is an island nation with a relatively low population, with relatively small markets, with low environmental awareness levels, dependent on exports, and with a very underdeveloped recycling infrastructure.

It is undoubtedly the case that the requirement for new outlets is not as pressing for some materials as for others. For example, the current glass manufacturing industry on the island of Ireland seems to have sufficient extra capacity to accept short to medium term increases in volumes of good quality cullet (with some green glass problems). And the exporting of metals does not seem a major deterrent to merchants, as long as the

markets abroad are relatively stable. However, there is a pressing requirement for new stable paper and cardboard markets as they will be required to increase recovery levels due to packaging and landfilling regulations. There is a wide range of potential markets for recycled plastic products, but the economics and infrastructure of recovery are a problem as is the domestic, commercial and public agency reluctance to purchase such products.

In all cases, instruments and tools are required to boost recovery levels and to support potential new outlets, especially Irish outlets.

Barriers to Recovery

As the low levels of recycling would indicate, there are many barriers to the collection, reuse and recycling of waste materials in Ireland today. Some of these are material specific, such as the diversity of plastic waste streams. Others, such as a lack of environmental awareness, affect the recovery of all waste streams.

As well as the 14 general barriers to recycling identified in this study, each material stream also has specific barriers preventing its increased recovery and recycling. Since so many barriers exist, both generally and specific to material streams, it is clear that a series of tools and instruments are required to overcome them.

Strategy for Waste Reuse and Recycling

A strategic approach is required in order to overcome the many barriers in place. All the required elements for a major increase in the recovery and recycling of waste must be put into place. These include awareness, information, economics, infrastructure and legislation. The forces and drivers to achieve this framework must be managed effectively and proactively. Active participation by the various stakeholder groups is of paramount importance.

The aim of this strategy is to reduce the waste we are creating and then to convert that waste into useful raw materials that can be used beneficially in the manufacture of viable products. By a series of actions, delivering a range of tools to the stakeholders involved (all the population), this strategy will reduce our unnecessary consumption of finite resources as well as diminishing our dependency on landfill and the concomitant pollution that it can cause.

Central to any strategy is the question of who will have the responsibility to implement it. Allocation of responsibility and provision of adequate resources are required to drive forward the actions required to create the conditions under which recycling can prosper.

The strategy and responsible agents should be action driven - it should not merely involve discussion groups alone. It should set specific targets and goals and develop plans to achieve them. It should be the central hub of a network of actors and stakeholders required to create conditions for sustainable waste management in Ireland. A committee or other discussion forum alone will not suffice. **Real power, permanent staffing, and an action orientation are required**.

Potentially Viable Tools and Instruments

The 17 main instruments that have been applied successfully elsewhere and that should be considered in Ireland in order to develop the framework within which recycling can grow to the required level are as follows:

- Research
- Awareness raising programme
- Eco labels
- Participatory approach
- Standards
- Design for the Environment
- Information provision
- Market Development Programme
- Economic instruments
- Green procurement
- Pan-Irish approach
- Extended producer responsibility
- Public private partnerships
- Infrastructural development
- Paper mill
- Legislation implementation
- Landfill bans

Implementation of Instruments and Actions

In any strategy all concerned must also be clear of their assigned roles. The role of the instrument developers is especially important since these organisations will implement the instruments by a series of actions. Specific to each of the following main stakeholder groups, the following priority actions should be seriously considered for implementation (other further actions are also recommended in the body of this report):

National Government:

1. Enunciate a national strategy for sustainable waste management.
2. Allocate specific responsibility for implementation of the various elements of the strategy, with the provision of required authority/powers and resources.
3. Implement a wide-ranging awareness campaign on recycling, expanding and building upon the It's Easy to Make a Difference scheme, as described in Section 8 of this report.
4. Implement a Market Development Programme to acquire and disseminate information regarding markets for waste streams; the programme will also disseminate grants and financial supports for market development issues; the

programme will work with recyclers and other to develop markets; the programme will promote standards and quality criteria relating to recyclates and products from recyclates; adequate resources, expertise and funding required to be provided.

5. Develop a service to acquire, store and disseminate information relating to waste issues.
6. In conjunction with the other key stakeholders, secure the implementation of producer responsibility initiatives within the respective sectors for the various streams of waste.
7. In the absence of producer responsibility initiatives being implemented within the various sectors, investigate potential mechanisms for the introduction of product charges on non-packaging waste generating products. Product charges should be a priority target for newspapers, office paper, etc.
8. Review the conditions established for REPAK to operate as an Approved Body in the certification of the scheme by the Minister to include for specified numerical targets for the recycling and recovery of packaging waste in the period 2002 to 2005.
9. Investigate the effects of extending the responsibility obligations in the packaging sector by a reduction of the threshold for obligated waste packaging producers (as Major Producers) to 10 tonnes per annum.
10. Investigate the removal of VAT on recyclates and the reduction of VAT on recycled products.
11. Increase landfill levy by a substantial amount in year 2003.
12. Implement grant aid and financial assistance schemes in support of worthwhile recycling projects, infrastructure, research etc.
13. DOELG to provide guidance documents to all government and public agencies who would then develop and implement detailed green procurement policies.
14. DOELG to provide guidance documents to all government and public agencies who would then develop plans to significantly increase their waste recovery levels.
15. Carry out discussions with Environment officials from Northern Ireland with a view to developing joint projects and infrastructural development.
16. Significantly increase direct funding and support of local authorities for infrastructural development for segregation, collection and recycling facilities.
17. Undertake a detailed feasibility study, with particular reference to the potential for a producer responsibility initiative, in relation to the possible development of a paper mill in Ireland in partnership with industry, local authorities, recyclers and other stakeholders.
18. Implement a national landfill ban on all materials for which adequate bring sites or collection facilities are nationally in place.
19. Streamline planning regulations to facilitate the early development of substantial additional bring sites.

20. Increase level of waste related research to investigate awareness, information, economic, infrastructural, and legislative requirements.
21. Include environmental issues, including waste, in curricula of primary, secondary and tertiary educational systems.

Local Government:

1. Implement effective and long term local awareness raising campaigns, with elements outlined in Section 8 of this report.
2. Employ adequate number of environmental education/training officers to significantly increase environmental awareness levels in each region.
3. Support national programme on market development and promote the programme at a local level.
4. Substantially increase landfill charges by end of year 2002.
5. Implement weight/volume related charges (pay-as-you-throw) schemes, so that larger domestic waste producers pay more (these charges must not be regressive).
6. All local authorities to apply the guidance issued by central government and to ensure that all its agencies and departments develop and implement a green procurement policy.
7. All local authorities to apply the guidance issued by central government and to ensure that all its agencies and departments recover their waste.
8. All local authorities to avail of public private partnerships for waste segregation, collection, and recycling as well as the development of infrastructure.
9. Local authorities to implement kerbside collection schemes for dry recyclables in urban areas.
10. Local authorities to develop bring site numbers to a level of 1 bring site per 500 persons.
11. Local authorities to extend materials collected in bring sites, to include: textiles, plastics, food cans, UBCs.
12. Implement a local landfill ban for all material streams for which adequate bring sites or collection facilities are in place.
13. Ensure total enforcement of waste packaging regulations within each region.
14. Ensure that only authorised waste disposal occurs within each region.

Industry:

1. Develop green procurement policies within industry, in particular to support new Irish recycling facilities, such as a paper mill or mills.
2. Accept responsibility for the production of manufacturing waste and the waste arising from products. Accordingly, implement producer responsibility initiatives designed to reduce the level of waste production and put into place

measures to ensure that waste which is generated from products is collected for recycling, in particular to support new Irish recycling facilities, such as a paper mill or mills.

3. All employees to be trained on waste prevention and recovery issues.
4. Development of standards and quality criteria relating to recyclates as a raw material suitable for usage in industry.
5. Greater importance placed on environment in design and production decisions.
6. Reduce level of green glass usage for container glass.
7. Industry to use eco-label systems on their products and packaging.
8. Increase level of waste related research to reduce industrial waste production and increase recovery.

Recyclers:

1. Develop public private partnerships with local authorities.
2. Utilise national programme for market development.
3. Development of standards and quality criteria to facilitate the use of recyclates and recycled products in appropriate circumstances.

Environmental Protection Agency:

1. Continue to develop adequate data regarding waste arisings, recovery, disposal etc.
2. Co-ordinate increased levels of appropriate research regarding waste prevention and recovery.
3. Play a major role in the development and implementation of national strategy on sustainable waste management and the coordination of waste recovery strategy.

REPAK:

1. Develop national infrastructure by co-funding with local and national government.
2. Maintain and improve the level of recovery of packaging waste from commercial/industrial sources while steadily increasing the focus on domestic packaging waste recovery.
3. Facilitate training programmes for all member companies to increase waste prevention and recovery.
4. Increase market development focus and co-fund market related projects from research, pilot schemes etc.

Synopsis of Main Conclusions

It is clear from the best available data that the arisings of waste in Ireland are very high and that the rate of growth of these arisings is unsustainable. It is vital, therefore, that Ireland, as a matter of urgency, implements a National Waste Prevention Plan, whereby the growth rates of waste arisings is firstly halted, and ultimately reversed.

It is also clear that the recovery rate for the reuse and recycling of this waste in Ireland leaves a great deal of room for improvement. At present the rate of waste recovery is much lower than international norms and is also well below our national targets. The recovery levels for all waste streams considered (glass, textiles, ferrous metals, paper, cardboard, plastic, non-ferrous metals, aluminium, wood and used beverage cartons) are less than acceptable.

A study of the current outlets for the recovered municipal solid waste streams considered shows that such outlets are being utilised for all these streams, both in Ireland and abroad, with the exception of used beverage cartons. A variety of such outlets for the various materials was identified and analysed in this study. Wood is the only material that is recycled solely in Ireland, currently no waste wood is being exported for recycling. All the container glass recovered in Ireland is also recycled, either in the Republic of Ireland or in a facility in Northern Ireland. However, many of the outlets for other waste streams are abroad, and this sometimes adversely affects the viability of their long term usage for a variety of reasons.

The situation regarding the export of large volumes of waste paper, cardboard and plastic in particular is problematic. There is an urgent and major requirement to increase the number and capacity of Irish facilities to recycle these waste streams.

Several potential new outlets for each waste stream were identified and analysed as part of this study. While some of these are more viable than others, many such outlets are worth considering, all of which are being widely utilised in other countries with higher recycling levels than Ireland.

The barriers to recycling in Ireland were also identified and analysed as part of this study. This analysis considered current general barriers to waste recovery and also specific barriers to each material waste stream. Many of these barriers are having a deleterious effect on the viability of developing a widespread culture of recycling in Ireland.

In order to overcome these barriers, a strategic approach is recommended, whereby all the required elements for a major increase in the recovery and recycling of waste can be put into place and the forces and drivers to achieve this can be managed effectively and proactively. A variety of key stakeholder groups are identified in this study whose active participation is of paramount importance.

Three levels are recommended in this strategy. At the widest level is the strategy itself in order to create a sustainable culture of recycling in Ireland. Within the strategy, and driving it, a range of tools and policy instruments are required in order to develop the proper awareness, information, economic, infrastructural and legislative conditions necessary for a higher rate of recycling. Several such recommended tools and instruments are identified and described in this report.

However, in order to bring about and deliver these instruments, several specific actions are required by the various main stakeholders. The carrying out of these actions delivers

the tools and instruments required to put into place the framework for widespread recycling. These stakeholder groups and their required actions are identified and described in this report. In particular, a range of actions is required from National Government, Local Government, Industry, Recyclers, the EPA, REPAK, Environmental Experts, NGOs and the General Public. In all, 79 such actions are recommended in the main body of this report so that these stakeholder groups can play their role in the development of recycling in Ireland.

All stages of the recycling chain (supply, collection, processing and demand) must be developed in Ireland. All are interdependent and mutually supportive, and all require positive actions by a range of stakeholders, using a carrot and stick approach, to solve the problem.

This overall strategy to create stable, long-term recycling markets for Irish waste streams must be developed and co-ordinated properly. In particular, allocation of responsibility and provision of adequate resources are required to drive forward the actions necessary to create the conditions under which a sustainable recycling system can prosper in Ireland.

CONTENTS

FACT SHEETS FOR EACH MATERIAL STREAM ARE AS FOLLOW:

1. **Glass**
2. **Textiles**
3. **Ferrous Metals**
4. **Paper**
5. **Cardboard**
6. **Plastics**
7. **Non-ferrous metals**
8. **Aluminium**
9. **Wood**
10. **Composites (Used Beverage Cartons)**

These are available on the EPA website at www.epa.ie

1. Introduction

The resources of our planet are finite. We are consuming them at an unsustainable rate for our food, shelter, transport, energy and leisure. Unless we begin to reduce this consumption, we are seriously jeopardising the ability of future generations to enjoy the levels and variety of raw materials currently available to us.

In Ireland, this pattern of consumption is especially critical because we generally use these virgin raw materials and their products once, discard them quickly and then bury them in the ground, in landfills. These landfills can then contribute to the pollution of our soil, water and air. We are thus both wasting limited and valuable resources and potentially threatening our environment with discarded waste materials.

The benefits of reusing and recycling these products are manifold, both environmental and economical, and include the following:

- Less virgin and finite raw material usage
- Energy savings in the manufacture of products from recyclates
- Reductions in emissions from the manufacturing process through the use of recyclates
- Job creation in the recycling industry
- No emissions or energy requirements in the reuse of materials in their original form
- Reductions in imports yielding economic benefits and greater self-sufficiency
- Less pollution from landfilling and incineration
- Reduced costs of disposal to landfill and incineration
- Reductions in pollution and loss of amenities from mining/materials extraction

It is vital, therefore, that we greatly increase our reuse and recycling levels in Ireland.

1.1 Background

Ireland's current performance regarding the reuse and recycling of waste, in particular household waste, leaves a great deal of room for improvement. Furthermore, recent trends show [1, 2] that current growth rates in the quantity of arisings greatly outstrip the growth rates in the quantity of recycling.

For household waste, there was a 13.3% increase in national arisings between 1995 and 1998 with a reduction of 1.1% in amounts recovered for recycling. For commercial waste, there was a 44.5% increase in arisings between 1995 and 1998 with an increase in the recovery rate of only 3.4%.

Overall, the quantities of household and commercial waste reported collected between 1995 and 1998 increased by 23.2% whereas the increase in the recovery rate was only 1.2% (from 7.8% to 9%). Figure 1.1 on page 2 shows these statistics graphically:

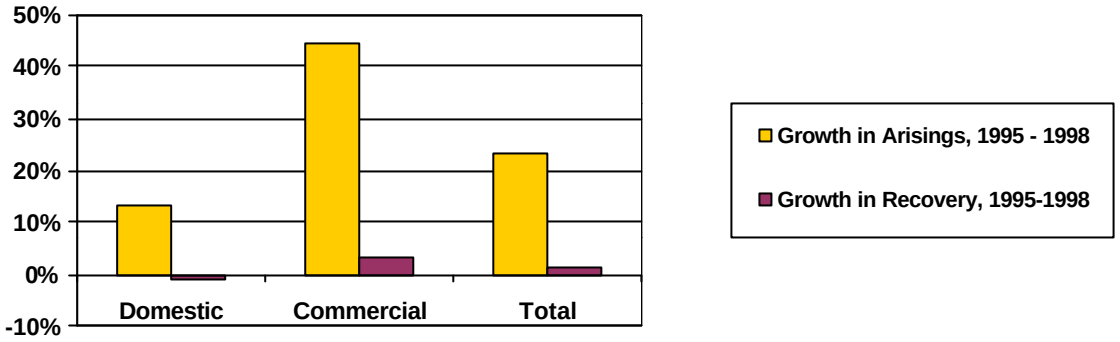

Figure 1.1: Growths in waste arisings and recovery levels from 1995 - 1998

These increases in arisings in turn have created a greater dependence on the use of landfill, which is currently the only disposal option in Ireland for material that has not been recovered. This is in direct contravention of current waste policies, which aim to decrease the current high levels of dependency on landfills for waste disposal [3]. The trends also indicate that we are wasting increasing amounts of valuable and finite raw materials. We are also increasing the potential pollution of our soil, water and air through this escalation in landfilling.

In household waste, having removed organics, paper was the single highest stream (29%) of the remaining waste and 96.8% of this stream was landfilled in 1998. Plastic was the next highest stream and comprised 18% of the remaining waste; 99.5% of this was landfilled.

In commercial waste, paper was the single highest stream at 61% and 79% of that material went to landfill in 1998. Commercial plastic waste is the third largest stream, comprising 10.6% of the total and 89.7% of that went to landfill. The composition of the waste from these sectors is shown in Figures 2.1, 2.2 and 2.3.

Household and commercial waste recovery figures for 1998 are shown in Table 1.1 on page 3. These data show the low levels of recovery, especially for domestic waste, and the large shortfall between current recovery levels and national targets.

In 1994, national targets for recycling domestic and commercial waste were set at 33% to be reached by 1999 [4]. This clearly was not achieved. The current national target, set in 1998, is for 35% of municipal waste to be recovered by 2013 [3] compared with the 1998 level of 9%.

	Household	Commercial	Total
Glass	18.6%	53.2%	30.8%
Textiles	9%	0%	8.2%
Ferrous Metals	4.5%	34.5%	12.5%
Paper	3.2%	21%	14.7%
Plastic	0.5%	10.3%	3.7%
Other Metals	0.0%	6.7%	0.4%
Aluminium	4.1%	6.7%	4.7%
Organics	1.5%	0.0%	1.2%
Others[1]	1.9%	15.3%	4.5%
Total	**3.2%**	**18.7%**	**9.0%**

Table 1.1: Irish waste recovery figures, 1998 [1,2]

In Ireland, several schemes, programmes and instruments have been initiated to stimulate waste recovery rates. The publication of *National Waste Databases* for 1995 and 1998 addressed the lack of information regarding the scale of the problem. New legislation was developed such as the *Waste Management Act, 1996*, *Waste Management (Packaging) Regulations, 1997 and Waste Management (Amendment) Act, 2001*. Waste Management Plans were adopted by local authorities with recovery targets and plans on how to achieve them. REPAK was initiated in 1996, with a view to increasing the amounts of packaging waste being recycled (target: 25% of packaging waste to be recovered by industry by year 2001 [5]). Infrastructure was developed by the funding of public and private sector projects through the Operational Programme 1994-1999. A national environmental awareness scheme (*It's easy to Make a Difference*) was initiated in 1999 by the Department of Environment and Local Government specifically to promote domestic recycling.

While it is true that some of these initiatives are at an early stage, it is apparent that the scale of the problem and the relative lack of progress thus far **require further radical and effective actions both on the supply and demand sides** of waste material reuse and recycling. On the supply side, the current levels of material recovery are low by international standards and require stimulation. However, one of the barriers to increased levels of municipal waste recovery is the **lack of reliable, stable markets and outlets** for these materials and the products that may be manufactured from them.

1.2 Objectives and Tasks

The fact that waste materials may be collected does not guarantee that they will be put to some beneficial use. There is therefore a need to assess and evaluate the availability

[1] 'Others' recovered refers to batteries in the household sector and wooden pallets in the commercial sector

of markets and other outlets for materials in the municipal waste stream that can be recovered.

The objectives of the research in this project were to identify, assess and evaluate existing and potential outlets for materials that can be recovered from municipal waste, both in Ireland and abroad. Another objective was to evaluate the potential of tools and instruments to stimulate such markets and the development of a strategic approach applying such tools for the creation of adequate, reliable and stable markets and other outlets for the recovery of useful materials from municipal waste.

The overall aim of the project was to aid a significant increase in municipal recycling rates in Ireland.

The principal tasks of the project were fourfold:

1. **To assess and evaluate the existing outlets** (both market and non-market) in Ireland and abroad for materials in the municipal waste stream that can be recycled or re-used.
2. **To evaluate the potential for new outlets** (both market and other non-market) in Ireland and abroad for materials contained in the municipal waste stream that can be re-used or recycled.
3. **To evaluate and provide an analysis of options**, including fiscal options and economic instruments, for the development of adequate, reliable and stable outlets for the re-use or recycling of materials contained in the municipal waste stream.
4. **To propose a strategic approach for the development of adequate, reliable and stable outlets** for the re-use or recycling of materials contained in the municipal waste stream, which will result in significant increases in the recycling of municipal waste in Ireland. This should include, where appropriate, **the recommendation of suitable fiscal instruments** that can be used to encourage re-use and recycling.

Thus, while the initial focus of the study was in market development, and most of the work carried out therein relates to that area, it became apparent during the research that **the need for market development was more pressing for some materials than for others**. In the case of metals, for example, there seem to be relatively stable markets, albeit abroad.

However, for almost all materials, the long-term viability of markets also depends on the **supply** of good quality segregated waste (whereby this waste is made available by consumers for cost-effective collection), the need for high-quality and cost-effective **collection** systems (whether though kerbside, 'back door' collection, bring sites or other means), and the proper infrastructure for processing, or **reprocessing** this waste into products. The **demand or market** for these products is also essential, whether industrial or domestic - without these markets the previous three stages are worthless.

These are the four interdependent elements in the recycling chain (see Figure 1.2). **Thus, in any strategy for the development of stable outlets, these other links in the recycling chain must also be tackled.** The strategy outlined in Section 7 attempts to do so.

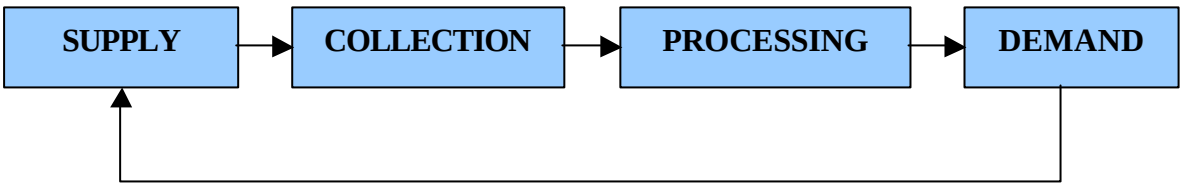

Figure 1.2: Four stages of the recycling chain

1.3 Scope of the Project

Figure 1.3 below shows the waste management hierarchy with the six main options in order of preference. As can be seen from this diagram, waste prevention and minimisation are the most preferred options, however these were not considered as part of this project. Nor were the two least preferred options considered, i.e. energy recovery and disposal methods.

The scope of this study included the two central options, the reuse and recycling of waste.

This study considered only municipal waste. Municipal waste is defined as [2]:

Municipal waste means household waste as well as commercial and other waste, which because of its nature and composition, is similar to household waste.

Thus, some waste types which arise from industrial or agricultural sources such as cardboard and farm plastics have been considered in this study since they are similar to household waste. Putrescable, municipal biodegradable wastes including kitchen and garden type materials are considered in a separate ERTDI research project and have been excluded from the scope of this study. Also, process type wastes from industry, animal wastes etc. have not been considered, nor has hazardous waste.

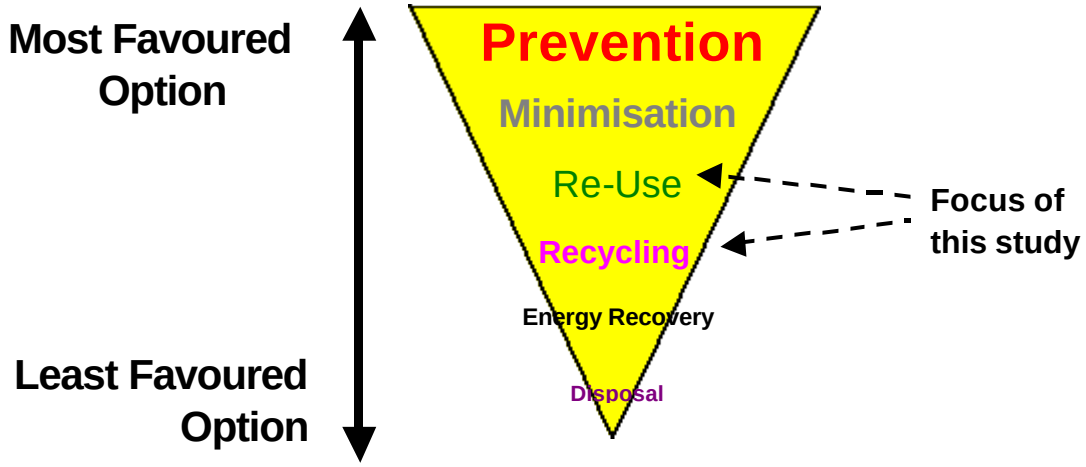

Figure 1.3: The waste management hierarchy

The specific materials under consideration in this study included the following:

- Paper
- Cardboard
- Glass
- Plastics
- Ferrous Metals
- Non-ferrous metals (excluding aluminium)
- Aluminium
- Textiles
- Wood
- Used Beverage Cartons (UBCs)

It should be noted that where possible, paper and cardboard were considered separately, although this is not usually the case in waste and recycling reports, studies and statistics.

1.4 Methodology

The methodology applied in this research included the following actions:

- Development of steering committee comprising personnel from Environmental Protection Agency, Department of the Environment and Local Government, Cork County Council and Clean Technology Centre.
- Identification of the main recyclers and handlers of Irish waste in Ireland, Northern Ireland and United Kingdom.
- Contact with these recyclers via questionnaire, phone calls, meeting, site visits etc.
- Relevant information gathered from these recyclers, assessed and reported.
- Contact with other stakeholders in waste and recycling, in Ireland and other countries.
- Attendance at conferences, workshops, seminars etc. on waste and waste recovery.
- Literature study on recycling and waste issues in Ireland and other countries.
- Contact with main recyclers and recycling agencies in Austria and other countries regarding potential new outlets for Irish waste and tools to increase recovery levels.
- 6 steering committee meetings.
- Reports development and delivery.

2. Waste Arisings in Ireland

The solid waste arisings in Ireland are considerable. These arisings are also growing as the Irish population increases, as it becomes more affluent, and as industrial and commercial activities continue to expand. Table 2.1 below shows the solid waste arisings for 1998 [6][2] in units of 1,000 tonnes per annum:

Household	Commercial	Street Cleaning	Industrial	Total
1,220	755	81	9,100	**11,156**

Table 2.1: Waste arisings in Ireland, 1998

Excluding agricultural waste, this amounts to over three tonnes of solid waste per person per year in Ireland. These data also indicate a massive growth in industrial waste of 47% since 1995.

For household and commercial waste, the gross quantities available for collection are shown for 1995 and 1998 in Table 2.2 below, in units of 1,000 tonnes:

	Household	Commercial	Total
1995	1,026	477	1,503
1998	1,163	689	1,852

Table 2.2: Gross waste quantities available for 1995 and 1998

According to these data, there was a total growth in overall municipal waste arisings collected over these three years, amounting to approximately 349,000 tonnes per annum. As shown in Figure 1.1 on page 2, this indicates a growth of 23.2% over three years, or an annual growth rate of 7.2%. As is pointed out in *Ireland's Millennium Report*: "based on specific waste streams, where historical data are considered to be reasonably reliable, waste quantities appear to be increasing more or less in line with economic growth". This increase caused a much higher dependency on landfill sites in Ireland during that time.

While no detailed estimation of waste arisings for years 2000 or 2001 were carried out during this study, the municipal waste generated has undoubtedly grown during that time. If the trend whereby waste generation growth parallels economic growth, the potential waste arisings could increase by 10% per annum, an even higher rate than that from 1995 – 1998. Two potential scenarios are given in Table 2.3 on page 8 – waste quantities available growth rates of 7% per annum and 10% per annum, in 1,000 tonnes. In both cases, despite the improved recovery levels noted below, the pressure on the landfills in Ireland would continue to be significant, and growing.

[2] (note: these figures also include waste arisings not collected for disposal or recovery. The figures given in Table 2.2 and in the Fact Sheets generally only cover waste available for collection – hence the slight disparity.)

	1998	1999	2000	2001
7% growth	1,852	1,981	2,120	2,269
10% growth	1,852	2037	2,240	2,465

Table 2.3: Projected potential municipal waste arisings, 1998 – 2001(1,000 tonnes)

2.1 Municipal Waste Composition

The composition of domestic waste arisings in Ireland, in 1998 is shown in Figure 2.1 below.

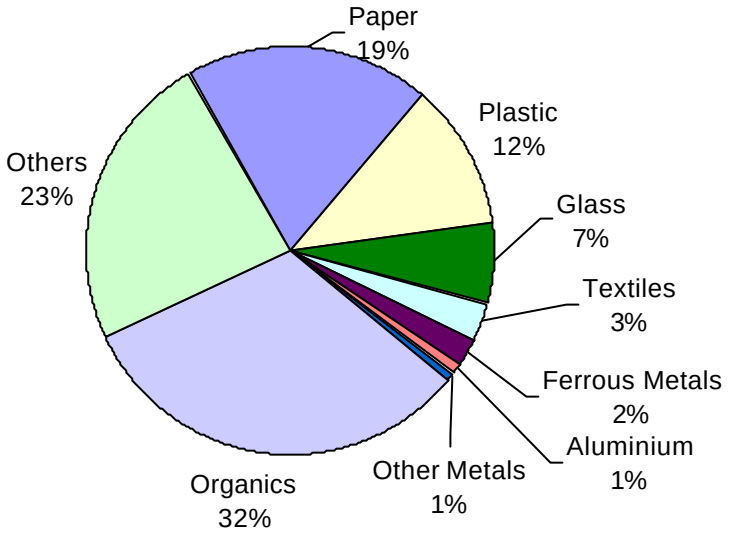

Figure 2.1: Composition of household waste arising, 1998

From this it can be seen that the main three domestic material waste streams under consideration in this study are Paper (19%), Plastic (12%) and Glass (7%). The 'Others' stream is also considerable and consists of composites, fine elements, unclassified combustibles including wood waste. Paper includes cardboard and other 'softer' papers including newsprint.

The composition of commercial waste arisings in Ireland, in 1998 is shown in Figure 2.2 on page 9[3]. From this it can be seen that over 61% of arisings comprise cardboard and paper. No breakdown between paper and cardboard is available for this waste stream, but it is expected that a high percentage comprises cardboard - especially in the retail and distribution sectors. However, in offices and the service sectors, paper waste is also a major waste stream. Other major waste streams include Plastics (10%), Glass (6%) and Others (9%) - some of which is wood, in particular wood pallets.

When both household and commercial wastes are combined (these wastes comprising most of municipal solid waste), the composition can be seen in Figure 2.3 on page 9.

[3] It should be noted that this characterisation arises from 4 small scale studies in Kerry and Dublin and a more comprehensive and widespread study has now been commissioned by the EPA, which will give more detailed and up to date information regarding the composition of the non household waste in Ireland

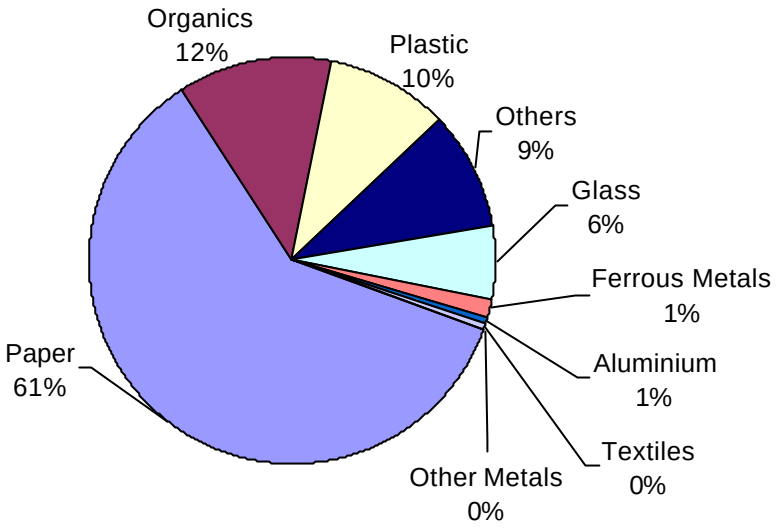

Figure 2.2: Composition of commercial waste arisings, 1998

For household and commercial waste combined, paper and cardboard is the largest waste stream, in fact it is three times the size of the next largest individual waste stream under consideration here: plastic (11%). Again, the exact breakdown of paper and cardboard in this stream is not known, but this present study did estimate the recovery levels of these two separate materials, and did assess potential new outlets for both. While several other waste material streams were considered in this study, the main other stream in terms of volume is glass, at 6%.

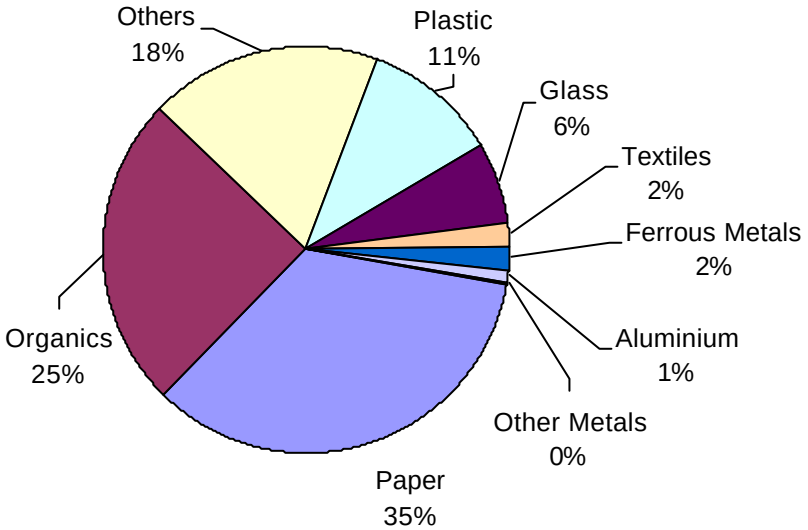

Figure 2.3: Composition of household and commercial waste streams, 1998

2.2 Municipal Waste Amounts

The amounts of household, commercial and municipal solid waste (MSW) available for collection in Ireland are shown in Table 2.4 on page 10. From this it can be seen that almost 2 million tonnes of commercial and domestic waste were collected for disposal or recovery in year 1998. Of this total, 1,163,216 tonnes (or 62.8%) came from the

household or domestic sector and 689,234 tonnes (or 37.2%) came from the commercial sector.

	Household	Commercial	Total
Paper	226,723	415,429	642,151
Organics	376,207	84,662	460,869
Others	273,213	65,417	338,630
Plastic	134,100	66,303	200,403
Glass	75,626	41,132	116,757
Textiles	35,954	3,434	39,388
Ferrous	23,854	8,705	32,559
Aluminium	11,711	3,744	15,455
Other Metals	5,828	409	6,236
Total	1,163,216	689,234	1,852,450

Table 2.4: Waste arisings for collection from domestic and commercial sectors, 1998

The fact that almost two thirds of the total waste comes from the domestic sector is problematic, since it is more difficult to recover waste from households than from businesses. While the barriers to waste recovery are discussed in more detail below, the fact that so much waste arisings are dispersed throughout households in Ireland is one of the main reasons for the current dependence on landfill and the low recovery levels.

In the individual Fact Sheets for each material: glass, textiles, ferrous metals, paper, cardboard, plastics, non-ferrous metals, aluminium and composites (used beverage cartons), these arisings are discussed in more detail.

Issues regarding these individual waste streams arisings considered in the Fact Sheets include:

- the nature and types of specific material
- the main sources
- the main usages of the material
- waste trends
- packaging/non packaging elements
- consumption trends
- trends in other countries

3. Waste Recovery in Ireland

In order to propose methods by which recovery levels of MSW in Ireland could be increased, it was firstly necessary to study the current levels and methods of recovery for each material, as well as the sources from which the different types of waste arise.

As stated in Section 1, waste recovery levels in Ireland are known to be very low and fall well below international norms and current national targets. According to the *National Waste Database Report, 1998* amounts of materials recovered (in tonnes) and the rates of recovery are shown in Table 3.1 below:

	Household		**Commercial**		**Total**	
Material	**Amounts**	**Rate**	**Amounts**	**Rate**	**Amounts**	**Rate**
Glass	14,100	18.6%	21,900	53.2%	36,000	30.8%
Paper	7,150	3.2%	87,152	21%	94,302	14.7%
Ferrous Metals	1,062	4.5%	3,007	34.5%	4,069	12.5%
Textiles	3,247	9%	0	0%	3,247	8.2%
Aluminium	480	4.1%	251	6.7%	731	4.7%
Others[4]	5,167	1.9%	10,000	15.3%	15,167	4.5%
Plastic	648	0.5%	6,828	10.3%	7,476	3.7%
Organics	5,665	1.5%	0	0.0%	5,665	1.2%
Other Metals	0	0.0%	28	6.7%	28	0.4%
Total	**37,518**	**3.2%**	**129,166**	**18.7%**	**166,684**	**9.0%**

Table 3.1: Amounts recovered and recovery rates in Ireland, 1998

As this table shows, the amounts recovered in the commercial sector are almost 3.5 times that from the domestic sector. However, since the arisings from households are almost double that from business, the recovery rates for commercial waste are almost 6 times that of domestic waste. Clearly there is a significant problem in both sectors, but the recovery levels from households, at 3.2%, are especially of serious concern.

While both these recovery levels are far below national targets, especially for household waste, they are also much less than those being achieved by our EU partners, as shown in Table 3.2 on page 12.

One recent international report is quite critical of these levels: "By international standards, waste recycling rates in Ireland are very low. Progress was made between 1993 and 1998 when the overall recycling rate for packaging waste increased from 10 to 15%, but this is still far below target. Substantial improvements can be made in the rate of recovery of materials from both household and commercial waste. The rate of recovery in industry is also low (30% for non-hazardous waste, 52% for hazardous). Over 85% of non-hazardous packaging waste produced in Ireland goes to public or private landfill" [7]

[4] 'Others recovered' refers to batteries in the household sector and wooden pallets in the commercial sector

	Glass	Plastic	Paper & Cardboard	Metals	Wood
Austria	77%	20%	75%	34%	14%
Denmark	61%	6%	47%	4%	-
Finland	48%	10%	57%	8%	-
France	42%	6%	49%	49%	18%
Germany	75%	45%	59%	82%	55%
Ireland [5]	**32%**	**2%**	**14%**	**4%**	**-**
Italy	33%	9%	39%	5%	39%
Netherlands	75%	12%	65%	67%	-
Sweden	76%	14%	66%	45%	-
UK	25%	7%	53%	26%	-
Total EU	***66%***	***16%***	***53%***	***48%***	***42%***

Table 3.2: A comparison of packaging recycling rates per material in EU States [8]

3.1 Recovered Amounts in Year 2000

While the current level of waste arisings in Ireland has not been quantified in this study, information was acquired regarding the amounts recovered by recyclers and contractors in the year 2000. Recovery rates cannot be definitively calculated (due to no exact knowledge of the arisings), and these figures may include waste from industrial as well as domestic and commercial sources and are therefore not comparable to EPA estimates for municipal waste recovered in 1998. However, Table 3.3 gives the amounts of material in tonnes that were reported recovered in the year 2000 from surveys conducted as part of this study.

Material	Amounts Recovered year 2000
Glass	40,500
Textiles	7,538
Ferrous metals	307,300
Paper	82,027
Cardboard	72,900
Plastics	15,000
Non-ferrous metals	29,500
Aluminium	16,890
Wood	50,000
UBCs[6]	N/a
Total:	**621,655**

Table 3.3: Amounts (in tonnes) of waste streams reported recovered in year 2000

[5] From: *National Waste Database, 1998* (packaging recovered in domestic and commercial waste streams

[6] Used beverage cartons. Note: some UBCs are being collected in Galway and Co. Waterford, but no outlet for these has yet been found

3.2 Recovery of Individual Waste Streams

Detailed particulars on the recovery of individual material waste streams, including the types of material recovered, the sources of the waste, the means of recovery etc. are described in the Fact Sheets. However, some of the main points of information regarding each stream are given below (see Fact Sheets for sources of the data and methodologies for calculation):

3.2.1 Glass

- The amount of glass reported recycled in year 2000 is 40,500 tonnes, 4,500 tonnes more than the 1998 level.
- While the rate of recycling is not known (since the arisings for year 2000 have not yet been collated), it is expected that it has not increased greatly.
- The rate of recycling in 1998 was considered to be 30.8%. Even if this has increased slightly, it is still far less than that of almost all other European Union countries, six of which have recovery rates of over 80%. In 1999, Ireland had the second lowest level of recovery in the EU for glass.
- Even at 30.8% the recovery rate of glass is greater than any other individual waste stream.
- The means of recovery for glass is almost completely via bring sites, with some collection, under glass management programmes, from commercial outlets such as pubs, restaurants, hotels etc.
- One company dominates the market in glass container collection and continues to increase its amounts collected; however other companies are also increasing their capacities. The high-quality cullet manufacturing capacity (including colour sorting and contaminant removal) of this company is currently close to capacity and it plans to increase processing to allow for increased recovery.
- The type of glass recovered in Ireland is primarily container glass, small amounts of flat glass are also recovered - mostly from commercial sources.
- 19 of the recovery companies contacted in the survey collect glass for recycling.
- 3 companies in Ireland accept container glass waste (cullet) for reprocessing - two of which recycle it to manufacture more glass containers, one of which recycles it to manufacture glass fibre products.

3.2.2 Textiles

- Five main companies are active in the Republic of Ireland collecting or recycling textile waste.
- These textiles are collected mainly via bring banks, and delivery to second-hand shops, but door-to-door collection schemes are also used.
- The companies contacted reported that 7,358 tonnes of waste or discarded textiles were recovered in the Republic of Ireland in the year 2000.
- This 7,358 tonnes is an increase of 4,111 tonnes (or 126%) over the 3,247 tonnes reported recovered in the National Waste Database Report 1998.

- The textiles recovered are almost all used clothing (including shoes) - some small amounts of linen and industrial cloths are also recovered.
- The arisings in textile waste have not yet been collated for the year 2000 - this was estimated to have been 39,388 tonnes in year 1998.
- The amount of waste carpets in Ireland is not known - in one German study it was estimated to be up to 30% of the waste textiles arising.
- There is no known recovery of waste carpets in Ireland - the main textile recovery companies do not collect waste carpets.

3.2.3 Ferrous Metal

- Ferrous metal wastes arising in Ireland come from packaging waste, waste from electrical and electronic equipment (WEEE), end-of-life vehicles (ELVs), construction and demolition (C&D), manufacturing, agriculture and other sources.
- The total arisings of ferrous metal waste are not known in Ireland - in the National Waste Database Report 1998, 32,559 tonnes were reported as arising from commercial and domestic sources. This does not include end-of-life vehicles and general scrap metal which was counted separately.
- In 1998 approximately 4,069 tonnes of waste ferrous metal was recovered from commercial and domestic sources.
- In this survey, for the year 2000, 307,300 tonnes of waste ferrous metal were reported to have been recovered by those contacted. This includes end-of-life vehicles and general scrap metal from a variety of sources.
- Approximately 2,523 tonnes of packaging ferrous metal was estimated to have been recovered in year 2000 [9].
- Between 16,920 and 34,780 tonnes of WEEE ferrous metal arose in the year 2000 - the amount of WEEE ferrous metal recovered is not known, but is expected to be low since only two local authority facilities are in place for the collection of WEEE.
- Of those companies contacted, 30 collectors or processors of waste ferrous metals supplied information - not all were willing to divulge the amounts they recovered.

3.2.4 Paper

- The total paper (including cardboard) waste arisings according to the National Waste Database Report 1998 was 642,151. This was, by far, the largest waste stream of municipal solid waste. The amount recovered in 1998 was 94,302 tonnes.
- The net amount of paper (including cardboard, but excluding paper packaging in which products are imported) imported in Ireland in year 1998 was 522,806 tonnes.
- These imports included 72,418 tonnes of newsprint; 9,436 tonnes of newspaper and journals; 52,595 tonnes of uncoated writing paper; 121,931 tonnes of coated

paper (for graphics etc.); 18,003 tonnes of notebooks; and 24,246 tonnes of other printed material.

- Waste paper is being recovered by 7 main companies.
- Approximately 82,027 tonnes of waste paper was reported recovered by those companies in year 2000.
- This paper includes newsprint, office paper, printers' waste, etc.
- The newsprint is currently being collected from domestic sources in three main kerbside schemes and several bring site schemes, almost all of which are being carried out in public private partnerships between local authorities and waste management/recovery companies.

3.2.5 Cardboard

- The total paper (including cardboard) waste arisings according to the National Database Survey 1998 was 642,151. This was, by far, the largest waste stream of municipal solid waste. The amount recovered was 94,302 tonnes that year.
- The net amount of paper (including cardboard, but excluding paper packaging in which products are imported) imported in Ireland in year 1998 was 522,806 tonnes.
- These net imports included 65,113 tonnes of uncoated kraft paper and paperboard; 34,182 tonnes of corrugated paper and paperboard; 49,514 tonnes of cartons, boxes, bags etc.
- There is one paper mill in Ireland, which manufactured 42,761 tonnes of cardboard in year 2000.
- 30 companies contacted during this survey indicated that they collect cardboard for recycling.
- 72,900 tonnes of cardboard were reported collected by these companies in year 2000.
- A total of 154,927 tonnes of waste paper and cardboard were recovered in Ireland in year 2000; 53% paper and 47% cardboard.
- If the estimated waste paper growth in Ireland between 1998 and 2000 was 8% per annum, the total paper and cardboard arisings would have been approximately 749,004 in year 2000. Thus the recovery rate would have been 20.6%.
- The average recovery rate of paper and cardboard in the EU was 49.2% in year 1999.

While the total volume of waste cardboard arisings in Ireland have not yet been collated for the year 2000, it is thought that the recovery rate of cardboard may be higher than that of paper. This is due to several reasons, including:

- The higher use of cardboard in commercial and industrial sectors, both of which have higher rates of recycling than the domestic sector.
- The ease of collection and storing of cardboard.

- The quality of industrial/commercial paper and board is much better and less contaminated than that from the domestic stream.
- Several local authorities are now banning commercial cardboard from their landfill sites which forces companies to find a recycler.
- Some local authorities have kerbside collection schemes currently in place whereby local contractors collect the segregated cardboard from outside companies' premises on a regular basis.
- Domestic kerbside collection schemes such as in Dublin, Galway and Co. Waterford also collect cardboard packaging as well as newspapers.

Thus the infrastructure for paper, and cardboard in particular, is being developed. The fact that there is a paper mill in Ireland that accepts cardboard (64% of amounts recovered) and has a ready market for its products is a further incentive as is the support mechanism from REPAK for the recovery of packaging materials.

3.2.6 Plastic

- 675,043 tonnes of packaging waste arose in Ireland in year 1998 containing approximately 167,890 tonnes of plastic. Thus approximately 25% of the packaging waste in Ireland comprised plastics.
- In one Western Europe study, 40% of plastics consumed are used for packaging; 19% for household/domestic uses; 18% for building and construction; 8% automotive; 7% electronic and electrical; 5% large industry and 3% agriculture.
- The sources of plastics waste in Europe are: municipal solid waste, 67%; distribution and industry 21%; Electrical and electronic, 4%; building and construction 3%; automotive 4% and agriculture 1%.
- One study of domestic plastic waste in the UK showed the following breakdown: other film, 37%; other dense plastic, 19%; food packaging 17%; bottles 17%; refuse sacks 10%.
- The mechanical recycling rate of waste plastic in Ireland in 1998 was 3.7%. The energy recovery rate was 0%.
- The EU average mechanical recycling rate is 11.3%. The average energy recovery rate is 19.25%.
- Of those contacted in this survey, 22 companies reported activity in plastics recovery. Of these, 19 companies are involved in waste plastics collection, and 8 actually recycle/reprocess the plastics.
- A total of 18,423 tonnes of plastics waste was reported recycled in Ireland year 2000; 15,000 tonnes of this came from the Republic of Ireland.
- This is an increase of 7,524 tonnes (or over 100%) over the 1998 figure of 7,476 tonnes.
- About 8,300 tonnes of the collected plastics were recycled in the Republic of Ireland.

- These plastics were received mainly from industrial and agricultural sources. Recently, small amounts of domestic waste plastics are being recovered by kerbside and bring site collections.
- Types of plastics recovered included: PET, LDPE, HDPE, PP, PVC, PS Hips, laminated plastics, PP mixed, ABS, and GPSS.
- 6,300 tonnes of farm film were reported recovered from the Irish Farm Film Producers Group (IFFPG) deposit scheme.

3.2.7 Non-ferrous metals (excluding aluminium)

- Waste non-ferrous metals arise from several sources, including packaging, WEEE, ELVs etc.
- Typical non-ferrous metals recycled in Ireland include: lead, nickel, brass, bronze, copper, gold, magnesium, mercury, platinum, precious metals mixed, silver, stainless steel, tin, titanium, tungsten, zinc and others.
- In Ireland, in 1998, only 28 tonnes (or 0.5%) of non-ferrous metals were recovered from arisings of 6,236 tonnes in the domestic and commercial sectors.
- Non-ferrous metals accounted for only 0.34% of the total municipal waste stream in 1998.
- It is estimated that between 2,880 and 5,920 tonnes of non-ferrous metals arose in Ireland in 2000 from WEEE.
- From a Dutch study by Auto Recycling Nederland, 10% of ELVs are estimated to comprise of non-ferrous metal. Based upon one estimate, the amount of non-ferrous metal arising from ELVs in Ireland, in 1998, was 5,889 tonnes.
- It is estimated that 3,500 tonnes of non-ferrous metals were recovered from ELVs in Ireland in year 2000.
- Over 29,500 tonnes of non-ferrous metals were recovered for export in Ireland in year 2000.
- One lead smelter in Ireland also recovered amounts of lead for reprocessing.

3.2.8 Aluminium

- In Ireland, a total of 15,455 tonnes of aluminium waste arisings were reported in 1998. These arose from packaging waste, WEEE, ELVs, manufacturing and other waste.
- The amount of aluminium in Irish packaging waste was estimated to have been approximately 11,780 tonnes in 1998 according to the National Waste Database Report 1998.
- Aluminium packaging in the UK comprises 66% aluminium cans; 22% aluminium foils and 12% other aluminium packaging.
- It is estimated that between 1,620 and 3,478 tonnes of WEEE aluminium arose in Ireland in year 2000.

- It is estimated that 1,325 tonnes of aluminium waste arose in Ireland in 1998 from ELVs.
- One collector estimates that approximately 6,000 tonnes of aluminium cans were sold in the Republic of Ireland in 2000.
- Approximately 890 tonnes of aluminium can waste were recovered in year 2000 (14.9% of the estimated arisings).
- The amount of aluminium recovered from WEEE in Ireland is not known, but is expected to be low.
- The amount of aluminium recovered from ELVs in Ireland is estimated to have been 3000 tonnes in year 2000.
- Approximately 13,000 tonnes of aluminium scrap was reported collected by merchants in year 2000.
- A total of approximately 16,890 tonnes of aluminium waste was reported recovered in Ireland in year 2000.

3.2.9 Wood

- The wood waste fraction for MSW is not quantified in the National Waste Database Report 1998.
- The waste reported from the "wood and wood products" sector of industry in 1998 was 244,259 tonnes.
- The wood content in MSW is attributable mainly to packaging, construction and demolition (C&D).
- An estimated 12.5% of packaging waste comprises wood. Thus an estimated 85,336 tonnes of wood packaging waste arose in 1998.
- One Irish study estimated that C&D waste is comprised of 14% wood. Thus an estimated 378,694 tonnes of wood waste arose from that sector in 1998.
- Wood recovery levels from the Irish wood industry in 1998 were reported at 221,377 tonnes or 90.6% recovery.
- From this study 30 waste contractors reported involvement in waste wood collection.
- Approximately 50,000 tonnes of wood waste were reported recovered by these operators in year 2000.
- REPAK have estimated that 10,459 tonnes of packaging wood waste was recovered by their members in year 2000.

3.2.10 Used beverage cartons (UBCs)

- UBCs are used widely in Ireland for packaging milk, fruit juices, soups etc.
- UBCs are composed of fibre, polyethylene and sometimes aluminium.
- UBCs are estimated to comprise less than 1% of domestic waste in Ireland.
- UBCs arise almost totally from the domestic waste stream.

- It is estimated that in Ireland, between 11,000 and 12,000 tonnes of waste UBCs arise annually.
- Almost all of this is landfilled.
- Only two kerbside schemes in Ireland currently collect UBCs: Galway and Co. Waterford.
- In the Galway kerbside collection scheme, about 0.8% of material recovered comprised UBCs.
- Almost no bring sites in Ireland accept waste UBCs.
- In Europe, 37% of UBCs are recovered; 20% for mechanical recycling and 17% for energy recovery.

4. Current Outlets

One of the main tasks of this project was to assess and evaluate the existing outlets (both market and non-market) in Ireland and abroad for materials in the municipal waste stream that are being recycled or re-used. As part of this process, information was received from recyclers and collectors of MSW as to the outlets they are utilising.

The main outlets identified from the sources contacted in this survey are listed in Table 4.1 below:

Materials	Main Outlets	Irl[7]	Abr.
Glass	Recycled for glass container manufacture	X	
	Recycled for glass fibre manufacture	X	
	Flat glass recycled for flat glass manufacture		X
Textiles	Reuse (as second hand clothes)	X	X
	Processed for rags		X
Ferrous Metals	Recycled in mills for ferrous manufacture	X[8]	X
	Small amounts in foundry	X	
Paper	Recycled in mills for paper manufacture		X
	Recycled for animal bedding	X	
	Composted	X	
Cardboard	Recycled in mills for cardboard manufacture	X	X
Plastic	Recycled to manufacture other plastic products	X	X
Non-ferrous metals	Recycled in foundries and smelters		X
	Lead smelter	X	
Aluminium	Recycled in smelters	X	X
Wood	Recycled for wood board manufacture	X	
	Mulching	X	
	Composting	X	
	Reuse	X	
	Energy recovery	X	
UBCs	None yet in use		

Table 4.1: Main outlets for recovered materials in Ireland, 2000

As can be seen from this table, all the material streams (except used beverage cartons) have outlets available to them. All the waste container glass and wood that is collected in Ireland is recycled in Ireland - none is exported. Apart from those two materials and cardboard, the majority of the other material streams are exported for processing abroad. Currently there is no Irish facility for recycling ferrous metal waste or non-ferrous metal

[7] "Irl" signifies recycled in Ireland (north and south), "abr" signifies recycled abroad

[8] No longer available since the closure of Irish Ispat (May, 2001)

waste (except lead). Likewise with paper, only a small percentage of which is recycled in Ireland. Plastics and aluminium wastes are processed successfully both in Ireland and abroad.

It is clear, therefore that there is a major dependence on foreign facilities for the processing of Irish waste. This is not so problematic in the case of metals, for which there seem to be stable outlets (although transport costs are higher for export). However, in the cases of paper and cardboard, the necessity to export is a major barrier (see Section 6).

The current outlets for these materials are discussed in much greater detail in the Fact Sheets, but the main findings for each stream are summarised below:

4.1 Glass

Almost all of the recovered glass in Ireland is container glass from bottles, jars, food containers etc. It is received using bring sites and some collection schemes. There is one major supplier of cullet, and a number of smaller operators.

One company reprocesses most of this material in Ireland, in the manufacture of new glass containers. While there are some problems relating to green glass and contaminants, this company has the capacity to accept much higher volumes of good quality cullet - in fact it has imported cullet from abroad in the past.

Another glass manufacturing company in Northern Ireland also accepts cullet from the Republic of Ireland and this facility also has a much higher capacity to accept cullet than is currently being utilised.

A third company in the Republic of Ireland accepts cullet from container glass as a feedstock for the manufacture of fibre glass and glass wool for insulation.

While some flat glass from windows (buildings and ELVs) is collected and recycled, quality control requirements for this type of glass generally render it unsuitable in the manufacture of new container glass. Accordingly, flat glass is currently being exported to the UK and France for recycling. Flat glass is not manufactured in Ireland at present.

4.2 Textiles

Waste textiles in the form of garments are reused in Ireland and sold in second-hand shops on a widespread basis. One company in particular has a range of charity shops, but several charities accept and resell used garments.

Other companies that collect used textiles export them to third world countries to be sold and distributed there. Some of this material is first sent to a large reprocessing facility, in Belfast, which sorts the garments for export.

Clothes or other textiles that are not of sufficient quality for resale, either in Ireland or abroad, are processed into cleansing rags for industrial usage.

Of the used textiles recovered in Ireland by the companies contacted, approximately 7% is resold in Ireland, 83% is exported to third world countries or used to manufacture rags, and 10% is of insufficient quality to facilitate beneficial reuse and is landfilled.

4.3 Ferrous Metals

Of the estimated minimum of 307,300 tonnes of waste ferrous metal reported recovered in year 2000, 184,000 tonnes was sent to Irish Ispat for recycling, another 7,000 tonnes was reprocessed in an Irish foundry and at least 116,300 tonnes was exported to steel mills in other countries.

It is estimated that 50% of the scrap collected in Ireland requires shredding before it can be accepted for smelting by international steelworks. Material requiring shredding includes end-of-life vehicles (ELVs) and domestic appliances. The shredders produce a clean shredded ferrous product as well as a mixed non-ferrous product which is sent for further processing in a heavy media plant in the UK. The shredders also produce a currently unavoidable waste stream, known as "fluff", comprising dirt, glass, concrete, rubber and plastics which are currently sent to landfill.

There are three facilities in the Republic of Ireland which provide shredding facilities for this type of scrap. There are a further two shredding facilities in Northern Ireland. The combined capacity of these five shredders is approximately 570,000 tonnes per annum.

In the year 2000 it is estimated that facilities in the Republic produced 120,000 tonnes of fragmentised ferrous metal, 90,000 tonnes of which was delivered to Irish Ispat for steel production. At least a further 30,000 tonnes of shredded ferrous was exported was to steel mills abroad.

In addition to the shredder operators there are several firms that act as metal processors, traditionally known as scrap metal dealers. These companies operate mechanical shears for the dismantling and slicing of metal items into smaller, more recyclable pieces. Until recently the majority of these processors/ collectors sold their produce, which did not require shredding, to Irish Ispat Ltd. An estimated 96,000 tonnes of this material was sold to Irish Ispat in the year 2000. A number of these processors/collectors chose to export a further 116,000 tonnes of ferrous scrap to a number of European countries which include Spain, Portugal and France.

Since the closure of Irish Ispat in May 2001, metal processors are now left with no option but to export their ferrous metals. The export of ferrous metal is generally managed by the companies engaged in the shredding of the material and the main processors/collectors of scrap. These companies have the capacity to store enough material to make a shipment viable, which is generally in the range of 2,000 to 4,000 tonnes.

4.4 Paper

In total, 82,027 tonnes of waste paper (excluding cardboard) was reported recovered in the year 2000, by those from whom information was received in this survey. There are four main exporters and these either collect material themselves and/or are supplied by several sources – mostly private waste management contractors.

98% of the paper reported as being recovered (or 80,402 tonnes) is sent for export to various paper mills, mostly in the UK but also other countries.

Of those contacted, 27 companies indicated involvement in paper collection or export. Only seven of the companies who responded export the material themselves. The other companies supply these exporters with the waste paper. One company exports relatively

small amounts of waste paper to its parent company in Belgium but the volumes they are collecting are expanding rapidly and they have now secured contracts with at least two local authorities for waste newsprint, magazines and cardboard.

Two companies claim to be shredding 2,600 tonnes of waste paper and using it for animal bedding. From anecdotal evidence it is believed that many other small-scale companies or individuals are processing waste paper for animal bedding in Ireland. This work is carried out periodically, depending on the available levels of straw and other bedding materials, and those involved process relatively small amounts of paper.

Small amounts of paper are also being used for composting, both in home composters and in local authority schemes such as that being currently implemented in Dublin and Kerry. While only a relatively small percentage of the compost feedstock can be composed of waste newsprint, large scale composting programmes are now envisaged due to the likely forthcoming Landfill Directive. This could lead to greater usage of waste paper for this purpose.

4.5 Cardboard

Of the companies contacted, 30 indicated that they are involved in either cardboard collecting and/or recycling. In reality, only one company actually recycles the cardboard, the others supply this one and other mills abroad. There are four main exporters of cardboard.

Of the 72,900 tonnes that were reported to have been recovered in year 2000, 46,990 tonnes (or 64.4%) were sent to a cardboard mill in Dublin, and reprocessed to make more corrugated cases.

Almost all the remaining material (25,910 tonnes or 35.6%) was exported to paper mills abroad – mainly in the UK and Spain. Some waste cardboard is also sent to the Far East – China in particular. Again this material was recycled in the manufacture of more cardboard.

Cardboard, especially heavy cardboard and corrugated boxes, is also reused in Ireland (as corrugated boxes), but while the extent of reuse has not been quantified, is not considered as high as in other countries.

4.6 Plastics

A reported 18,423 tonnes of waste plastic were reported collected for recycling in the Republic of Ireland and Northern Ireland in year 2000. Of this, approximately 15,000 tonnes were collected in the Republic. 6,300 tonnes of this was farm plastic, and was exported to Scotland where it was recycled; a relatively small but growing amount was exported to other countries in Europe, Africa and China and the remainder was recycled in Ireland.

Approximately 8,300 tonnes of plastic waste was reported recycled in The Republic of Ireland by 4 or 5 main processors.

Most of the plastics recovered by those contacted in this survey came from the industrial and agricultural sectors. Very small amounts are being collected from domestic sources, though this is now beginning to increase.

Most types of plastics are recycled in Ireland including PET, LDPE, HDPE, PP, PVC, PS Hips, Laminated Plastics, PP mixed, PC, ABS, GPPS. These plastics and their uses are given in the Fact Sheet on Plastics. A variety of products are produced from this recycling, including plastic bags, farm film, regrind, pellets, "plastic lumber" etc. Processes include baling, shredding, regrinding, pelleting, extrusion etc. Some companies supply industrial sources with this material, others manufacture products such as bags for sale to the general public and industry.

4.7 Non-Ferrous Metals

The main Irish scrap metal merchants export non-ferrous metals mostly to the UK and continental Europe, often using metal brokers as intermediates. However in recent years there has been a move towards e-commerce and e-trading in non-ferrous metal trading where Irish Metal Merchants can trade their metals 'online' selling to customers worldwide.

A wide variety of metals and alloys are traded to several countries. These metals go to foundries and smelters in these countries to manufacture new products.

While some of these metals are collected and exported without processing, some are also extracted from products containing other metals and other materials such as ELVs and domestic appliances. There are three shredder operations in the Republic of Ireland which extract a fragmentised mixed metal from this scrap. Two of these separate ferrous from non-ferrous by a wet process and by magnetic means. Non-ferrous accounts for approximately 5% of the metals separated. This mixed non-ferrous fragment is then separated into the various metal types using a floatation process in the UK.

Most copper goes to Belgium and is smelted there.

Specialist companies collect lead-acid batteries and separate the lead from the plastic casing. The lead from these lead-acid batteries is subsequently recovered in a UK plant.

There is one lead smelter in Ireland which manufactures lead products for the building trade.

4.8 Aluminium

Used aluminium beverage cans are collected extensively in Ireland from bring sites and by kerbside collections in Dublin, Galway, and Co. Waterford and throughout the country from schools and workplace canteens etc. These are all exported by four main collectors. These main dealers export to Alcan in Warrington, UK, for reprocessing.

There are a number of shredder operators in Ireland which produce a fragmentised mixed metal from scrap such as ELVs and domestic appliances. It is estimated that 3% of this fragmentised metal is aluminium.

Aluminium fragment generated by shredding operations in Cork, Dublin and Limerick is exported for recovery in heavy media plants in the UK. Facilities in Warwickshire and Newmarket operate such flotation operations.

Other aluminium scrap from manufacturing which includes aluminium sheets, offcuts, extrusion material and lithoplate is sold to brokers and ingot manufactures in the UK and on the continent.

A percentage of this scrap is processed into aluminium alloy ingots at one Irish facility which is currently producing 6,700 tonnes per annum. Some of the raw material for this process is also imported.

4.9 Wood

According to those contacted for this study, the total amount of wood waste recovered from the municipal sector in the year 2000 was estimated to be approximately 50,000 tonnes. While it is thought that some of this comes from packaging waste, it also included domestic waste, and some waste from C&D and industrial sources.

Wood reprocessing has been an integral part of the wood processing industry in Ireland for decades, resulting in a high recovery of wood waste from sawmilling and other wood processing industries. Assuming successful separation and no contamination, wood waste can theoretically find as many applications as virgin wood. Wood is the only waste stream considered in this study that is reprocessed solely in Ireland – no wood waste was reported to have been exported from Ireland. The outlets which had been developed for the industrial sector are now also receptive to wood waste currently recovered from the municipal sector. Currently the main outlets for wood waste in Ireland are:

- ***Wood Board Manufacture*:** There are four major wood board manufacturing plants in Ireland that produce Medium Density Fibreboard (MDF), Oriented Strand Board (OSB), chipboard and veneer. These companies accept a range of wood waste which includes: wood chip, sawdust, bark chip and peelings, which form part of the basic feedstock for these products.
- ***Mulching and Composting*:** There are a number of companies in Ireland mulching and composting wood waste to create beneficial products. Mulching consists of grinding wood waste into smaller pieces that can be used as ground covering or outdoor decoration.
- ***Wood Waste reuse:*** There are at least two companies in Ireland involved in the reconditioning of pallets. One company recovers the wood from a percentage of waste pallets which they collect. The pallets are dismantled, cut and combined with virgin material to manufacture new pallets. Another company recovers pallet timber which they export to the UK for manufacture into new pallets.
- ***Wood as a fuel:*** Several companies in Ireland use their waste wood as a biomass fuel. This is especially true of wood processing companies, sawmills etc. This practice reduces their demand for electricity consumption and their requirement to dispose of the waste. Non contaminated wood waste provides a clean burning, low sulphur fuel. A number of sawmills in Ireland which kiln dry timber also use wood waste as a heat source.

4.10 Used Beverage Cartons

Small amounts of Used Beverage Cartons (UBCs) were collected for recovery in year 2000. Currently kerbside collection schemes in Galway and Co. Waterford collect this waste stream. Neither of these systems has yet identified an outlet for the UBCs, but both are actively seeking potential outlets.

5. Potential New Outlets

In order to stimulate higher recovery levels of MSW, current outlets need to be exploited fully and new outlets need to be identified and developed. This is especially important because of the fact that Ireland is an island nation with a relatively low population, with relatively small markets, with low environmental awareness levels, dependent on exports, and with a very underdeveloped recycling infrastructure.

However, it is also the case that the requirement for new outlets is not as pressing for some materials as for others. For example, the current glass manufacturing industry seems to have sufficient extra capacity to accept short to medium term increases in volumes of good quality cullet (with some green glass problems). The exporting of metals does not seem a major deterrent to merchants, as long as those markets are relatively stable. However, there is a pressing requirement for new stable paper and cardboard markets, as their recovery levels will greatly increase due to packaging and landfilling regulations. There is a wide range of potential markets for recycled plastic products, but the economics and infrastructure of recovery are a problem as is the domestic, commercial and public agency reluctance to purchase such products.

In all cases, instruments and tools are required to boost recovery levels and to support potential new outlets, especially Irish outlets.

Materials	**Potential New Outlets**
Glass	Industrial abrasives; Glass wool products; construction aggregate; glassphalt; filtration media; landscaping; Portland Cement; epoxy binders; ceramic glazes.
Textiles	Production of yarn and fleece; production of synthetic materials; textile hardboards; carpet products.
Ferrous Metals	
Paper	Moulded fibre packaging; insulation; building board and furniture; paper mill in Ireland.
Cardboard	Higher levels of reuse; 2nd cardboard mill in Ireland.
Plastic	Several in road safety, home gardening, horticulture, building, domestic, entertainment, agriculture, furniture, marine engineering, plumbing and drainage, education, sports, waste industry, transport, office etc.
Non-Ferrous Metals	
Aluminium	
Wood	Wood-fibre-plastic products; inorganic bonded wood composites; pulp and paper manufacture; others.
UBCs	Paper based products, new cartons, thermoformed products and building material, heat recovery.

Table 5.1: Summary of potential new outlets for waste streams

Potential outlets were examined for each waste stream as part of this research. In particular, markets that are already being utilised successfully by other countries with higher recovery levels than Ireland were studied vis-à-vis their applicability here.

Potential new outlets for each material, where required, are listed in Table 5.1 on page 26, and discussed in detail in the Fact Sheets. However, the potentially most viable options for each material are described briefly below:

5.1 Glass

As can be seen from the Fact Sheet on Glass and Section 4, the two main producers of glass containers in Ireland have the capacity to process much higher volumes of high quality and uncontaminated glass. In other countries, raw material demands for the manufacture of glass containers also continues to dominate the market for waste glass. At present, the recycling of glass, using high quality cullet, to manufacture more glass containers, is the most economically and environmentally beneficial usage in most situations and should be supported and developed further with the right instruments and tools.

However, the markets for new green glass containers are not as large as the potential green glass waste arisings. Furthermore, there are also limits relating to the ability of cullet producers to process sufficient amounts of waste glass, should the amounts recovered increase dramatically. There are also problems regarding contaminants in cullet and the higher the level of cullet usage in glass manufacture, the higher the level of purity required.

Glass is an extremely recyclable material and has many potential uses. While many of the potential outlets listed here and described in detail in the Fact Sheet on Glass are not currently economically viable in Ireland, this situation could change with the right economic and other instruments. Potential new outlets include the following:

- **Industrial Abrasives:** Processed recycled glass is used as an industrial abrasive or the material for 'shot blasting' or 'sand blasting' in several countries, under several brand names. Typically it is used to remove scale, paint (including graffiti removal) and rust. Grit is the most widely used abrasive medium in Ireland at present – mainly copper and steel grit imported from Spain and Italy.

  This use for waste glass has many advantages including the fact that mixed glass colours and green glass can be used. The glass can contain impurities such as ceramics, and when the abrasive has been used, it does not need special disposal requirements unlike other abrasives. In some areas, spent glass abrasives are then reused in the manufacture of asphalt for road construction and other uses [10].

  The use of waste glass as an abrasive can provide a local solution to this waste problem. Currently, large volumes of cullet must be sent long distances for processing involving expensive transport costs. This is after an initial processing to achieve the required standard cullet of a specific colour. Some processed cullet is not of sufficient quality for use in the manufacture of glass and there are also problems regarding the market for green cullet.

  The price of copper and steel grit for blasting is about €127 - €165 per tonne at present and this level of payment could make the use of recycled glass viable since cullet is typically sold for about €51 per tonne.

- **Glass Wool, Glass Fibre, Fibreglass:** The use of cullet as a feedstock for glass wool products is widespread in many countries, including Sweden and the USA, with high levels of glass waste recovery.

  However, the market for glass wool and glass fibre in Ireland is served mostly by one company that already uses cullet as 50% of its raw material – about 5,000 tonnes of cullet in all. Thus the potential for a major further diversion of glass waste to this source is limited. But 32,143 tonnes of glass fibres were also imported into Ireland in 1998, so there is scope for the development of this material in Ireland, with feedstock partly made from waste glass.

- **Construction Aggregate:** The use of recycled glass as an alternative construction aggregate has grown in the last decade, as greater volumes of waste glass are becoming available. Cullet is used for many construction applications in the United States where detailed studies of standards and specifications have been carried out to identify the specific cullet requirements for the various uses [11]. Construction products made from cullet are also growing in number.

  However, despite these proven uses for cullet in construction, and the innovative nature of some new products, the cost of collecting, processing and delivering the processed cullet makes such material impossible to compete with raw aggregate in the open market. Virgin aggregate can cost as little as €3.81 per tonne. The viable use of cullet for construction would require the introduction of economic and other instruments such as landfill taxes, landfill bans, aggregate taxes etc. The building and construction industries also work to standards and specifications, all of which are stringent, and many of which tend to be very prescriptive. Designers and engineers in this industry are slow to depart from proven materials. The suitability of waste glass usage for any construction purpose would have to be proven beyond doubt to meet these specifications and ensure acceptance in this industry.

- **Glassphalt:** Asphalt containing glass cullet as an aggregate is called 'glassphalt' and has been widely used, particularly in the USA, since the 1960s, as an alternative to landfilling glass waste. In glassphalt, 5% to 40% of the rock and sand aggregate can be replaced by crushed glass or cullet. The use of glassphalt is usually used in areas of low traffic or low speeds on roads so the most common usages are on footpaths, for residential streets, car parks, kerbs etc.

  One successful pilot scheme in Ireland, initiated by REPAK, with partnership from the National Roads Authority, Monaghan County Council, REHAB and the Lagan Group showed that this outlet is technically possible. In this pilot project, 350 tonnes of waste glass was mixed into the bituminous layer of the N2 north of Carrickmacross in Co. Monaghan. The trial substituted 10% of the aggregate normally used for this type of construction with glass, surfaced by an 'overcoat' of asphalt which has no glass included in it.

  However, this scheme was funded by REPAK and without similar financial and other incentives to support the economics, the use of glassphalt is currently financially unsound in Ireland, where aggregates are relatively plentiful and cheap.

- **On-Site Waste Water Treatment Filtration Media [10]:** Recycled glass can be used as a substitute to sand filters in septic tanks in rural areas. Processed glass cullet can provide the same performance characteristics as sand in this wastewater filtration process. However, the standards required by local authority and health

board regulators must be met and supporting financial and other instruments must be applied to make this application cost effective.

- **Slow Rate Filtration Media [12]:** Slow rate filtration systems are used to provide pre-treatment for drinking water. Slow rate filtration systems are an alternative to conventional rapid sand filters in these systems. Research suggests that crushed recycled glass may be used effectively as a filter medium in systems of this type. Glass cullet has also been shown to provide a high quality substitute for sand in other forms of water filtration, including high flow filtration (in swimming pools etc.)
- **Other Potential Outlets:** Several other potential outlets for waste glass are being exploited in other countries. While these may require financial and other tools to make them viable, they should be considered. Each of these may only provide a sufficient market for small amounts of recycled glass in Ireland, but combined they could have a significant role to play in the increased recovery of waste glass (especially green, contaminated or mixed glass). They include:
  - **Landscaping applications**: recycled glass is commonly used in landscaping to provide colour and aesthetic backgrounds. These can take the form of gravel, aggregates etc. Sand made from recycled glass is commonly also used in sand bunkers in golf courses. It is also used as ground cover or plant mulch.
  - **Portland Cement**: Glass has been used in architectural applications in Portland Cement Concrete (PCC) for many years, but sufficient tests have not been made to allow it for usage in load bearing situations. Again, in an Irish context, the economic viability of such a practice is not currently proven.
  - **Epoxy binders**: Epoxy binders are used in many applications to manufacture composite materials. Some of these applications can use recycled glass as the aggregate. The physical properties required for the application will determine whether glass is an appropriate aggregate.
  - **Ceramic glazes**: Several companies worldwide manufacture tiles and glazes from recycled glass, when combined with other raw materials. The glass gives the tiles a translucent look and glossy surface which is considered attractive for bathrooms etc. Mosaic type tiles can also be manufactured from mixed coloured glass. The manufacture of this type of product is usually specialist and small scale.

5.2 Textiles

There are few potential new outlets for waste textiles in Ireland other than reselling them or reprocessing them to make rags and cleaning wipes for industry. Of those interviewed, all textile recyclers agreed that they could accept more good quality used textiles and would increase their sorting and processing facilities to meet any such increased demand. Since almost all the recovered used textiles are actually reused rather than recycled, this increases the environmental benefit. However, only a relatively low percentage (7%) of this material is resold in Ireland – this could be increased if people would accept good second hand clothes as a viable alternative to new ones.

In other countries in Europe, almost all recovered textiles are also sorted and exported to less affluent areas. In Germany, however, where high volumes of textiles are collected, a greater level of reprocessing of these materials does take place for various markets. These processes include:

- Tearing for the production of yarn and fleece
- Agglomeration and regranulation for the production of synthetic materials
- Shredding for textile hardboards

For the production of woven textiles, fabrics and fleeces, the textiles are mechanically torn and reduced to fibres. Out of recycled fibres it is possible to produce fleeces for different purposes. Textiles of lesser quality are also used for the paper and board industry. An example of this is roofing felt. Recycled textiles are also used in the motor industry, for example as the interior trim for cars. Insulating panels can also be made from recycled textiles.

Thus it can be seen that there are other potential outlets for used or 'waste' textiles other than those utilised in Ireland at present, but they are of lesser value and are only used in situations where other more valuable outlets (resale in the same country or by export) are not available. This is currently not the situation in Ireland, but these outlets may require consideration in the future.

One area where new markets may be developed is in the recycling of carpets. One German study has shown that about 30% of waste textiles comprises carpets. It is not known if any such carpet waste is recycled in Ireland, however this is unlikely. None of those contacted during this survey accept waste carpets or other 'heavy' textiles for recovery.

5.3 Ferrous Metals

Due to the closure of Irish Ispat Ltd. in May 2001, and the breakdown of discussions to sell it as a going concern, the short to mid term future outlets for waste ferrous recycling are destined to be in steel mills overseas. Currently the preferred destinations for ferrous dealers are steel mills in continental Europe. Some continental outlets are currently more favourable than the UK at present for currency reasons and the stability in currency exchange due to the Euro zone.

Steel mills serve as an efficient outlet for the recovery of ferrous metal, and are the main outlets for this waste stream all over the world. A high quality steel can be recovered from waste ferrous through the smelting process. The production of steel through the recycling of waste metal requires less energy than that required to produce steel from raw materials. It is, therefore, an environmentally beneficial activity.

When in operation, Irish Ispat Ltd. claimed to process approximately 360,000 tonnes of ferrous scrap/fragmentised ferrous annually. At least 50% of this ferrous scrap was imported, mainly from the UK. The import and export of waste ferrous metals is a widespread and profitable activity.

While it was not within the remit of this study to examine the feasibility of a new steel mill in Ireland, it seems clear that there are stable and economically viable outlets for current and short term future supplies of waste ferrous metals, albeit in other countries. Thus, the main efforts regarding this waste stream should be towards recovery of larger

volumes. Recovery of such volumes will also be a legal recycling requirement in the near future, especially for ferrous metals arising from ELVs and WEEE, due to forthcoming legislation. The finances to be provided to fund this legal requirement will greatly boost metal recycling of metals.

5.4 Paper

Since paper is an extremely recoverable commodity and as very high levels of recovery are apparent in several countries, there are many potential uses for paper waste. Paper, as mentioned already, is also a very large waste stream in Ireland.

It is vital, in order to divert more and more waste paper from landfill and to create a culture of recycling and reusing wastes in Ireland, to develop new outlets and uses for waste paper. This necessity is all the more pressing since Ireland does not have a paper mill to which its waste paper can be sent cheaply, at bw transport costs, as is the case in most European countries. The fluctuating prices at paper mills are a major deterrent to widespread paper recovery and the availability of other potential uses would greatly alleviate this problem.

In particular it would be even more beneficial to develop local and national solutions for our waste paper problems, instead of depending on more fragile markets abroad. Local solutions to waste issues are significantly more effective and lead to greater local community involvement in initiatives. Any major collection scheme is dependent on public goodwill to one extent or another – if people see their waste as a solution to some local problem or contributing to the provision of jobs locally, the spin off in greater recovery levels can be significant. This was proven in a recent composting initiative in Kerry – when the compost produced by the local authority was made available free of charge to the community, the amounts of organic wastes presented for collection (and subsequent composting) rose.

At present the following products are being manufactured from Irish waste paper:

- Corrugated Cases
- Sanitary Products
- Newsprint
- Packaging papers
- Graphic papers
- Other paper products
- Compost
- Animal Bedding

As was mentioned above, these paper-based products are manufactured in mills in the UK and elsewhere abroad. The composting material and animal bedding is being produced in Ireland in small amounts.

However, there are other potential products that can be made from waste paper. Again these are being manufactured on a wide scale elsewhere, but not from Irish waste paper. The advantages and disadvantages of these outlets are given briefly in Table 5.2 on page 32.

Of these, three outlets: building and furniture products, cellulose insulation and moulded fibre packaging offer the most viable options for widespread paper waste recovery and diversion from landfill. These are discussed in more detail below and in further detail in the Fact Sheet on Paper.

PRODUCT	Advantages	Disadvantages	Comments
Structural Board	Should be a good market	Complicated process; Considerable amount of R&D; Patents/Copyrights; Reluctance in building industry to usage	This has been successful in Germany & the USA
Mulch	Shredding is a relatively simple process	Aesthetically unpleasant compared with bark mulch	May be possible to mix with leaves/ bark to create a mulch
Insulating Material	Low tech. process; shredding with chemical treatment	Competing with traditional insulating material market; needs incentives; needs acceptance from Agrement Board, architects, builders *et al.*	Viable alternative for the construction industry if approved and promoted
Moulded Packaging Material	Potential demand in Ireland with large scale electronics and electrical plants; also fruit and veg.	Limited opportunity in egg box market; Lack of incentives	Will electronics/food companies support this idea?
Animal Feed	Alternative to grass, feasible from initial trials at Moorepark by Teagasc.	Unlikely to receive widespread acceptance; public health issues; currently this is a very sensitive industry to the public	Must be mixed with other feedstuffs
Paper to Ethanol	Should be able to locate a market for the Ethanol	The capital cost associated with such a facility may be prohibitive; acceptance problems	Is the expertise in Ireland?
Energy via Incineration	Widely used technology in UK & Europe	Contentious issue with the Irish public (dioxins etc.)	Not within the scope of this project

Table 5.2: Potential new outlets for waste paper

5.4.1 Moulded fibre packaging

There are two main types of moulded fibre based packaging:

- ***Conventional moulded fibre packaging***

  The basic raw materials for this packaging are paper/packaging, wax emulsion, aluminium sulphate, as well as any printing materials which may be deemed necessary. This process accepts the lowest levels of waste paper grade. Utilities required for production facilities include water, electricity, gas (for dryers). The most widespread use of conventional moulded fibre packaging products is in the packaging of fruits, food products, wine bottles, apples, drink container holders

and eggs. It is also suitable as protective packaging for industrial, medical and electrical goods such as car batteries, surgical goods, glass tubes, video recorders, fax machines, mobile phones, pagers, PCs and television monitors etc. This type of packaging is widely used in Europe and the USA. In the US, approximately 450,000 tons of this material was used for packaging in 1999, a 40% increase since 1997 [13].

- ***Thermoformed fibre packaging***

  This type of packaging differs from conventional fibre in that it uses heat to mould or form the products. These products are consequently of a higher quality than the conventional moulds. Purported benefits of thermoformed systems over conventional moulded fibre systems are:

  - capacity to use all paper waste - including corrugated board and beverage cartons - reducing raw material costs while maintaining the highest product quality
  - elimination of the necessity for a drying line means large savings in fuel, space, personnel and product waste
  - dimensional stability and repeatability is provided by advanced thermoforming technology
  - ability to produce near perpendicular draft angles for 'square fit' auto packaging and nesting

It would appear that moulded paper packaging production could be a viable option initially due to the low level of technology required for manufacture. A potential market exists but it must be convinced to adopt this new initiative – instruments would be required to prompt movement away from the plastic based packaging. There are some manufacturers of moulded fibre products in Ireland at present, but they mostly reuse waste cardboard etc. in a dry process to manufacture new packaging. One company actually imports waste cardboard from Germany and UK for 'quality and pricing reasons'[9].

The most economically viable target market would be the packaging provided for the protection of high value components, such as in the electronics industry. Companies with environmental policies in this sector could be encouraged, and may even be enthusiastic about substituting paper based moulded packaging for expanded polystyrene etc.

5.4.2 Insulation

Cellulose building thermal insulation is a recycled product made from newsprint and other waste papers. It is milled into a fibre with borax added to make it vermin resistant and boric acid added to make it fire resistant.

This product can be used widely in construction of domestic houses or other larger facilities. In the USA, this is the fastest growing use for recovered waste paper. About

[9] from an interview

550,000 tonnes of recovered paper were used for this product in 1998, and approximately 700,000 tons in 1999 [13].

One company already exports this material into Ireland on a small scale. Made from recycled newsprint, its environmental benefits include:

- 100% recycled content, conserving resources and easing pressure on landfill.
- Its manufacture consumes an order of magnitude less energy in manufacture than all other insulation materials.
- There is no added formaldehyde, VOCs or CFCs, or other hazardous toxic materials.
- High energy efficiency.
- After use this material can be recycled again.

Several companies manufacture waste paper based products that can be used as loft-insulation in all building types, and as cavity insulation in the walls and floors of timber-frame houses. The product has been successfully used in houses and commercial buildings throughout the UK and Europe [14].

5.4.3 Building board and furniture products

The environmental impact of the building industry is significant. For instance over 50% of material resources taken from nature are building-related [15]. In 1997 44% of waste entering the Kinsale Road Landfill site in Cork was construction and demolition related waste [16]. In Europe 40% of energy consumption is building related [15]. Very few recycled products are currently used in the construction industry in Ireland, unlike practices elsewhere. Several types of boards are now available on the market that can reuse waste materials but still meet international building standards. These products provide many environmental benefits and comply with high quality specifications.

Exterior and interior structural building board from recycled paper is commercially available from several companies in the U.S. Potential products include:

- Exterior Structural Building Board
- Sidewall Insulation (sheathing)
- Roof Deck
- Roof Insulation
- Interior Structural Building Board
- Floor Decking
- Interior Panels
- Floor Underlay

The products of another company include automotive board, components for the shipping container industry, US government grade board, furniture board, and a variety of other speciality applications including truck interiors and picture frames.

Another US company manufactures office furniture made from a range of recycled materials. Panels are constructed from 100% recycled and compressed newsprint

providing a sound absorbent material. Panels can be colour matched with water-based paints or left natural.

Several other products comprise engineered honeycomb panels made from recycled fibre. The resulting structural panels are particularly strong (standard 3/4" panels have the bending strength of particleboard at less than half the weight). They can be painted, laminated, edge-banded, and curved to custom radii. Standard panels are made from recycled resources, primarily kraft fibre recovered from old corrugated containers and industrial liner board. These products are formaldehyde free and do not off-gas during fabrication or after installation. Non-toxic PVA (white) glue is used to laminate panels. Product applications include furniture, cabinetry, exhibits, displays, stage sets, interior design and industrial components.

5.4.4 A paper mill in Ireland

One new potential outlet in the Republic of Ireland for waste paper is a paper or pulp mill in the country itself. There are currently approximately 1,200 pulp and paper mills in Europe. Ireland previously had a number of paper and pulp mills, but they were nearly all closed for financial reasons. In Northern Ireland, there were two mills until recently. One of these, in Larne, was closed in 1999. The other, in Lurgan still manufactures very small volumes of pulp from waste paper and makes moulded fibre products from the pulp such as egg cartons and other packaging materials. It receives recycled paper from several suppliers, mostly in Northern Ireland, repulps it and moulds packaging products from it as mentioned above.

Not having a mid or large-scale paper or pulp production facility in Ireland is a fundamental barrier to higher levels of waste paper recovery. Currently almost all waste paper is exported and therefore subject to the vagaries of price as well as currency uncertainties and problems related to the poor current performance of the Euro.

Having spoken to interested stakeholders in such an undertaking, it was felt by one paper recycler that a small paper mill, producing about 60,000 tonnes per annum of paper from recycled fibre could be viable with the proper supports and a guaranteed market for its products in Ireland. Another Danish expert felt that a pulp mill would be more viable since there is currently a small market for recycled paper in Ireland. The capital costs for a pulp mill are also much less than that for a paper mill and the process is much cheaper and simpler.

Having a paper or pulp mill in Ireland would overcome some of the barriers relating to paper waste recovery outlined below. Furthermore, since so much waste paper of various qualities and grades is readily available in Ireland, raw materials should not be a problem. However, stakeholders would need to commit waste paper to the facility. While current markets for the end products are low, they could be developed by the proper instruments.

However such an enterprise also has uncertainties and potential disadvantages attached. These include:

- Capital costs incurred in building such a facility
- Competition from UK and other mills for the end products in terms of prices and economies of scale
- Small market for recycled paper in Ireland

- Relatively small market for pulp at present (for toilet and sanitary products) – furthermore since some of these toilet product manufacturers are owned by large multinational suppliers of pulp, they may not avail of the pulp from a local mill if it was owned by a rival company

Further research, including a full feasibility study, is required regarding the issue of building a pulp or paper mill in Ireland. Such an undertaking would also require substantial support from the Irish government, in tax concessions, capital grants etc. It would also require a guaranteed supply of large volumes of good quality waste paper, from local authorities, waste management companies and other suppliers.

5.5 Cardboard

The European pulp and paper industry comprises more than 1,000 paper mills and 220 pulp mills. In 1999, The Confederation of European Paper Industries (CEPI) member countries produced more than 85.2 million tonnes of paper and board. The raw materials consumption of this industry consists of virgin pulp (44%) and recovered fibres (40%) as well as other materials [17]. These amounts include both paper and cardboard and with over 1,220 mills the recycling of paper and board to manufacture new products is by far the main outlet.

The potential of new outlets for cardboard, other than its recycling to manufacture new cardboard products is limited. In almost all other EU countries, this is the only large-scale outlet being utilised. While there are barriers to increasing the levels of recovery and recycling of waste cardboard (see below), the alternative uses for waste paper outlined above and in the Fact Sheet on Paper are, on the whole, not as suitable for cardboard as for other paper types. A possible exception is the use of cardboard in structural board. It can also be used as a packing material, when shredded, or cut to soften it.

All those involved in the export of waste cardboard who were contacted in the course of this study were confident that they could find markets abroad for increased volumes of cardboard. While the prices being offered at foreign mills may fluctuate, as they have done in the past, with the proper financial support mechanisms, infrastructural development (to reduce collection costs etc.) and other drivers, markets abroad can be found.

However, this may not always be the case. As Esa Hyvarinen of CEPI stated in a recent conference on paper recovery [17]: "Today the situation in the recovered market is tight, and the papermaking capacity is not the constraining factor in paper recycling. Therefore, there is no need for major new innovations at the moment. However… all used paper and board is not suitable for papermaking. When, in addition, landfilling of organic materials is banned in the near future, alternative uses become more and more topical an issue. Furthermore, one can anticipate that some of today's large scale paper products – at least relatively speaking – will suffer in volume in the future, it is important to find new product uses for wood-based fibres".

It is clear, therefore, that R&D will be required to develop further uses for waste cardboard in the future. It is also clear that higher levels of separation at source for waste cardboard is essential, and this could also lead to higher levels of cardboard reuse, which is a better option than recycling.

With this in mind, and in view of the fact that almost 200,000 tonnes of uncoated kraft paper and paperboard, corrugated paper and paperboard and cartons, boxes, bags etc. were imported in 1998, the potential for another cardboard mill is growing. As was mentioned in the paper fact sheet, there are pros and cons to such a venture. However, given a relatively stable supply of the required material, and stable markets for cardboard products in Ireland, the viability of a small scale cardboard mill may be on the increase.

With a guaranteed supply of the required raw material (good quality waste cardboard), the proper economic support mechanisms, and a commitment from industry to use the cardboard produced at the facility, another cardboard mill in Ireland could provide a sustainable new outlet for the growing amounts of waste cardboard being recovered. This issue requires further study so that the specific circumstances in which such a venture could be economically viable are discovered and recommendations as to how they can be achieved are made.

5.6 Plastics

Most of the processors contacted in this study state that they could process more plastics, from domestic as well as industrial sources, if they could be guaranteed a supply of clean and segregated material. With plastics one of the main problems regarding good supplies is that its primary source is from the domestic sector, but there is almost no segregation of domestic waste in Ireland, apart from schemes in Dublin, Galway and Co. Waterford.

However, the use of recycled plastics is also not common in Ireland. This means that a stable market for recycled plastic products is not guaranteed, especially as local authority, national government and public agencies show limited interest in green procurement policies. Current processors could produce a far greater range of products and new recyclers could be encouraged to develop products from recycled plastics if markets for such materials could be developed.

Regarding potential new outlets for plastic waste, there are literally thousands of products and outlets that can be produced from this waste stream. One search of a recycling website in the UK [18] showed the extremely wide range of consumer products available in the UK alone for several types of recycled plastics and mixtures of plastics. These are listed in Table 5.3 on page 38:

About 449 commercial products are listed for sale in this website alone from these plastics. Other products also available are manufactured from plastics mixed with board, hemp, metal, metal and glass, rubber, textiles, paper, steel and timber.

Plastic type	No. of Products	Plastic Type	No. of Products
Plastic – general	156	polycarbonate	2
expanded polystyrene	26	polyethylene	17
high density polyethylene	37	polyethylene and polypropylene	10
high density polyethylene and polypropylene	2	polyethylene foam	3
high impact polystyrene	4	polypropylene	13
low density polyethylene	26	polyethylene and low density polypropylene	1
MDPE	7	polystyrene	30
mixed	33	polystyrene and polypropylene	4
PET	1	polystyrene, polypropylene and nylon	1
polythene	14	polythene film	1
polythene and flexible PVC	4	polyethylenes and polypropylenes	7
polyvinylchloride (PVC)	12	polyvinylchloride and polypropylene	1
polyvinylchloride unplasticised	3	various	25
polythene	9	**Total Products:**	**449**

Table 5.3: Recycled plastics used manufacture products

Recycled plastic products serve several markets and industries worldwide, all of which are suitable for Ireland, including:

- Road Safety (bollards, signs, fencing etc.)
- Home gardening (planters, containers, watering cans, composters etc.)
- Large scale Horticulture (planters, fencing, containers, etc.)
- Building (various)
- Domestic (laundry bins, brushes, dustbins, blankets, clocks, pillows, buckets, etc.)
- Entertainment, toys (cassettes, CD holders, dolls, toys etc.)
- Agriculture (fencing, animal feed containers, decking, etc.)
- Furniture (outdoor and indoor tables, desks, benches, carpets, lamps, etc.)
- Marine Engineering (walls, pontoons)
- Plumbing and Drainage (piping)

- Education (pens, pencil holders, geometry products etc.)
- Sports (posts, equipment, etc.)
- Waste industry (sacks, bin liners, etc.)
- Transport (boxes, pallets, film, packing etc.)
- Office (cartridges, furniture, equipment, diskettes, etc.)

The main products manufactured from recycled plastic in the UK include bin liners, carrier bags, PVC pipes and flooring, fibre-fill duvets, audio video and CD cases, fencing, garden furniture and car bumpers. It is also noted that closed-loop recycling whereby recycled plastic is used to make the same product from which the waste is derived, is rare. The American Plastics Council (APC) products sourcebook lists over 1,300 different types of plastic products with recycled content. From this the primary outlet for recycled PET bottles is fibre for carpets and a wide variety of textiles[10] and the primary market for recycled HDPE is bottles. PET is also used for egg cartons, furniture, insulation, landfill liners, insulation etc [20]. The APC claims that new end uses for PET are now being created such as coating for corrugated paper and waterproof containers for shipping. Other end uses for HDPE are drainage pipes, sheet and film products, pallets and plastic lumber [21]. HDPE is being used more and more for furniture, outdoor accessories, garden edging etc. The plastic timber industry is also prominent in the USA, with further research and new standards paving the way for further use of plastics in structural applications, and tests are now underway to use recycled plastic in railroad ties and marine pilings. However, the quality and type of plastic waste is important when considering its potential end-of-life usage.

Most recovered plastic in Europe is either incinerated with heat recovery or mechanically recycled. The relatively high mass and potentially low levels of contamination make collected plastic bottles and industrially sourced packaging film waste (e.g. shrink and stretch wrap) suitable feeds for this mechanical recycling. However, plastic bottles only account for less than 20% of domestic waste, which in turn constitutes 67% of overall plastic waste. It is not generally considered practical to mechanically recycle the remaining plastics, especially if, as is often the case, they are mixed. In Austria, for example, of the 44,207 tonnes of mixed plastic recovered, 36,171 tonnes (or 82%) were incinerated for energy; the remainder, 8,036 tonnes (or 18%), were mechanically recycled to make pallets, roofing tiles, drainpipes etc. or used for feedstock for methanol in a German plant.

Feedstock recycling is described in more detail in the Fact Sheet on Plastics. However, in order for this chemical type of recycling to compete with mechanical recycling it must be sure of large amounts of very low contamination feedstocks and must reduce its processing costs. New technologies are being tested in this regard however, thus increasing competitiveness.

[10] In Ireland, large amounts of processed PET are imported by Wellman International, Co. Meath, for the manufacture of clothing, but only relatively small amounts of PET from Irish sources are received – though these are now increasing.

5.7 Non-Ferrous Metals

Access to international markets is easy for Irish collectors of waste non-ferrous metals. Many such markets exist in the UK and Europe as is described in Section 4.7. In recent years the use of e-trading is becoming especially common, making such trade even easier administratively.

Furthermore, demand for these metals, all of which are valuable and some of which are precious, is high and their trade is profitable.

According to those contacted in this survey, who are involved in the collection and export of non-ferrous metals, the value of these commodities and the ease of access to foreign markets ensures that any future growth in recovery volumes can be accommodated by the current outlets.

It is recommended, therefore, that the main efforts regarding the increased recovery of these waste streams should concentrate on the supply side. Developments regarding the recovery of WEEE and ELVs described in the Fact Sheet on Ferrous Metals will assist this growth in supply.

Developments regarding the disposal, use, recovery and, where possible prevention, of hazardous wastes as specified in the National Hazardous Waste Management Plan should also have an affect. These wastes are mostly industrial and include wastes containing mercury and other heavy metals. However the prevention, disposal, use and recovery of batteries (such as lead and nickel/cadmium) and accumulators will also be covered by that plan.

5.8 Aluminium

As previously described, about 6,700 tonnes of aluminium is recycled in Ireland and about 10,921 tonnes is exported, mostly to the UK for reprocessing. There is a capacity for further recovery in this Irish facility, but Irish scrap metal merchants export aluminium mainly to the UK and continental Europe, often using metal brokers as intermediates. In recent years this business has been made easier administratively and more profitable since the increase in direct e-commerce and e-trading with foreign smelters and customers worldwide. A wide range of non-ferrous metal waste is exported from Ireland.

The relatively low collection rate of aluminium from the municipal waste stream in Ireland leaves great opportunities for increased recycling in the future. As one of the most valuable components in the consumer waste stream, aluminium cans are often the economic backbone of municipal and private recycling programs. The price can fluctuate with the commodity price for new aluminium, but aluminium can scrap has always maintained a strong price in comparison to other recyclables. The rates of recovery in some countries show that great potential exists to increase the recovery of this commodity to very high levels. At a value of over €762 per tonne, and a potential annual market of up to 8,000 tonnes, this commodity has a potential value of €6.1 million per annum in Ireland, using current outlets.

While aluminium foils are currently not widely collected from the municipal waste stream in Ireland, it is likely that with increased kerbside collection and the development of more advanced bring sites, the collection of post consumer foil will become economically feasible. Types of foil that can be recycled include; pie plates,

frozen food trays, take-away fast food containers, clean household and commercial kitchen foils. Materials recovered in other countries also include laminated and paper backed aluminium and foils with aluminium content ranging from 18% up to 100%.

Greater levels of recovery should also be possible from the forthcoming programmes regarding WEEE and ELV recovery. Coupled with the fact that there is an upward trend for aluminium applications in the automotive sector, with several manufacturers introducing new models with aluminium front hoods in order to further reduce the weight of cars, it is anticipated that the level of aluminium component in ELVs will increase in the future from the estimated 2.25% content at present. Thus recovery levels should also increase.

5.9 Wood

Wood waste, principally a relatively inert, but organic material, has become a priority material because of the recovery requirements of the Packaging Waste Regulations and the impending Landfill Directive. Accordingly, processing and end-markets of this waste material are rapidly evolving fields. Wood waste is already supplied to a number of existing wood markets. There is however, scope for increasing market share for wood waste in these outlets as well as opening up new opportunities for recycled wood. Market opportunities for wood waste could be expanded by:

- Greater use in particle board and MDF manufacture.
- Increased use in landscaping and horticultural applications as a mulch.
- As a bulking material and carbon source in the manufacture of compost.
- Regulation of construction and demolition practices to achieve a higher percentage of salvaged timbers. These may be re-milled and used in new building construction, or to supply the growing market for used timber, such as timber flooring.

There are also new technologies for compounding wood waste with non-wood materials to produce a variety of composite products. Some innovative composite materials which have been developed internationally include:

5.9.1 Wood-fibre-plastic composites

The use of recycled wood as a reinforcing filler in thermoplastics is a recent innovation. Most commodity thermoplastics, such as low- and high-density polyethylene (LDPE, HDPE), polypropylene (pp), and polystyrene (ps), can be blended with waste wood. Polyester terphalate (PET) is generally not used because its melting temperature is greater than the degradation point of wood.

A number of different types of building material have been successfully marketed in the U.S. from these composites including roofing shingles, windowsills and door frames. These materials are made from 100% recycled material, are weather resistant, are highly fire resistant, require no maintenance and are aesthetically pleasing.

5.9.2 Inorganic-bonded wood composites

Inorganic-bonded wood composites are those that contain a mineral or mineral mix as a binder system. The three most common inorganic binder systems are magnesium oxide, gypsum and Portland cement. Both magnesium oxide and gypsum are moisture sensitive and composite products made with them are used primarily for interior applications. Portland cement-bonded products are more durable and have exterior and interior applications. All inorganic-bonded products are highly resistant to fire and insects and other pests. Wood can also be used as the aggregate in cement to make lightweight building blocks and roofing slates.

Cement-bonded wood composites are used in a wide range of building types. In the Philippines, cement board is fabricated using mostly manual labour and is used in low-cost housing. In Japan, the fabrication of cement board is automated and used in expensive modular housing. The versatility of cement board manufacturing makes it ideally suited to recycled wood. With a small capital investment and the most rudimentary tools, good-quality cement boards can be produced on a small scale using generally unskilled labour. If the market for cement board increases, technology can be introduced to increase manufacturing throughput. The labour force can be trained concurrently with the gradual introduction of more sophisticated technology.

5.9.3 Pulp and paper manufacturing

One USA study [22] identified the use of 'Urban Recycled Wood (URW)" in three outlets: biomass fuel end use, composite wood manufacturing and pulp and paper manufacturing. In Ireland waste wood is already being used as a fuel and for composite wood manufacturing. Since there is no pulp and paper manufacturing in Ireland, however, this is not a current outlet. In the USA, of nine pulp and paper mills surveyed, 78% said that they have used URW in the past for feedstock, but only 33% currently use this resource. Mills with certain equipment such as chip washers etc. and mills that can guarantee a clean and consistent supply of wood continue to utilise this resource.

In the event of a paper or pulp mill being developed in Ireland (as is described above), this may be a possible outlet for this waste stream, especially for industrial wood waste that is clean and of a consistent nature.

5.9.4 Other applications

Low grade wood waste chip has been successfully used for temporary road surfaces, in animal pastures, landfills and other areas where mud becomes problematic in wet conditions. Woodchip material can also be used as a horse-arena surface material and as bedding materials for dairy cows and other animals. These applications seem particularly suited to the Irish environment and weather conditions.

5.10 Used Beverage Cartons (UBCs)

As was mentioned above, there are, as yet, no outlets for UBCs in Ireland. In Europe, 54% of the material recovered is mechanically recycled, and 46% is incinerated. In most countries a mixture of these two options is applied; in others, such as Denmark and Switzerland, UBCs are only incinerated. The methods of collection for UBCs vary. Usually a combination of collection systems and bring sites are applied.

The material from UBCs recycled in Europe is predominantly used for the manufacture of paper and card based products. These include: shopping bags, cores for paper reel, sheets of cardboard, disposable kitchen towels, printing paper, plaster board lining, corrugated board etc.

The process of recovering the fibre element of UBCs is similar to that of paper and cardboard recycling. The difference to the usual waste paper process consists in the separation of the fibre part (75% of the composite mass) from the plastic and aluminium part. This separation takes place in a specific pulper that dissolves the fibre from the residue. The recovered fibre is recycled into new paper based products. The plastic, ink and aluminium parts are still usually bound after the process and are usually incinerated together. While this polyethylene is of little value, the aluminium is valuable and may be recoverable. Some research into this process is underway.

UBCs can also be recycled using a thermal compression process to manufacture home and building products. One example, Tectan, is manufactured by Entwicklungsgesellschaft für Verbundmaterial Diez (EVD) who are owned by the German Tetra Pak group. Tectan is composed of paper (75%), polyethylene (20%) and aluminium (5%), the components of the beverage carton. There is a wide range of products made from the Tectan board including clocks, briefcases, chairs, tables, dustbins and notice boards. It can also be used to manufacture building board for a variety of indoor building applications from doors to stair banister panelling etc. At present, Tectan is made mostly from factory waste and some post-consumer UBCs. Further research is therefore required to analyse if this type of material can be manufactured from post-consumer UBCs alone.

6. Barriers to Recovery

There are many barriers to the collection, reuse and recycling of waste materials in Ireland today. Some of these are material specific, such as the diversity of plastic waste streams. Others, such as a lack of environmental awareness, affect the recovery of all waste streams.

6.1 General Barriers

The following 14 barriers hinder the increased collection, reuse and recycling of waste materials in Ireland:

Barriers to Recycling in Ireland		
No culture of recycling	Small island, dispersed population	No paper production
Cheap, easy disposal	Low environmental awareness	Infrastructural deficiencies
Lack of research	Lack of information provision	Lack of standards
Technical barriers	Lack of green public procurement	Lack of economic instruments
Lack of legislation, lack of enforcement	Lack of extended producer responsibility	

Table 6.1: Barriers to recycling in Ireland

These general barriers to waste reuse and recycling are discussed in more detail below:

6.1.1 No culture of recycling, lack of self-sufficiency

There is almost no culture of recovery in Ireland today. Irish people now live in a 'throwaway society'. In previous generations, Irish people were prepared to reuse material in their home or at their job. Likewise previous generations of Irish people had an abhorrence of waste. Since it has become an affluent society, however, Ireland has forgotten, in a relatively short space of time, the old truism: "waste not, want not". Now people in general, and young people in particular, are primarily interested in fashionable products that are 'new and improved'. The demand today is for new and bigger cars, new and bigger houses, new and bigger TVs, new and faster computers, the latest mobile phone and Manchester United or Liverpool FC football shirt etc. The fact that the products being replaced are in perfect working order and carry out the function for which they are required is not an issue. While this preference is related to a lack of environmental awareness, the idea is prevalent in Ireland that if something is even slightly old, remade, repaired or recycled in any way then it must be inferior, and is not desirable. And since, for the first time in its history, people on a widespread scale can afford 'new and improved' products and services, then these are demanded, whether or not they are required, and irrespective of the consequences.

Nor does Ireland have the inclination towards self-sufficiency that is common in other cultures. Ireland's prevalence for exporting its problems means that it has not developed the capacity to reuse or recycle these wastes. Thus we have never developed the ability, and consequently have little current capacity, to recycle substantial quantities of materials such as paper, non-ferrous metals, composite materials, aluminium etc. While we did have a steel mill to previously take our waste ferrous metals, it now also has ceased to exist and this very large waste stream will also have to be exported in order to be recycled.

6.1.2 Small island – small population, low density, dispersed population

Ireland is a relatively small island economy with a relatively small and dispersed population. It is also an export economy whereby the majority of its industries, whether food, software, telecommunications, information technology or pharmachem are all geared for export. Ireland does not, therefore, currently have either the size of home market or the culture of self-sufficiency required for large scale, local based recovery systems. Thus there is a major problem regarding recycled goods from a demand side.

This geographic and demographic feature of Ireland also creates barriers on the supply side. For large-scale waste recovery projects to be successful, especially kerbside collection schemes, a certain density of population is usually required. It is difficult to create a collection scheme for a small, dispersed population at low cost. Given the economies of scale, and the high transport costs involved, it is difficult for Irish local authorities, especially rural ones, to achieve the levels of waste recovery of the densely and highly populated centres available in areas in the Netherlands, Denmark, Germany and Austria.

However, almost half the Irish population lives in an urban area. All the main urban centres: Dublin, Cork, Galway, Limerick and Waterford could have viable kerbside collection schemes. High volume collection systems in these and other dense population centres could significantly increase the amounts of wastes collected in Ireland. Dublin, Galway and Waterford County have implemented kerbside collection schemes – other regions must follow these examples.

6.1.3 No paper production in Ireland

Paper and cardboard constituted 36% of all waste arisings of the commercial domestic waste streams in 1998 with about 642,151 tonnes available for collection. Further arisings from the *Pulp, Paper and Paper Products; Printing and Publishing* sector of industry that year were estimated as 165,371 tonnes.

By far the most common use for waste paper worldwide is in the manufacture of more paper and pulp. One of the main reasons for relatively high recovery levels of paper waste in countries such as Austria, Denmark, Germany and the UK is the availability of paper mills that will take large volumes of this waste. Over 1,200 pulp and paper mills are in operation in Europe, but only two (one pulp, one cardboard) are processing waste paper and cardboard in Ireland.

Technologies have now been developed that ensure that waste paper can be de-inked and repulped effectively and relatively cheaply and this makes the waste paper valuable, especially in comparison with pulp made from virgin materials such as trees. Without a paper mill, Ireland must export most of its paper wastes, at a high transport, economic

and environmental cost, thus making it less competitive than paper wastes arising adjacent to the mills, especially in the UK.

6.1.4 Cheap and easy disposal systems

While landfill charges have increased rapidly in Ireland in the last few years, and continue to rise, they are still relatively cheap in comparison with other EU Member States. Furthermore, the waste disposal industry is a well-established, profitable, large-scale and competitive industry in Ireland so that relatively good prices are available for those seeking to dispose of commercial or industrial waste to landfill. These disposal companies have large fleets of trucks and skips and can service waste producers well and effectively. While the law in Ireland has been made more stringent by the *Waste Management Act, 1996*, and the *Waste Management (Amendment) Act, 2001*, it is still very easy to dispose of waste as a sole option without consideration to prevention, minimisation, and re-use of this waste – let alone recycling. A proposed landfill levy will help alleviate this barrier.

6.1.5 Low levels of environmental awareness

The main reason for the high levels of waste production and the main deterrent to material recovery in Ireland are the low levels of environmental awareness among the population. These are exemplified by some statistics in a recent national awareness survey [23], for example:

- Only 68% of people say that the environment is an urgent and immediate problem – this means that almost one third of the population (about 1.2 million people) believe that we do not have an environmental problem. How can we convince them to recycle their waste?

- Only 39% feel that they as individuals have the main responsibility for the environment whereas 42% believe that national/local government has the main responsibility – this means that almost two thirds of the Irish population (about 2.3 million people) believe that protection of the environment is someone else's responsibility. How can we expect them to recycle their waste?

- 56% of people never look at environmental labelling – this means that those companies who do make an effort to produce environmentally friendly products, reduce their packaging, or use recycled packaging do not gain full credit for their efforts.

- 68% of people never think of the amount of packaging on a product before purchasing – this does not create an incentive or impetus for companies to reduce the amount of packaging they use.

- 74% of people never refused a product due to excessive packaging – again this represents a disincentive to packaging minimisation.

- 56% of people have never conserved water in the home – this means that the amount of drinking water produced by local authorities and thus the amount of waste water requiring treatment, is far in excess of what is essentially required.

- 30% of people have never recycled glass – how is it then possible for Ireland (recovery level: 30.8%) to reach the recovery levels for glass in countries such as: Switzerland (93%), Netherlands (91%), Sweden and Austria (both 84%)?

- 50% of people have never recycled cans – how then is it possible for Ireland (approximate recovery level: 15%) to reach the recovery levels for aluminium cans in other countries such as: Finland (95%), Sweden (90%), and Switzerland (90%)?

These levels of awareness show that people do not consider environmental issues, either at the purchasing stage whereby waste is created, or with the environmental treatment option for the management of that waste. This means that many people are unwilling to consider recovery as an option for them. Thus collecting waste for recovery is far more difficult than it needs to be and, accordingly, the problems associated with waste segregation and waste streams contamination are extensive. This lack of concern for the environment also means that even when good quality, less packaged and more environmentally friendly products are available, people will not use them – thus ensuring that the markets for and supplies of recycled materials such as paper and plastic remain low. The fact that people do not care about the type or quantity of packaging of products they purchase ensures that the amounts of waste arisings will continue to develop at an unsustainable rate.

The lack of public participation in waste issues in Ireland at all levels deters significant recovery levels. This lack of participation and active community involvement is prevalent at all levels of waste reduction programmes. The commitment of the community is especially crucial, however, when planning local or regional programmes. The lack of significant Local Agenda 21 schemes in Ireland restricts public 'ownership' of the waste issue and promotes the sense hat waste management plans and strategies are being imposed from above upon the public. The apparent lack of transparency and openness in some regions regarding waste planning and recovery issues creates alienation and hostility to proposals and significantly reduces their suitability and possibilities for success.

Another problem caused by the lack of environmental awareness among the general public is that, as a result, environmental issues are not considered of high enough priority among policy and decision makers. Thus the environmental implications of developments and plans are not sufficiently considered and the resources required in local and national government environmental departments are not sufficient. Furthermore, when difficult decisions are required, for example regarding the imposition of domestic waste charges, infrastructural development or the implementation of eco-taxes, they are often not carried through for fear that they would be too unpopular to the general public. When they are carried through and imposed, they are often met with severe acceptability and implementation problems – examples of this are household waste charges in Dublin and Cork.

Another awareness problem is that environmental issues generally are covered in the media only when a 'bad news' story occurs. When an environmental success does occur, for example in an industry achieving an industrial award, or a local authority engaging on an ambitious kerbside programme, this is not a media event. The environmental awareness and conscience of the Irish media therefore also needs to be tackled so that they can play a more balanced and supportive role.

The level of environmental awareness in Irish business and industry is also low. The benefits of good environmental policies, whether financial, regulatory or social are neither widely understood nor fully appreciated. The widespread acceptance that current practices vis-à-vis waste, water and air are neither sustainable nor in line with Irish and EU environmental policies has not been achieved. One of the main problems relating to industry and waste is that there is a general perception that waste is a necessary evil and that waste is fit only for disposal. In other countries, however, this waste is not seen as a necessary result of commercial or industrial activity, and any waste that cannot be avoided is seen as a resource, a commodity, something of value. Until the waste streams emanating from businesses are seen as potential assets or commercial opportunities, a widespread move to recovering them for reuse or recycling will not occur. The use, for example, of waste exchanges in other countries is common, as is the concept of industrial ecology. This is where the wastes from one company, or process, becomes the raw material for another. Thus a symbiosis can be developed, creating a win-win situation. This is very rare in Ireland, at present.

6.1.6 Infrastructural deficiencies

Unlike other EU Member States, Ireland has only relatively recently begun to consider the issue of waste and to develop national and local policies for higher levels of recovery. This means that the infrastructure required for widespread collection and reprocessing is still at a very early stage.

Thus, for example, the number of bring-sites for materials is quite low per capita compared with other countries. In Ireland an estimated 1,100 bring sites are in place for a population of 3.8 million people. Thus there is one bring site per 3,500 people, giving recover levels of 30.8% for glass and about 15% for aluminium cans. This is well below the European average of one bring site per 1200 citizens and it is very poor when compared with the rates in countries with high recovery levels. In Austria, for example, there are 30,000 bring sites, or about 1 bring site per 270 people. Austria has a recovery level of 84% for glass and about 50% for aluminium cans.

Another problem is that, where there are bring sites, they are inadequately serviced and are often dirty and/or full. This deters potential recyclers and it gives recycling a bad name. Where there are bring sites, people are abusing them. This must be stopped. Brings sites must also be regularly serviced and full banks must be emptied promptly.

The numbers of separate wheelie bins or other containers for segregated wastes are insufficient. The types of reprocessing facilities and equipment required for separation and de-contamination of wastes are inadequate. The kerbside collection schemes required have not yet been developed. The skills to develop good quality recycled products from paper and other waste streams have not been learned. The relevant drivers including local authorities should acquire appropriate skills and knowledge in this area. In addition, adequate personnel and resources should be made available in environmental departments in both local and national government.

Another infrastructural deficiency is the lack of an organised and proven market for trading waste materials and a lack of public price disclosure. While some waste exchange operations are now coming on stream – in particular using the internet – these are still at an early stage and merchants are wary of using them for high value transactions. Trade magazines also are increasingly a source of reliable information on actual market conditions.

One of the main requirements for wide scale recovery and reuse of waste streams is segregation. The earlier waste streams are separated, the greater value they have and the more options there are for economically viable recycling. In order to successfully separate domestic and commercial waste streams, the proper infrastructure must be in place. This requires separate bags or bins, separate collection schemes and facilities, adequate numbers and high quality bring sites etc. These are all lacking in Ireland at present and adequate resources are required to turn this deficiency around.

6.1.7 Lack of research

Another barrier to higher levels of waste recovery is a lack of knowledge regarding the types of wastes being produced in Ireland, the compositions of the different waste streams, the reasons why waste arisings are so high, best practice regarding waste recovery, the potential markets for the various waste streams etc. The reasons for the poor environmental awareness in Ireland must be studied. Underlying attitudes to the environment, and potential means for changing these attitudes must also be learned. The lessons learned in other countries that have faced a similar waste challenge in the past need to be transferred to an Irish situation and socio-economic climate. There is a need for technology transfer, whereby the innovations and successful developments in other countries are applied properly to Ireland.

While the ERTDI research programme, this study and other waste related studies aim to alleviate some the barriers regarding a lack of information, further and ongoing research is required and the results of this research need to be disseminated as widely as possible to all the relevant stakeholders. This is especially required regarding market development.

6.1.8 Lack of information provision

It is not enough to gather information through research and studies. This must also be presented in a variety of suitable forms and disseminated widely.

Many recyclers complain about the lack of information available to them regarding potential markets for their materials, potential new ways to collect waste streams, examples of best practice etc. Many entrepreneurs complain about the lack of information available regarding how they could become involved in the recycling industry, what kinds of supports are available, what kind of recycling is being undertaken in Ireland at present etc. Many industrial and commercial producers of waste complain about the lack of information available on how they could reduce their waste arisings, how they could reuse their waste streams, what recycling options are available to them, what kind of legislative requirements have been imposed on them etc. Many members of the general public complain about the lack of information regarding their options for recycling, what recycling facilities are available in their region, what kinds of materials can be recycled in Ireland etc. Many local authorities are unsure of the best methods of changing environmental attitudes, increasing awareness levels, approaching the general public on environmental issues etc.

Thus there is a general lack of information on the reuse and recycling of materials in Ireland today. There are some sources of information available, e.g. ENFO (Ireland's public information service on environmental matters) , REPAK, Life to Waste Website and Directory etc., however these are not adequate to fully serve the needs of those in

search of information on waste and to disseminate the benefits of recycling to all stakeholders. There is no single visible focal point for quality information on waste in Ireland.

6.1.9 Lack of standards – questions on quality

While high quality and good value products are available from recycled materials, there is a wide spread in quality, as is the case in products from virgin raw material. Furthermore, as is stated above, Irish people seem to have an aversion to using so-called second-hand or recycled products.

However, in order to convince people that recycled products can perform well, a set of standards is required whereby the quality of the product is assured to the purchaser. These standards could be issued as part of the Market Development Programme (see Section 8.3.4) and only recycled products that meet required standards and are approved by this programme would be certified. Without industry level standards, purchasers (particularly in industry and commerce which are the major markets for recycled products) are wary of accepting these products. Furthermore, without the ability to achieve certified standards, industry is slow to embark on a programme to produce such products, because the market for them is affected by uncertainty. Without such standards, these waste streams cannot be incorporated into material specifications and are not yet perceived as an industrial commodity – which is what they can become using the correct instruments.

6.1.10 Technical barriers

Several technical barriers regarding the recovery and reuse of waste streams have yet to be overcome to ensure long-term viability of this sector. More details on these technical problems, especially relating to paper and plastics are given in the Fact Sheets. For example, there are technical limits to the number of times a cellulose fibre can be recycled before it degrades below the re-usable quality and while these limits are nowhere near being reached in Ireland at this time, potential large scale investors and producers are wary of them. If a high level of recovery for certain purposes occurs, for example in glass manufacturing, the need for purer material and a lack of contamination becomes more acute.

A more pressing technical difficulty is the lack of understanding of the engineering properties of recovered materials that have value in alternative applications [24]. While material sciences are at an advanced stage for most raw materials, this is not yet the case for recovered 'waste' materials, especially in Ireland. Furthermore, there is a lack of serious R&D initiatives to discover and validate alternative uses for such materials.

6.1.11 Lack of green public procurement

There is a distinct lack of green procurement policies in the commercial, industrial, and domestic sectors in Ireland. The most pressing area where this creates a barrier to higher recovery levels, however, is in the public sector.

It is estimated that public procurement purchases are valued at over €1,000 billion every year across the EU (14% of EU GDP). In Ireland the Gross Domestic Product for 1999 [25] was IR£69 billion (€87.6 billion), 14% of which is IR£9.7 billion (€12.3 billion)- considerable spending power. However, green public procurement policies are not

being implemented in Ireland. This means that one of the main barriers to increased recycling and recovery levels, the lack of markets, is not being tackled. If the national and local government agencies will not support such market development, it is difficult to expect private industry or householders to do so.

The European Commission has recently adopted a Communication [26] that defines the legally correct way for public authorities to take environmental considerations into account, when making purchasing decisions without infringing internal market or other public procurement rules. For example, public authorities can specify the raw materials and the production processes used in a contract, such as energy from renewable sources or recycled paper or plastic, but in Ireland they are reluctant to do so, despite examples from other countries where this has occurred. Thus there are clear legal procedures in place whereby hospitals, schools, universities, colleges, health boards, local authorities, government offices etc. can significantly increase the market for recycled and greener products. But these are not being used, either because of a lack of awareness or due to a conservative interpretation of the competition rules related to tender evaluation.

6.1.12 Lack of economic instruments

Financial incentives are required to boost waste recovery and recycling levels on both the supply and demand sides. There is still a notion prevalent in Ireland that recycling should always either be free of cost or inherently profitable. While this is possible in some cases without support (e.g. glass, some metals), in others (such as plastics and paper), economic supporting instruments at some level are often required.

On the supply side, the mechanisms required to ensure higher recovery levels include awareness raising, supports for bring sites or kerbside collection and supports for collectors and recyclers of waste. The need for public participation has been described above. However, awareness raising and education can be resource demanding and costly over a long period. The development of sufficient quantities and quality of bring sites also required funding, whether from local or national sources. Kerbside collection is more cost intensive than bring site schemes and any such collection system does require support from authorities in public private partnerships. This is true of those collection schemes running in Dublin, Galway and Co. Waterford. The REPAK Payment Scheme (RPS) scheme is now giving some support for waste packaging collectors on a payment per tonne basis, the amount depending on the material and demand at an particular time. However, while this is providing some incentive and has supported a modest increase in recovery levels for some streams, packaging only accounted for 675,043 tonnes (or 33%) in 1998 out of total arisings of municipal waste of over 2 million tonnes. The REPAK scheme also does not support the development of recycling facilities to process the recyclates and create new products.

At present there is inadequate economic support for awareness raising and collection facilities in most, if not all, regions in Ireland and the recovery levels are extremely low as a result.

On the demand side, there are few if any economic incentives in place to encourage consumers, whether domestic, public agency, or commercial, to buy recycled or recyclable products or products with recycled packaging. This, combined with the lack of support for awareness raising, guarantees inadequate markets for these materials.

One economic instrument to support recycling is to make the cost of landfill so unattractive that recycling becomes more feasible. The cost of landfilling has increased greatly in Ireland in the past five years. This is chiefly as a result of higher costs in landfill development and maintenance due to the *Waste Management Act, 1996*, the *Waste Management (Licensing) Regulations 1997*, and the costs associated with the implementation of Regional Waste Management Strategies vis-à-vis recycling supports etc. Already this has had a major effect, especially in combination with packaging waste which receives support through REPAK.

A landfill tax or levy has been proposed for some time in Ireland and a consultation paper has recently been published by the DOELG on the subject. It is now hoped that this will be implemented in 2002. The initial levy proposed is £15 (€19) per tonne. The monies accrued from this levy are then to be used in an Environment Fund to support and benefit other recovery schemes and recycling initiatives. It is imperative that this levy be applied as soon as possible, and increased quickly thereafter.

A plastic shopping bag levy, of up to 15p (19 cent) per bag has also been proposed in the *Waste Management (Amendment) Act, 2001*. This will have the effect of increasing the reuse of plastic bags and thus decreasing the amount of waste arising from this source. It is due for implementation in March, 2002.

The lack of economic supports is thus damaging to the recycling chain at all of its four stages: supply, collection, processing and demand.

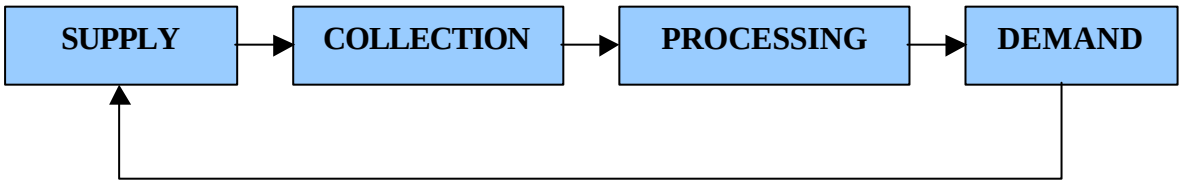

Figure 6.1: four stages of recycling chain

6.1.13 Lack of adequate legislation, lack of enforcement

Environmental legislation can have a major role in changing behaviour. *The EPA Act, 1992* has had a major impact on certain sectors of industry and how they perform regarding the environment. *The Waste Management Act, 1996*, *The Waste (Packaging) Regulations, 1997* and the *Waste Management (Amendment) Act, 2001*, have attempted to do the same regarding solid waste production. But, while this legislation has certainly had some effect regarding waste disposal activities and landfill site maintenance, it has not, as yet, adequately boosted the level of recycling.

Another major problem regarding waste recovery is the inadequacy of bring site numbers. This problem is exacerbated by the planning requirements for the location of these sites and the ability of those who do not want bring sites near them to prevent their development. This 'not in my back yard' (NIMBY) factor is prevalent in all aspects of waste, whether involving landfills, incinerators, bring sites, transfer stations, material resource facilities etc. However, in the case of bring sites, it is especially regrettable since almost everybody agrees that recycling levels should be increased. These planning regulations deter the required increase of bring sites.

A recent and very effective legislative method of forcing commercial waste producers to increase their levels of recycling is the banning of commercial waste in landfills. The banning of certain waste streams that are particularly recoverable (e.g. cardboard, paper, glass) has been used in several regions. Likewise the banning of very large waste streams such as those from Construction and Demolition (C&D) waste. Recently, however, in areas where landfill space has become scarce (such as Galway and Cork), the banning of all or a high percentage of commercial waste has been implemented. The *Waste Management (Amendment) Act, 2000* (Section 8) also allows the Minister to prohibit or limit the landfill of specified waste streams at a national level.

One of the main sources of waste streams such as wood, ferrous metal and other metals is the C&D sector. This industry is subject to the same waste legislation requirements as other industrial sectors, but there are indications that its activities in many cases contravene legislation. The waste in building and construction sites is often buried at these sites. The waste in site preparation or in the case of demolition is often sent to illegal landfills. Fly tipping is especially prevalent in this sector. Even when official and cost free waste C&D recycling facilities are provided[11] to this sector they are under-utilised.

The legislation in this sector is also inadequate, especially in relation to the separation of waste at source. In demolition, for example, there is no responsibility on the contractors to extract recoverable waste streams such as slate, tile, glass, wood, masonry etc. from other wastes through selective demolition. It is easier and cheaper for the contractor to simply knock in the roof of the building, knock down the walls, and dispose of all the mixed and recyclable material together in an illegal site.

Another problem with legislative implementation relates to hazardous waste, in particular to hazardous waste being produced by domestic sources. While this stream is not under consideration in this study, and may only represent a small fraction of the overall municipal waste stream, it is apparent that much of the domestically produced hazardous waste (including batteries, paints, cleaning agents, preservatives, etc.) is being landfilled despite the illegality of this practice. These waste streams also sometimes include recoverable metals from batteries, cans, other packaging waste etc.

6.1.14 Lack of extended producer responsibility

The concept of extended producer responsibility, whereby the producers of the waste are responsible for its recovery and recycling, is the cornerstone of many of the highly successful systems in other European countries. This responsibility usually takes the form of an arrangement with an appointed body. In most cases it applies to packaging waste in particular. In Germany this is achieved by the Duales System Deutschland (DSD) and in Austria by Alstoff Recycling Austria AG (ARA). In the year 2000, DSD collected 6.4 million tonnes of waste, of which 5.48 million tonnes was recycled (including heat recovery) thus meeting its recovery targets of 75 % for glass, 70% each for paper/cardboard and tinplate and 60% each for plastics, aluminium and composites. In Austria, in the year 2000, 679,265 tonnes of packaging waste were collected for recycling and heat recovery – approximately 60% of packaging arisings. The current REPAK scheme in Ireland has been set less ambitious targets from *Directive 94/62/EC on Packaging and Packaging Waste* and has required less funding from its member

[11] For example, in the Kinsale Road Landfill Site, Cork as part of the DEMCON 20/20 project

companies. Furthermore, not all companies producing waste and meeting membership requirements have joined the REPAK scheme.

The success of the REPAK scheme in meeting its targets for year 2000 is notable, but the required increase in recovery from 25% to 50% and eventually (by 2009) to 75% recovery will be extremely difficult for the current scheme, given its legal scope and financial basis.

As regards non-packaging waste, the producer responsibility for other waste streams, in particular waste from end-of-life vehicles (ELVs) and waste electrical and electronic equipment (WEEE), has not yet been properly been defined, nor are these waste producers recovering adequate amounts of waste.

6.2 Barriers Specific to Materials

As well as the 14 general barriers described above, each material stream also has specific barriers preventing their increased recovery and recycling. While these specific barriers to individual waste streams are discussed in more detail in the Fact Sheets for each material, they are described briefly below. These are also listed in Table 6.2:

Material	Specific Barriers
Glass	Green glass market; contaminants; mixed colours; insufficient bring sites; awareness levels; insufficient markets
Textiles	Awareness levels; personal nature of textiles; infrastructural deficiencies; throwaway society; lack of research
Ferrous Metals	Insufficient collection systems and bring sites; economic barriers; lack of collection facilities for WEEE; economic problems for WEEE collection; price fluctuations
Paper	No paper production in Ireland; price fluctuations; false public perceptions of recycled paper; lack of research
Cardboard	Insufficient cardboard production in Ireland; price fluctuations
Plastics	Many plastics on the market; non suitable for food packaging; large fraction of mixed plastics; energy value of plastics recovery; contamination; limited potential demand; low virgin plastics prices
Non-ferrous metals	Lack of WEEE collection facilities; economic problems with WEEE recovery; low awareness: hazardous materials
Aluminium	Lack of collection systems and bring sites, collection facilities; lack of support instruments; lack of awareness; waste characterisation of aluminium waste stream
Wood	Prevalence of contaminated wood; lack of wood waste segregation; lack of legislation implementation
UBCs	Little waste segregation; contamination; no paper mill in Ireland; nature of composites (different materials); poor infrastructure

Table 6.2: Barriers to recovery of specific waste streams

Material specific barriers include:

6.2.1 Glass

Since there is some capacity to accept and recycle higher levels of good quality cullet in Ireland, the main barriers relate to the collection and processing of this cullet. These include:

- **Problem regarding market for green glass:** At present, the potential supply of green cullet is greater than the potential market for green glass in Ireland. Only two products are produced from green glass by the main glass recycler, but large amounts of wine and certain beer bottles are imported which means that supply outweighs demand. This problem regarding a glut of green glass on the market in Ireland is therefore a potential barrier to increased levels of recovery.
- **Contaminants**: Since a high percentage of cullet is now used in glass manufacture, a high level of purity in that cullet is required. Stones and ceramics do not melt in the furnaces and they can block outpour holes from the furnaces into the bottle moulding machines causing damage and huge production losses. Recyclers can reject any cullet with contaminants. Furthermore, expensive and sophisticated equipment is required to remove potential contaminants - all this deters some potential glass collectors and suppliers.
- **Mixed Colours**: Another deterrent to higher levels of glass recovery is the mixture of colours sometimes found in the cullet. This is caused by people putting bottles into the wrong banks, either by colour blindness, carelessness or because the green banks are full. The cullet for amber and green container manufacturing requires a purity rate of 90%, that for clear glass requires 99% purity. Glass manufacturers will reject a load of cullet with insufficient colour purity – this material could then go to landfill.
- **Not enough bring sites**: Most glass waste is generated in the domestic sector (65%) yet this has only an 18.5% recovery rate compared to the 53.2% recovery rate in the commercial sector. It has been shown that one of the main barriers to recycling is a lack of convenience and it is much easier to throw bottles, jars etc. into our rubbish than to bring them to a distant bring site. Approximately only 1,100 bring sites are in use in Ireland at present, that is one per 3,500 persons. This compares to one bring site per 270 persons in Austria where there is an 84% recovery rate. Since glass is usually not considered suitable for collection by kerbside systems, bring sites are especially important for this waste stream.
- **Awareness Levels**: The general issue of environmental awareness and the low levels of awareness in Ireland are discussed above. However, with specific reference to glass, the general public is not aware of the total recyclability of this material, the potential for its reuse, the environmental benefits of its recycling etc. Nor are they aware of how much of the container glass they purchase is comprised of recycled glass already - the labelling of such products does not usually give this awareness raising information.
- **Insufficient Markets**: While the main users of glass waste in Ireland, i.e. two glass container manufacturers and one glass fibre manufacturer, are keen to accept more

cullet of a sufficient quality, further markets are required. This will prevent a monopoly situation, provide local solutions to local problems implementing the proximity principle, and allow for the usage of green glass waste and contaminated glass waste.

6.2.2 Textiles

Again, the companies involved in waste textile recovery and recycling seem to have sufficient markets to take these materials. The primary requirement for this material stream is to increase collection levels. The following barriers must be overcome to achieve such an increase:

- **Awareness levels**: the domestic sector is the main source of textiles, but the general public is not aware of the environmental and social benefits of textile recovery (whether clothing or carpets) – this false perception must be altered. Nor is the public aware of the benefits of purchasing second hand clothes. Commercial outlets that produce textile waste are also often ignorant of the fact that this material could be collected for free and recycled, saving them the costs of landfill.
- **The personal nature of textiles**: textiles are unique among the materials under consideration in this study, in that they are worn. Thus there is a type of personal relationship with certain pieces of clothing, unlike other waste streams. Although people know that they will not or cannot wear certain items of undamaged clothing in the future, they are averse to giving them up for reuse or recycling. Thus the clothes lie unused in wardrobes or boxes until they are no longer usable or fashionable. Many people are also reluctant to wearing clothing that was already worn by someone else - hence the market for used clothing remains relatively small.
- **Infrastructural deficiencies**: While some companies do provide kerbside collection of textiles, this does not cover a widespread area of the country. There is insufficient source separation of textiles among householders. The number of textile bring sites in Ireland is not accurately known. From information gathered in this survey, it is estimated to be between 200 and 250 in the whole country. Thus, at best, there is one bring site per 15,000 inhabitants. This is clearly insufficient. Furthermore, no recovery facility for waste carpets is available in Ireland which means that all of this resource is currently landfilled.
- **Throwaway society**: The increased spending power of young people, in particular, leads to the discarding (though not recycling) of relatively new and high quality clothes, simply because they have the wrong label or a more fashionable design has become trendy. Almost all of these new clothes are imported, having a damaging effect on our economy and the purchasers have such a low level of environmental awareness that they do not consider the environmental effect of the manufacture of these unnecessary items.
- **Lack of Research**: As is the case with other materials, there is insufficient research into the textiles that we use and their characteristics, especially with respect to potential reuses. Of those contacted in this study regarding other outlets for clothing, carpets and other textiles, none were aware of or had confidence in potential new outlets. It is now clear that textile and carpet manufacturers are studying the characteristics of these materials in Europe and in the USA [27], but little or no such study is being carried out in Ireland.

6.2.3 Ferrous metals

There are several barriers specific to higher rates of ferrous metal recovery in Ireland. These have resulted in the current poor performance regarding the recovery of metal packaging, ELVs and metal contained in WEEE compared with the rest of the EU. These include:

- **Insufficient source separation of steel cans**: There is inadequate source separation of steel cans in Ireland. The number of bring sites for steel cans (for food) in Ireland is not known, but is thought to be extremely low. This is not the case in other countries. While kerbside collections do recover food cans, these cover a very small percentage of households in Ireland. Thus there are very few possibilities for householders to recycle this waste stream.
- **Economic barriers**: Steel drink cans have a relatively low value compared to aluminium which is 65 - 75 times more valuable. In 2000, one tonne of steel cans was worth £10 (€12.70), while one tonne of aluminium cans was worth between £650 (€825.50) and £750 (€952.50), so the economics of collecting and recycling this material were poor. Steel food cans which are lined with tin require specialised treatment for tin separation. The cost of exporting these cans for this process makes it uneconomical to recycle them.
- **Lack of facilities for the collection of WEEE:** Only two authorities (Galway and Louth County Councils) provide a collection facility for all types of WEEE. While many other local authorities make the effort to collect white goods, it is estimated that over 80% of WEEE which contains many hazardous substances is sent to landfill. Since WEEE contains 47% ferrous metals and an estimated 16,920 to 34,780 tonnes of ferrous metals arise from WEEE in Ireland, this lack of facilities is a major barrier.
- **Only specific items of WEEE are economical to recycle:** Scrap dealers are reluctant to recycle WEEE that has a low metal value. They are also reluctant to handle WEEE that might contain hazardous materials which requires specialist recyclers. Currently there are only 10 recyclers which specialise in WEEE operating in Ireland and these companies only handle specific items of WEEE that are economically viable to recycle or reuse. Many forms of WEEE are composed of mixed materials, which require manual disassembly, which is costly. Therefore there is a significant percentage of WEEE that is not currently profitable to recycle based on the value of the recovered material alone.
- **Fluctuations in price and currencies:** The price for ferrous metals offered by international steel mills fluctuates with supply and demand. Furthermore, business people will need a guaranteed market at a guaranteed price before they engage in any business plan or acquire the finance to develop it. These guarantees are not available in the scrap metal business. The extra uncertainty regarding the currency rate fluctuations between the Euro and Sterling is another deterrent for merchants dealing with UK mills.

6.2.4 Paper

Paper is a major waste stream in Ireland, but recovery levels are extremely low in comparison with other EU Member States. This is due to the general barriers outlined above and the specific barriers for paper including:

- **No paper production in Ireland:** By far the most common use for waste paper worldwide is in the manufacture of more paper and pulp. One of the main reasons for relatively high recovery levels of paper waste in countries such as Austria, Denmark and Germany is the availability of paper mills that will take large volumes of this waste. There are approximately 1,200 pulp and paper mills in Europe but no paper mill in Ireland. Without a paper mill, Ireland must export most of its paper wastes, at a high economic and environmental cost, thus making it less competitive than paper wastes arising adjacent to the mills, especially in the UK.
- **Fluctuations in price and currencies etc.:** The price of waste paper quoted by paper mills is notoriously volatile. This volatility is a disincentive to agents or collectors of paper waste – even those situated adjacent to those mills. However, it is a major deterrent to Irish collectors whose financial outlays to both collect and transport this material to UK mills will be far higher than their UK counterparts.
- **False public perceptions on recycled paper:** There is still a widespread level of consumer misconception concerning the quality of recycled content paper. These misconceptions are common among domestic, commercial and industrial paper users. It is also a fact that certain newspaper manufacturers in Ireland do not use recycled paper as a policy despite the fact that in the UK levels of recycled paper usage are quite high in newspapers with no appreciable deterioration in quality. In the early days of recycled paper there were problems with appearance and copier performance, but this is no longer the case as recycled paper can now meet the same technical specifications as virgin equivalents. In fact, in some cases, recycled paper can better meet user requirements.

  Another problem with public perception is that consumers generally expect recycled paper to be cheaper than its virgin equivalent. Without the required economic instruments, this is not usually the case, with recycled paper being marginally more expensive, less than 5% in some instances, for same quality paper.
- **Lack of Research**: Another barrier to higher levels of waste paper recovery is a lack of knowledge regarding potential uses for this stream. The lessons learned in other countries need to be transferred to an Irish situation and socio-economic climate. Furthermore, how we use our paper and why we use so much of it needs to be researched for ways that we can reduce this usage and change our ways. An exact characterisation, for example, of the types and uses of paper in domestic, commercial and industrial sectors is required. This is especially true when one considers that in Ireland the per capita usage of paper is so relatively high in comparison with other countries.

6.2.5 Cardboard

Barriers specific to the increased level of cardboard recovery in Ireland include:

- **Insufficient cardboard production in Ireland**: By far the most common use for waste cardboard worldwide is in the manufacture of more paper board products. Without a second cardboard mill, Ireland must export large volumes of cardboard wastes, at a high economic and environmental cost, thus making it less competitive than paper wastes arising adjacent to the mills, especially in the UK.
- **Fluctuations in price and currencies etc**.: The price of waste cardboard quoted by paper mills is notoriously volatile. There were price booms in 1989 and 1994-1995 and busts in 1993 and 1996-1999. The prices also varied from negative costs to values over the basic pulp price. Thus the cyclical and volatile nature of pulp prices is mirrored in the values of recovered waste cardboard and this creates difficulties for the development and protection of a stable and sustained waste paper collection market in Ireland.

6.2.6 Plastics

There are several barriers to waste plastic recovery in Ireland, including:

- **Many plastics on the market**: There is a large variety of plastics and plastic products in the municipal waste stream. Very often products are made from mixed plastics or are composed of composites of plastics with card, metals, paper, organics etc. The more types of plastics on the market, the greater difficulty there is in segregating the plastics of different molecular construction for mechanical recovery. If there were fewer types of plastics, it would be easier to separate them into manageable groups given the economies of scale regarding kerbside collection and subsequent separation from a materials recovery facility (MRF). The value of mixed plastics is much less than that of separate plastics and in Europe this is mostly sent to incineration with energy recovery.
- **Not suitable for food applications**: EU legislation [28,29] lays down strict criteria regarding the qualities of plastics that are allowed to come into contact with food. This is obviously to prevent any potential food contamination. Because of the stringency of these directives, plastics recyclers are reluctant to use their product for this type of packaging. This means that the potential market for recycled plastics in the packaging industry is limited since much of the plastics used in food packaging come into contact with food.
- **Large fraction of mixed plastics**: Mixed plastics form a very large fraction of the plastic waste arisings in Ireland. This is especially true for domestic waste, which has currently the lowest recovery rate (0.5%). Since Irish householders segregate very little waste at source, this situation is likely to continue with possible exceptions in areas such as Dublin, Galway and Co. Waterford. Since mixed plastics are of very limited use and low value, the economic consequences of post disposal collection and separating of this stream are not conducive to mechanical recovery.
- **Energy requirements to sort & segregate vs. energy saved:** Several organisations are now examining the environmental value of mechanical recovery and recycling of mixed plastics [30,31,32] in certain conditions. There is little doubt as to the

environmental value of recovering individual high quality waste plastic streams, such as PET, HDPE etc. using bring sites and kerbside collection schemes. However, for the majority of mixed plastics and plastics of lesser quality, the environmental benefits are less.

- **Contamination problems:** For high quality mechanical recycling, it is necessary to take care that waste plastics are not contaminated. This is ensured by segregation at source, as well as good collection and recovery schemes. Since domestic waste comprises up to 67% of the plastic waste available, in order to ensure viable mechanical recycling, contamination must be avoided.
- **Limited potential demand:** LDPE in the form of foils, wraps, pallet wrappings, construction foils, bags for non-food items, gardening foils, plastic bags etc. comprise the largest single element of the plastic waste stream in Ireland. When collected, these 'soft' plastics tend to be of low quality, dirty and not suitable for many end-markets. The only outlets for this type of material are waste sacks, mulch films, other films etc. and the markets for these products will quickly become saturated if higher levels of plastic waste recovery come on stream.
- **Low virgin plastics prices:** One of the main barriers to recycling plastic is the lack of sustained competitive pricing between virgin polymer and recyclate. Generally the cost of virgin polymer is cheaper, and it also fluctuates, creating instability in the market. This risk deters potential investors and causes a barrier to higher levels of recovery. It also means that it is often cheaper for plastics manufacturers to buy virgin polymer to manufacture their products.

6.2.7 Non-ferrous metals

Although non-ferrous metals are often of a high value and agents seem to have easy access to markets abroad, the level of recovery in Ireland is still low. Thus, it would seem that there are barriers to be overcome. The barriers specific to non-ferrous metals include:

- **Lack of collection systems for WEEE**: Since 8% of WEEE comprises non-ferrous metals (primarily copper) it is estimated that up to 5,920 tonnes of non-ferrous waste arises from this waste stream. Currently there are only two authorities (Galway and Louth County Councils) that provide collection facilities for all types of WEEE. It is clear, therefore, that there is a lack of facilities for this waste stream at present.
- **Economic problems with WEEE recovery**: Many forms of WEEE are composed of mixed materials, which require manual disassembly, which is costly. WEEE that contains hazardous materials is also expensive to recover. Therefore there is a significant percentage of WEEE that is not currently profitable to recycle based on the value of the recovered material alone.
- **Low Awareness Levels - Hazardous Materials**: Specific to non-ferrous metal, especially components of WEEE, is the fact that most consumers do not consider this material to be recyclable. Much of the public are unaware of the environmental damage that can be caused by the disposal of hazardous non-ferrous metals such as those contained in batteries, (lead, cadmium, nickel). Public awareness programmes

and better collection systems for hazardous wastes are recognised as a key driver for success in those areas that have achieved high recovery levels.

6.2.8 Aluminium

Despite the high value for aluminium waste and the relatively high levels of arisings from packaging, WEEE, ELVs, manufacturing, C&D and other sources, recovery levels are low. The following barriers specific to aluminium prevent higher recovery levels at present:

- **Not enough collection schemes or bring sites**: the number of kerbside collection systems and bring sites for aluminium cans is low in Ireland at present. Unlike glass, aluminium cans are light, easy (no colour separation required) and safe to recover. The beverage contained in cans is usually consumed quickly, often near the sales outlet or at home. Collection of waste aluminium cans should be relatively easy and levels of recovery of cans in other countries is very high. There is almost no collection infrastructure for other forms of aluminium packaging in Ireland. Almost no foils, trays, or other forms of packaging (which comprise 34% of aluminium packaging) are recovered in Ireland.
- **Lack of support instruments**: Despite the financial value of this waste, only four main recovery companies are active in Ireland. It is up to these companies to promote aluminium recovery schemes and to develop the infrastructure to collect this valuable waste. These companies need support in their efforts to recover waste aluminium cans. Local authorities in particular could provide better partnership possibilities to these companies in their efforts. A more aggressive and innovative campaign to recover this resource is required.
- **Lack of Awareness**: Most consumers do not consider this material to be recyclable when they purchase beverages packaged by aluminium. 50% of people surveyed in 2000 indicated that they have never recycled aluminium cans. Thus the use of labels on aluminium cans would be worthwhile, pointing out, for example, that by recycling them, 95% of the energy used in primary production can be saved. Unlike other materials, such as plastics, aluminium packaging is easy to store for recycling and has a high economic value. Without comparative information, consumers cannot make an informed choice regarding the type and environmental value of the packaging they choose, nor can they be persuaded not to waste this material.
- **Waste characterisation of aluminium**: Approximately 11,780 tonnes of packaging aluminium waste arose in Ireland in the year 1998. However, insufficient details exist regarding the exact composition of this waste stream, thus making it difficult to know the type or source of this waste. Without knowing the types of waste arising, it is difficult to determine the best methods of recovery and without knowing how these materials are used, it is difficult to develop plans to minimise their usage.

6.2.9 Wood

Wood waste is a very recyclable commodity. However, there are barriers in Ireland to the collection of this stream and there are limited outlets in place at present. These barriers include:

- **Limited outlets for contaminated wood**: Much of the wood waste arising in Ireland is contaminated with paints, varnishes, adhesives, wall coverings, insulation, and wood impregnated chemicals. This limits their potential usage, for mulch, wood products, as a fuel etc.
- **Lack of segregation of wood waste**: A major barrier to the recovery of wood from municipal waste is the lack of segregating this wood from a composite waste stream. For example, the wood element of demolition waste is often combined with metals, concrete and other building materials. Similarly, the wood in waste furniture is combined with many other materials. It is currently generally considered not economically feasible for waste contractors to segregate wood from these composite waste streams when compared to the cost of sending these materials to landfill, though there are a few exceptions.
- **Waste legislation implementation:** One of the main sources of wood waste is from construction and demolition (C&D). Construction and demolition (C&D) waste is commonly landfilled on construction sites and in illegal 'tips'. Increased enforcement is required in order to prevent the illegal disposal of C&D waste and to provide an incentive for construction and demolition companies to have their waste recovered and recycled.

6.2.10 Used beverage cartons (UBCs)

The barriers specific to preventing UBCs being recovered in Ireland include:

- **No waste segregation – contamination:** One of the main requirements for ubc recycling is the importance of keeping this stream separate from other household wastes. For acceptance at mills, at least 90% purity is required. 10% acceptable contamination includes only water. No more than 5% tolerable contamination (other coated/laminated packaging from frozen foods etc.) allowed. Since there is so little waste segregation in Ireland, with only 2 kerbside schemes collecting UBCs, there is little chance for the recovery of this waste stream.
- **No paper mill in Ireland***:* Over 50% of the recovered UBCs in Europe are repulped, the fibre element extracted and used in paper related and other production. Since there is no paper mill in Ireland capable of taking this stream, it must be exported. The extra transport cost of transporting this relatively low value commodity is a major deterrent to increased recycling levels. Without a mill capable of processing this waste stream, the economical viability of recycling is low. The export of this recyclate also causes an environmental load and brings into question the environmental benefits of recovery, vis-à-vis other disposal methods, especially energy recovery.
- **Nature of composites – different materials***:* One of the problems relating to composite materials in general is that they are made from a combination of materials that are often difficult and expensive to separate after recovery. Thus in the case of UBCs, the fibres must be extracted for reuse. In the case of larger composite products, such as electronic and electrical equipment, again only some elements of the product are useful and they must be extracted in disassembly.

- **Poor infrastructure*:*** As is the case with other waste streams, the poor infrastructure for kerbside and other collection schemes (as well as bring sites) deters recovery of UBCs and other composites. Virtually no bring sites are available for this waste stream in Ireland. Until methods of recovering this stream are developed, it is not possible to collect, process and create viable markets for the resulting products.

6.3 Summary of Barriers

Thus it can be seen that the recovery of each individual waste stream is hindered by a number of specific barriers. However, the effect of the general barriers outlined in Section 6.1 above is further developed in Table 6.3 on page 64.

As can be seen from this table, almost all of the 14 general barriers identified hinder every waste stream's recovery potential with the exception of the paper mill which is exclusive to just paper, wood and UBCs. Paper and wood are hindered by all barriers, but the extent of the hindrance to paper recovery (little of what is recovered being recycled in Ireland) is far higher than that to wood (all of what is recovered being recycled in Ireland).

While it is not exactly accurate, it is possible to relatively compare the effect of the combined barriers on each waste stream. **From this it can be seen that paper, cardboard and plastic are the most hindered by the barriers in place, and the lack of instruments to overcome them.** These are also very large waste streams, so a range of measures and instruments are required to recovery the large amounts of materials involved.

Given the very low recovery rate of these three streams, especially in comparison to that of other EU Member States, it is not surprising that significant barriers exist to improved performance.

It is clear that these three waste steams in particular will require instruments in order to increase their recovery levels adequately.

However, paper, though a very large waste stream, is not generally a packaging material, and does not receive the same level of support as cardboard and plastic from the REPAK scheme. This means that paper, in particular, requires a high level of assistance to overcome its barriers. **The main barrier pertaining to paper is, by far, the lack of a paper mill in Ireland combined with the lack of adequate collection facilities.**

Material / Barrier	No culture of recycling	Small island	No paper production capacity	Cheap and easy disposal	Low awareness levels	Infrastructural deficiencies	Lack of research	Lack of information	Lack of standards	Technical barriers	Lack of Green procurement	Lack of economic instruments	Legislation problems	Lack of extended producer responsibility	* Total
Glass	**	*		**	***	***	*	*		*	*	**	*	**	20
Textiles	*	*		**	**	**	*	*			*	*	*	*	14
Ferrous Metals	*	*		*	**	**	*	*	*	*	*	**	*	**	17
Paper	***	***	***	**	***	***	**	*	**	**	***	***	**	***	35
Cardboard	***	***		**	***	***	*	*	*	**	***	**	**	**	28
Plastics	***	***		***	***	***	**	*	**	**	***	**	**	***	32
Non-ferrous metals	*	*		*	**	**	*	*	*	*	*	*	*	**	16
Aluminium	**	**		**	***	***	*	*	*	*	*	**	*	**	22
Wood	**	*	*	***	**	**	*	*	*	*	**	*	***	*	22
UBCs	*	*	*	**	*	**	*	*	*		*	*	*	*	15

Table 6.3: General barriers to recovery and their effect[12]

[12] * indicates a minor barrier; ** indicated a moderate barrier, *** indicated a major barrier

7. Strategy for Waste Reuse and Recycling

A strategic approach is required in order to overcome the many barriers outlined in the previous section. All the required elements for a major increase in the recovery and recycling of waste must be put into place and the forces and drivers to achieve this must be managed effectively and proactively. The active participation of the various stakeholders is of paramount importance.

Several of the potential required instruments and tools are outlined in Section 8. It is not sufficient, however, to implement these on an ad hoc basis. It is imperative that these driving forces are put into place in a considered and strategic manner. Specific responsibilities must be identified and the relevant target groups must be assigned these responsibilities, so that a maximum effect is ensured. The implementation of such a strategy also requires that all the measures are mutually supportive.

The aim of this strategy is to reduce the waste we are creating and then to convert that waste into useful raw materials that can be used beneficially in the manufacture of viable products. By a series of actions, delivering a range of tools to the stakeholders involved (all the population), this strategy will reduce our unnecessary consumption of finite resources as well as diminishing our dependency on landfill and the concomitant pollution that it can cause.

7.1 Three Levels of Strategy

There are three levels to this strategy. At the widest level is the strategy itself to create a sustainable culture of recycling in Ireland. Within the strategy, and driving it, there are the tools and policy instruments required in order to develop the proper awareness, information, economic and legislative conditions and infrastructure. However in order to bring about and deliver these instruments, several specific actions are required by the various main stakeholders. The carrying out of these actions delivers the tools and instruments required to put into place the framework for recycling. The delivery of the actions and development of the instruments is overseen and managed effectively in the implementation of the strategy for change.

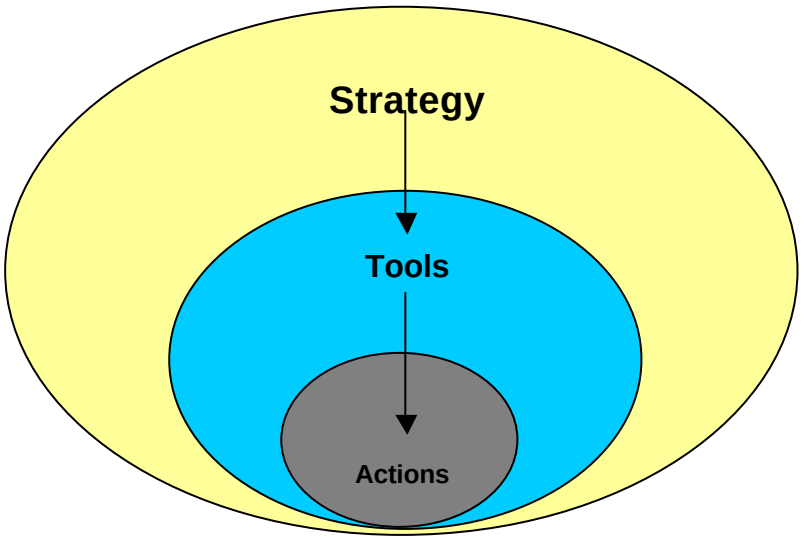

Figure 7.1: Three levels of strategy for change

7.2 Five Elements of the Strategy

There are five main components or strands of this strategy. Each has a different focus, but all are required and all are interdependent. Without any one of these elements, the strategy is less likely to be successful. Indeed, it is inevitable that the strategy would fail in the absence of the more crucial elements. Each element of the strategy is driven by the application of a number of tools and instruments. The five elements of the strategy are:

1. **Raise awareness of the problem** and the need for change. Motivate people so that they are willing to make a change in behaviour relating to waste and recycled products.
2. **Develop and deliver information**, giving people the knowledge how to best to reduce and recycle waste and the confidence to do so.
3. **Develop and put into place the economic conditions** to make recovery and recycling of waste financially and socially viable.
4. **Identify and set up the correct physical infrastructure** to facilitate the collection and reprocessing of waste.
5. **Create and enforce the legislative framework** to ensure that waste producers comply with best practice and reduce their disposal of waste to landfill.

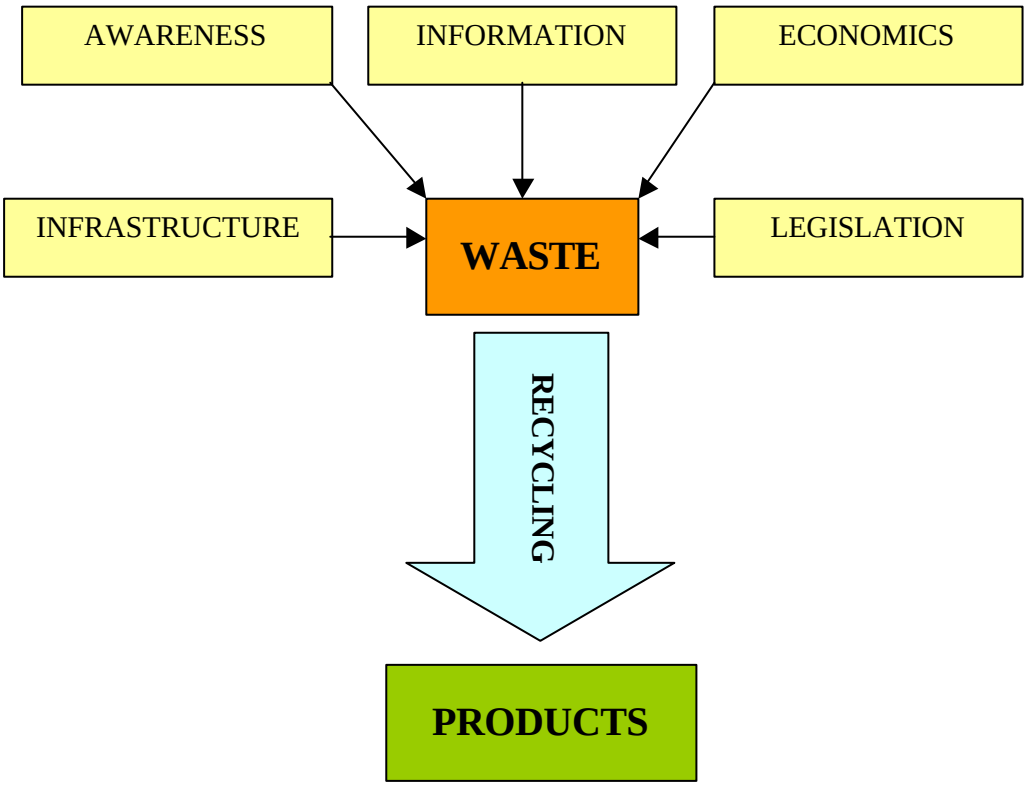

Figure 7.2: Elements of strategy

7.3 All Stages of Recycling Chain

As discussed above, the initial focus of this study was on the demand issue for recyclates and recycled products, and the potential of new outlets and markets for the various waste streams. Several potential new outlets were identified for various materials in Section 6 and the Fact Sheets. However, as is explained above, the need for new outlets is greater for some materials than others. But in the case of all materials, in order to make new outlets viable, it is necessary to ensure the supply, collection and processing capabilities of much larger waste volumes. Thus any strategy to increase the markets for recycled products in Ireland must take an holistic approach and look at all stages of the process, not just one.

The four stages of the recycling chain are supply, collection, processing and demand. It is not enough to simply ensure that there are sufficient amounts of segregated waste available for recycling. The systems of collection must be in place so that these wastes can be cost-effectively gathered in the appropriate form using best practice by the various agents required. The infrastructure for collection must be developed, but so must the facilities for recycling and reprocessing. However, this is still not enough. It is also necessary to increase the demand for the recyclate and the products manufactured therefrom. And, once these products have been used, their 'waste' can be entered into the chain for another cycle.

All the four stages of the recycling chain are interdependent and mutually supportive. They all require tools and policy instruments to strengthen them. They also all require actions to implement these tools and instruments of support. Thus any strategy to develop sustainable and long-term viable markets for recyclates and recycled products must apply itself to all stages of the recycling chain.

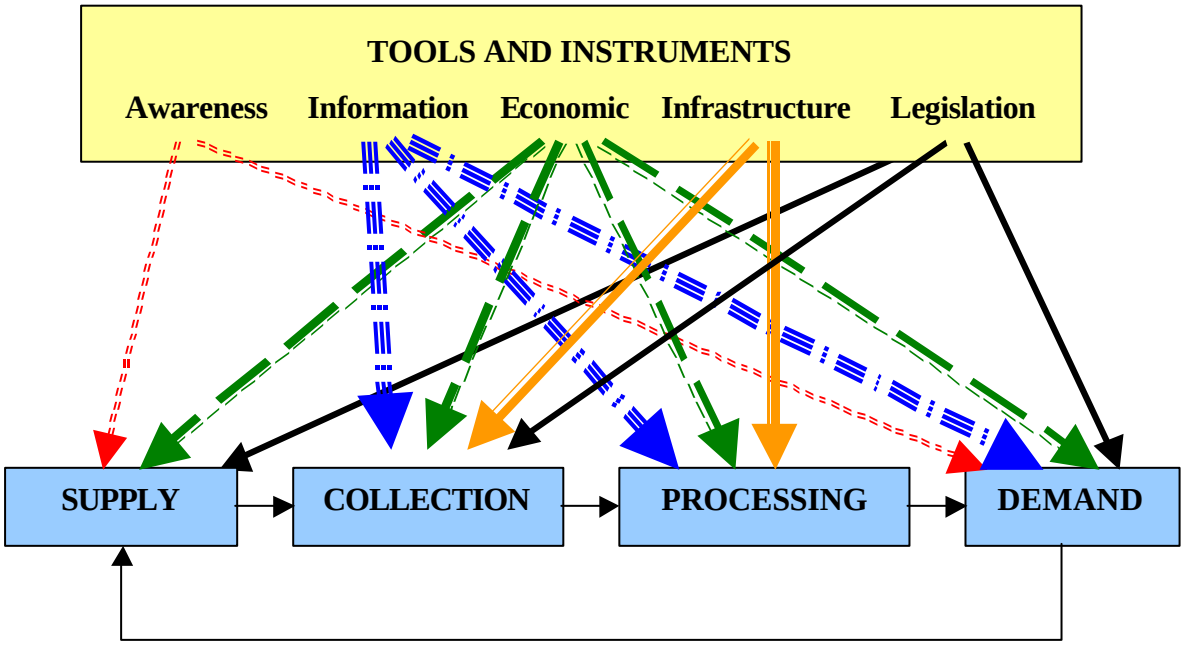

Figure 7.3: Stages of the recycling chain

- In order to increase the supply of recyclable waste, tools to promote awareness, economic instruments, and legislative improvements are required.

- In order to ensure collection, technical information, economic conditions, infrastructural development and legislative tools are required.
- In order to increase processing capacity, technical, economic, and infrastructural tools are required
- In order to increase demand for recycled products, greater awareness is required, as well as technical information (what is possible from the recyclates). Economic and legislative support is also required.

7.4 Carrot and Stick Approach

In order to put into place a recovery and recycling regime in Ireland, a carrot and stick approach is necessary to stimulate the waste producers to change their ways.

Since change is a difficult concept for many people, they will need as much support as possible. This support can come from a heightened awareness, whereby they learn the problems that Ireland is facing, the pressures on our environment, the pollution they are causing, the damage they are doing to the future generations of our citizens. From this awareness, they can learn what must be done. But this awareness raising is a long and painstaking process. Results may not be apparent immediately. There is no quick fix.

This support can also come from information, giving people the knowledge what to do, how to make their segregated waste available in the best way etc. It will also come in the form of economic conditions, whereby it is financially beneficial for them to buy recycled products and to make their waste available for recycling. This also enforces the polluter pays principle. A better infrastructure, whereby it is easier for them to physically make their waste available (through more bring sites, better collection systems etc.), is another incentive (or carrot) based tool.

However, the incentive or 'carrot' must be supported by the 'stick'. This stick will ensure that people are simply not allowed to continue to consume on an unsustainable basis nor to dispose of their ensuing waste in a manner that, while suiting their convenience, also pollutes and deprives future generations of these materials. This requires the enactment of future legislation and the proper enforcement of current legislation. This legislation must be supported by punitive economic instruments, whereby it will also be very costly for these waste producers to pollute and consume resources.

Information, economic support and a better infrastructure also provide incentives for those involved in the recycling business (at collection or reprocessing levels) to develop the industry. At present, there are too many economic and other barriers to attract potential investors to the industry.

Table 7.1 on page 69 shows the carrot (or incentive) and stick (or disincentive) based tools and instruments.

Carrot (Incentive based) Instruments	Stick (or Disincentive based) Instruments
Awareness	Legislative
Information	Economic disincentives to disposal
Economic incentives to recovery	
Infrastructure	

Table 7.1: Carrot and stick approach

7.5 Stakeholder Involvement, Roles and Responsibilities

Everybody in Ireland is a stakeholder in the waste and pollution issue. We all produce waste, in our work, leisure and home, so we are all polluters. However, since we all depend on clean soil, water and air, we all have a major vested interest in ensuring that they are protected and that the landfilling and incineration of waste be minimised. We all require raw materials for our work, food and shelter. However, we must also ensure that future generations have access to the level of resources that we enjoy. This means that every citizen must be targeted in any national strategy to recover and recycle waste. Since different stakeholder groups have different responsibilities vis-à-vis the different elements of the recycling chain, the different instruments available must be applied in a suitable manner for each. Some stakeholders have roles in the development and implementation of tools and instruments. Others will be the main targets of these drivers so that they can behave more responsibly with respect to the raw materials they consume and the waste they create.

The main stakeholder groups are as follows:

- **Government Departments and State Agencies**[13]: this includes the Department of Environment and Local Government in particular, but also other relevant departments, such as Finance, Education and Science, and Enterprise Trade and Employment etc. It also includes state agencies such as Enterprise Ireland, the National Standards Authority of Ireland, Forfás etc.
- **Local Government**: this includes county councils, town and city corporations, urban district corporations.
- **Industry**: this includes all elements of business and commerce including all industrial sectors, agriculture, service sectors, tourism, finance, commerce, retail, transport etc.
- **Consumers**[14]: this includes all consumers such as domestic, industrial, public agencies etc.

[13] Note: in the case of green public procurement, awareness raising, research etc. national and local government also includes all public agencies including schools, health boards, hospitals, colleges, universities, semi-state companies etc.

[14] While everybody consumes material in their home, job and at leisure, different instruments will focus on the different consumption activities of the people within these roles. Similarly everybody produces waste, but different instruments will focus on the activity of waste production within different roles.

- **Recyclers**: this includes all business elements involved in waste management, collection, reprocessing, reusing and recycling.
- **Waste Producers**: this includes all waste producers such as domestic, industrial, public agencies etc.

National and Local Authorities have the main role to play in the development and implementation of tools and instruments since they drive the social, legislative and economic infrastructure within which we live. Industry, as the main creator of the products that will ultimately become waste, also has a role to play in the development of tools to reduce its own burden on the environment.

As regards the target groups for the tools, they are primarily the consumers of raw materials and waste producers. These consumers may be domestic, industrial, public agencies etc. Likewise those who produce waste as a result of this consumption. Another target group may be classified as recyclers, i.e. those who collect and process the waste streams and who will, ultimately, develop the recycling industry to the required level.

The main roles of the stakeholders are summarised below:

Instrument Developers
Government Departments, State Agencies and EPA
Local Government
Industry

Target Groups
Consumers (domestic, industrial, public agencies)
Waste Producers (domestic, industrial, public agencies)
Recyclers

Other stakeholder groups with an important role in the development of a viable recycling industry in Ireland are:

- **EPA**: the EPA will obviously play a central role in the licensing and regulating of waste issues, the development of data, the co-ordination of research, the development of a strategy etc.
- **NGOs**: NGOs will continue to play an important role regarding waste recycling, as representatives of the general public, as independent environmental protectors etc.
- **REPAK**: REPAK is the only current government approved body to implement producer responsibility with respect to packaging waste in Ireland.
- **Environmental Experts**: independent environmental experts will continue to carry out research and develop the required information to drive recycling, develop new markets etc.
- **General Public**: the general public must play its part, accepting responsibility for its waste, making itself aware of the issues, increasing its waste recovery and purchasing recycled and more environmentally friendly products.

7.6 Who Will Drive the Strategy?

Central to any strategy is the question of who will have the responsibility to implement it. In order to optimise the co-ordination and to ensure a coherent implementation of the wide range of activities and the development of tools suggested herein, it is recommended that responsibility is allocated and that sufficient resources are made available. Also, since so many instrument developers are required to act and so many groups targeted, these must be brought together in an effective manner to ensure maximum co-operation. Above all, allocation of responsibility and provision of adequate resources are required to drive forward the actions required to create the conditions under which recycling can prosper.

It is essential to bring together all the various elements of the strategy and marshal all the relevant stakeholders into appropriate action. It is suggested that responsibility be assigned, but it is outside the remit of this study to further suggest the form or designation of such responsibility. It is further suggested, however, that relevant stakeholders be involved in any process aimed at bringing to fruition the strategy and consequent actions. Examples include Government Departments and State Agencies, EPA, Industry, Recyclers, REPAK, Local Authorities, NGOs and Independent Environmental Experts.

It should be borne in mind that recycling is only one constituent element in tackling the waste problem. Other elements might be prevention, minimisation, incineration with heat recovery, and disposal. Additionally, actions could be dovetailed with the National Hazardous Waste Management Plan. As a matter of urgency a Waste Prevention Strategy for Ireland is required to reduce the amounts of waste being generated.

In essence, an overall sustainable Waste Management Strategy should be implemented and the reuse and recycling strategy developed in this study would be but one constituent part.

It is also suggested that a national focal point relating to waste be provided - something which is currently lacking. It will consider both packaging and non-packaging waste.

The strategy should be given the required resources for effective operation. These could be supplied (for example) by national government, from the Environment Fund, from future extended producer responsibility schemes and generally from funds and charges collected by implementation of the polluter pays principle.

The strategy and responsible agents should be action driven - it should not merely involve discussion groups alone. It should set specific targets and goals and develop plans to achieve them. It should be the central hub of the network of actors and stakeholders required to create conditions for sustainable waste management in Ireland.

Several formats for developing responsibility are possible. Whichever format is chosen, it is important to realise that a committee or other discussion forum alone will not suffice. **Real power, permanent staffing, and an action orientation are required.**

Figure 7.4: Network of actors to develop sustainable waste management

7.6.1 Functions of the recycling programme

The overall strategy can involve actions which might encompass several functions. Examples of these are:

- **Awareness Campaigns**

  In general, all awareness raising activities could be channelled through one source.

- **Market Development Programme**

  Market development activities can also be developed. These would include initiatives and studies into the feasibility of creating local markets to replace/supplement those currently only available overseas.

- **Research and Development Programmes**

  Such programmes would fund both basic and applied research into additional or new products from wastes. This research differs from the importation of new product technologies (such as moulded fibre packaging and cellulose insulation) in that projects would be aimed at creating entirely new materials and outlets.

- **Provision of Information**

  Closely linked with awareness raising, a central source would offer a dedicated clearing house or one-stop shop supplying specialist information to industry, recyclers, local authorities, consumers, etc. Such information might vary from technical to logistical (location of nearest bring site, potential waste outlets, etc.)

- **Provision of Grants and Financial Supports**

  It may also be beneficial if a single source or responsible organisation would provide grant aid or might mediate in the provision of grant aid for new recycling initiatives, new schemes, etc.

8. Potentially Viable Tools and Instruments

The central element of the strategy to increase recovery levels of waste in Ireland is the application of several tools and instruments to create the conditions within which recycling can prosper. None of the countries that have achieved significant recycling levels, such as Netherlands, Austria, Germany and Denmark have done so without a major programme of support mechanisms over a long period of time.

One study [33] that identified how several regions achieved high recovery levels, showed the following drivers, as listed in Table 8.1 below:

Principal driver	No of case studies applicable	Examples
Waste management entities		
Restrictions on landfill (regulatory & fiscal)	6	Denmark, Germany, Netherlands, Italy, Seattle, Ontario
Requirement to provide separate collection facilities	4	Ontario, Netherlands, New York, Italy
Producer responsibility	3	France, Germany, Netherlands
Other fiscal drivers (deposit refund)	3	Denmark, California, New York
Markets for recyclates (paper)	5	Italy, California, Canberra, Ontario, Seattle
Households		
Volume based collection charges	4	Denmark, Germany, California, Seattle
Good collection facilities	All	Denmark, France, Germany, Italy, Netherlands, California, Canberra, New York, Seattle, Ontario, New Zealand
Public awareness	All	Denmark, France, Germany, Italy, Netherlands, California, New York, Seattle, Ontario, Canberra, New Zealand

Table 8.1: Principal drivers to improve recovery levels in 11 regions

As can be seen from Section 6, there are apparent in Ireland, at various levels and affecting various stakeholders, several barriers to the development of a higher level of recycling. These can only be overcome by a wide range of mutually supportive tools and policy instruments that can drive the recycling process, at all its four stages, and involving all the main stakeholders in beneficial roles.

Table 8.2 on page 74 shows a matrix with the main barriers identified and described in Section 6 and some potential tools and instruments that can be used to overcome them.

Barrier / **Instrument**	Awareness Raising Programme	Eco Labels	Participatory Approach	Standards	Design for the Environment	Information Provision	Market Development Programme	Economic Instruments	Green Public Procurement	Pan-Irish Approach	Extended Producer Responsibility	Public Private Partnerships	Infrastructural Development	Paper Mill	Legislation Implementation	Landfill Bans	Research
No culture of recycling	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Small Island	*						*		*				*				*
No paper production							*	*	*		*		*	*			*
Cheap and easy disposal								*							*	*	*
Low awareness levels	*	*	*		*	*	*		*			*	*				*
Infrastructural deficiencies								*		*		*	*	*			*
Lack of research							*	*									*
Lack of information	*	*	*	*	*	*	*						*	*	*	*	*
Lack of standards				*			*										*
Lack of green procurement	*	*	*	*	*	*	*	*	*								*
Lack of economic instruments								*									*
Legislative problems															*		*
Lack of extended producer responsibility					*						*						*

Table 8.2: Barriers to recycling in Ireland and potential tools to overcome them

In some cases more than one instrument is necessary to overcome a barrier. For example, all instruments will have a beneficial affect on the development of a recycling culture and several will improve the low levels of environmental awareness, lack of information, and lack of green procurement.

Likewise some instruments, such as awareness raising, the market development programme, economic instruments and green public procurement will aid the breakdown of more than one barrier and are thus highly recommended. However, this matrix does not attempt to 'weight' or prioritise the instruments, rather it shows which instruments are required to break down the respective barriers earlier identified.

It should be noted in this matrix that research is required, not only to learn how best to overcome all the barriers present, but also how best to identify and develop the tools and instruments required to overcome these barriers.

It should also be noted that for the barrier 'small island', while obviously no instrument is recommended to tackle the size of Ireland, its low population density and its relatively low urban/rural population ratio (50:50) per se, it is possible to alleviate the problems with regard to recycling that these geographic and demographic attributes have caused.

8.1 Component Instruments

As discussed in Section 7.6, the first step in the development of any strategy is the allocation of responsibility for its implementation. It is essential to bring together all the various elements of the strategy and marshal all the relevant stakeholders into appropriate action.

Strategy Components	Instruments (including Research at all Levels)
Awareness	Awareness raising programme Eco labels Participatory approach
Information	Standards Design for the Environment Information provision Market Development Programme
Economic	Economic instruments Green procurement Pan-Irish approach Extended producer responsibility Public private partnerships
Infrastructure	Infrastructural development Paper mill
Legislation	Legislation implementation Landfill bans

Table 8.3: Instruments and components

To support the strategy from the beginning and to ensure that it takes the correct path, further research is required. This is needed for every component of the strategy, to learn more about our wastes, how best to increase awareness, what information is required by each actor, what economic instruments are best to stimulate the various streams, how best to develop the infrastructure required and what type of legislation is also required.

As stated in Section 7, the strategy will have five main components, and a mutually supportive set of tools will be applied to drive each component. The tools and instruments that have been applied elsewhere and that should be considered in Ireland for each of these components are listed in Table 8.3 on page 75.

8.2 Awareness Based Instruments

Three main instruments must be applied to increase the levels of awareness to the required level for the strategy to succeed. These include:

8.2.1 Awareness Raising and Education Programmes

A major instrument and tool to ensure less waste creation and more waste recovery is the development of a higher level of environmental awareness among the general public, public agencies, commerce and industry. Without this awareness it is not possible to ensure the widespread collection of waste streams or usage of recycled products.

There are many key elements of a local or national environmental awareness raising campaign, the goal of which is not only to raise public awareness and concern regarding the environment, but also to translate this concern into a change of behaviour to more sustainable actions. Any such campaign will not focus on one waste stream, or one waste issue such as water or energy. Rather it will take an integrated approach to ensure that all elements of environmental best practice are promoted.

Waste separation is a vital element in the successful recovery and reuse of waste streams. This is especially true in the domestic sector where waste can easily become contaminated and worthless. In order for people to reduce their waste production, and then separate the waste streams for recovery, they must first become aware of it. Awareness is the first step in waste recovery.

The success of the recent Foot and Mouth prevention campaign in Ireland is an example of what can be achieved when the forces of government, industry and the media are engaged on a massive scale, marshalled well and in a focused manner. The public support for and involvement in all the required and simple activities to prevent the spread of this disease was exemplary. It also shows that the public can behave responsibly when properly motivated. The lessons learned from this campaign can also be applied to protect our environment, but it will require the proper resources and this subject will have to be considered as important as the protection of our meat industries.

Some elements of a successful, long-term campaign include the following:

Multi-Stakeholder Involvement

All people are part of the problem regarding waste, so all people are part of the solution. Furthermore, no social involvement can be ensured in any strategy unless people feel an inclusion and an ownership of the campaign. Everybody creates waste, at home, during

leisure, or in his or her work. How they use materials, what volumes of materials they use, what type of materials they use, how they dispose of these materials are all key issues to be addressed in any campaign. Domestic, public agency, commercial and industrial waste sources need to be targeted. Children, young adults, and adults will need a slightly different approach to win them over.

However, all user groups also need to be consulted in the development of any such campaign - the support of consumer groups, NGOs, educational officers, local authorities, industry, youth associations, chambers of commerce, environmental regulators, academics, environmental consultants, manufacturers and importers, recycling organisations, national government, resident groups *et alia* is required for success.

An innovative and daring approach is often required, especially for younger target groups. A recent environmental awareness campaign in the Netherlands for children, based on the Internet, was written by children themselves. No mention was made of the government or Department of Environment to make sure that children would remain interested. When a picture of the Minister did appear, it was in cartoon format and not very complimentary. This kind of innovative thinking is required to win the attention and hearts of children and other stakeholders[15]. A totally new approach is required regarding the raising of environmental awareness in Ireland, at all levels.

Local and National Campaigns

Environmental campaigns are best carried out at a local level, the smaller the location the better. People, as individuals, do not feel ownership of Ireland as a whole, but they do feel strongly about their own homes, streets, townlands, villages and towns. This is exemplified in the sudden environmental awareness that becomes apparent in areas where landfill sites, transfer stations or incinerators are proposed. All environmental awareness campaigns should tie in with Local Agenda 21 campaigns done at local level. However, small-scale projects at village or street level, such as that of the Tidy Towns Campaign, should be supported - highlighting the issues of most importance in that locality. National campaigns are also required, however, especially for young people, in schools.

Allocation of Responsibility

One of the main causes of poor behaviour in the Irish public regarding the environment is that most people do not feel personally involved in environmental damage. They do not think that they, personally, are damaging the environment and they feel that as just one person, they cannot be the cause of such a major problem. Any environmental awareness campaign must make it clear that we are all polluters, and those disposing of their waste to landfill or incineration are, in fact, polluting Ireland. Changing behaviour requires a carrot and stick approach and the stick of shame must be applied. People, as individuals, do not usually pay for the waste they create at work, nor do they pay extra for creating waste in the home (as they would in a pay-as-you-throw (PAYT) waste charge system). This means that other motivating factors must be applied, such as national pride, local pride, the effect that pollution will have on their children/grandchildren etc. A hard and accusatory line must be taken with polluters from time to time. Irish people are too quick to allocate responsibility elsewhere as was

[15] The use of puppet shows for children in REPAK's 'Recycling Week' campaign was a good example

shown in one awareness study [23], and this must be tackled if their environmental behaviour is to change.

Personal Ability to Make a Difference

Another feature of bad environmental behaviour is the common belief that any individual alone cannot make any difference to protect the environment. This was the major finding of a 1998 study [34] carried out on environmental attitudes in Ireland. This problem is widespread when people are faced with major environmental issues such as ozone layer depletion, climate change, regional waste strategies, national waste policies etc. Any awareness campaign must tackle this misconception as the recent DOELG campaign *It's Easy to Make A Difference* has attempted. However, sometimes it is not so easy to change and personal habits can be deeply engrained. People must be made aware of the fact that they both can *and must* make a major difference as individuals, at home, leisure and work.

Multimedia Usage

All local and national media should be used in any educational campaign. National and local radio and TV stations should be utilized. Newspapers, cinemas, magazines, the Internet, brochures, billboards, phone calls etc. must be exploited. Every household should receive personal information, suitable for them. Appropriate media for each target group and on each topic must be utilised.

Success Stories

The fact that other countries, regions and individuals have made a difference and have changed their ways should be emphasised. Success stories in households, businesses, offices, local authorities, schools, hospitals, and industry (in various sectors) must be highlighted and given credit. Good environmental practice is not difficult and champions of best practice must be developed and used as motivation. Media coverage of environmental issues is often negative and covers only bad news and crises. Much good work is being done in the field of waste reduction however, by NGOs, individuals, schools, local authorities, local groups, businesses, DOELG, EPA, REPAK, industries etc. and these must be emphasised to encourage others and develop a 'feel-good factor' in their choices. Best practices are being applied, but not in a wide enough scale. If some people can achieve success in this regard, others can also.

Educational System

Lifetime habits are often formed in childhood and it is a truism that the future of any country is its youth. It is vital, therefore, to teach good habits and responsible behaviour regarding the environment at a young age. Schools are one place where environmental issues can be made available to a guaranteed audience. The fragility and importance of the environment must be brought home to children in schools and it is vital that relevant and topical environmental issues become an integral part of curricula at primary, secondary and tertiary educational levels. Other awareness raising schemes in schools such as the involvement of local authorities' educational officers and the green flag scheme should be developed further and wider.

Long-Term Commitment

Any awareness campaign will not work unless it is developed for long-term effect and with long-term commitment. Changes can be slow and difficult to ensure. Countries such as Denmark and the Netherlands began environmental awareness raising at a variety of levels over 30 years ago and only now are they reaping the benefits of this commitment and investment. Five, ten and twenty-year environmental awareness campaigns should be planned immediately so that, if we cannot substantially change the behaviour of this or the next generation, then perhaps the one after that can be persuaded. Furthermore, such a campaign would require significant resources for a long time – far more than is being expended at present.

Training

In commerce, public agencies and industry a comprehensive training programme on waste and other environmental issues is required. The best methods of waste prevention, minimisation and recovery are often found by staff themselves, but they must be given the tools of awareness and understanding to achieve them. In general, we produce far more waste in our jobs than we do in our homes. But, in order to achieve best practice, it is not enough for employers to impose systems on their staff without staff involvement in the planning and development of these systems. This requires training and awareness raising. Training is a key element of environmental management systems but since only companies under the IPC Licensing or Waste Management Licensing systems are currently required to implement staff environmental training programmes, the vast majority of Irish workers remain ignorant of the issues. Any company producing significant volumes of waste should be required to train its staff.

8.2.2 A participatory approach

One of the main barriers regarding people's attitude to environmental protection in Ireland is that people often feel 'out of the loop' when strategies and plans are developed and implemented. The public are often consulted as a token gesture after policies and strategies have been decided. This is especially true of those living in marginalised areas and those who experience social exclusion.

Any waste reduction programme, especially at a local level, requires community support and community involvement. Several examples of good practice, in regions such as Canberra, Australia; Seattle, USA; Halifax, Nova Scotia, Canada; etc. show the importance of proactive partnerships between citizens and authorities in successful waste recovery campaigns [35]. Communities will only fully participate in waste recovery programmes with the following three elements [35]:

- effective public participation and consultation processes from the beginning
- an active, flexible and continuous education programme
- provision of facilitating support for the community

Agenda 21 is one such method for inclusivity and transparency in environmental excellence but this has not been widely developed in Ireland. The dos and don'ts of any such participatory approach are given in Table 8.3 on page 80 [36]:

Participation is…	Participation is not…
A process that empowers people to take an active part in collective action and decision making.	Giving information and assuming this is enough.
Active involvement of people, using their own experience as a basis to identify their own needs and resources to devise potential solutions.	Asking people what they think and then ignoring it, or deciding that their opinions are neither valid nor necessary.
A process which enables people to develop skills, knowledge and confidence.	Deciding what is 'good' for people.
A process which is resourced and is a core element of a chosen development strategy.	A cheaper, quicker or easier alternative to centralised planning.
A process which requires commitment of resources and some dedication of time, effort and energy.	Involving people in implementation of actions and development strategies without involving them in the planning stage.
A process which targets and identifies those who are marginalised and experience social exclusion.	Just contacting local established 'visible' groups without targeting the excluded and specifically involving communities of interest as well as geographic communities.
Active involvement of end-beneficiaries and users in the planning, implementation and monitoring of services.	
Power sharing and negotiation between different interests based on equality of status.	
Based on the organisation of people to identify and articulate their interests within a collective policy agenda committed to eliminating exclusion and inequality.	

Table 8.3: Essential elements of public participation

It should also be noted that greater public participation may be required by law in the future according to proposed EU Directives on public access to environmental information and public participation. However, whether or not public participation is a legal requirement, it should be applied at all times to ensure the effectiveness of any measures.

8.2.3 Eco-labels

In order to provide the public and business with guidelines for environmentally friendly purchasing practices, the use of eco-labels (for example the EU eco-label and flower) is required. The usage of the minimum amount and the most environmentally friendly type of packaging should also be promoted on a wide scale. All products with packaging from recycled materials, for example, should be well advertised and an appropriate label should be shown. The importance of such labels in purchasing practices should be well advertised and promoted by authorities and retail outlets. Environmentally friendly products (as well as being made more economically attractive with the proper economic instruments as highlighted elsewhere) should be promoted as widely as possible. Proper support, credit and financial incentives should also go to the manufacturers of eco-friendly products - newspapers that use recycled paper should be allowed to bear a nationally supported logo or label, for example.

8.3 Information Based Instruments

In order to stimulate confidence in the recycling industry, the recyclates used as a raw material, and the products created from it, information is required. Information is also required if those involved are to be able to use best available techniques to collect and process the recyclates. The recyclers also need to know what are the best possible products to create, what the market will accept, and how to drive the market. The following tools will help stimulate such confidence and knowledge:

8.3.1 Standards

The general attitude towards waste is that it is a liability rather than a commodity. Until waste is seen as a potential resource, widespread recovery and markets will not become a reality. In order to convince people that recycled products can perform well, a set of standards is required whereby the quality of the product is assured to the purchaser. These standards could be developed or overseen by the Market Development Programme (described below) in cooperation with the National Standards Authority of Ireland (NSAI), professional organisations, industry and recyclers. Only recycled products that meet required standards and are approved in the programme would be certified. Another benefit of standards is that potential investors will have more confidence in supporting potential schemes and industries that can show that their product will meet certain quality criteria.

As well as testing recycled end-products for quality, it necessary to be able to test the raw materials (i.e. waste streams) that are used. Such tests and recyclate specifications are necessary to develop widespread trade in these recovered wastes.

The need for standards and testing methods is especially important for the plastics waste stream, since this material (unlike metals, for example) has only recently begun to be recycled and there is a general mistrust of products made from recovered plastics. The potential market for such products is large, but the actual market in Ireland is very small.

The problems created by contamination in glass and wood also deter potential outlets and standards need to be applied in those steams also.

The construction and demolition (C&D) sector is producing large volumes of waste in several waste streams, and this sector provides many potential new outlets for recycled

products from glass, paper, plastics, wood etc. For these reasons, standards and specifications are especially important in this sector. Construction and road specifications and standards are quite conservative and, in some cases, old. This industry has always been heavily dependent on the use of virgin raw materials. A wide range of testing methods and specifications for potential C&D outlets must be developed by this industry for market development.

Some standards are already being applied by different agencies in different countries, but Ireland needs to decide which are the most suitable for this country at this time to stimulate the markets. Potential waste collectors and recyclers need to be educated on the kinds of standards required for national and international trade.

Current standards/specifications for the following recyclates are already in place [37] as shown in Table 8.4 below:

Material	Standard/Specification
Ferrous Metal	UK specifications for grades of ferrous raw material recycled for manufacture of iron and steel. European specifications. Institute of Scrap Recycling Industries (ISRI), USA.
Non-ferrous metal	BSMA (British Secondary Metals Association) industry standards are used in the UK. ISRI standards are used internationally.
Textiles	Various criteria are used by Irish collectors regarding marketability and wearability; any items not of sufficient quality to be worn is used for rags; any items not suitable for rags is disposed of.
Glass	A Europe-wide standard was agreed among glass manufacturers; The main Irish glass manufacturer has its own criteria and makes it known to potential suppliers; it also has procedural guidelines for the manufacture of suitable quality cullet.
Paper	There are three main sets of standards: European (produced by CEPI), American and Japanese. UK standards are not the same as CEPI standards, but from 1999 UK mills and suppliers have agreed to adopt the European Standard Grade List. Irish suppliers grade their waste paper according to the mills' criteria.
Plastics	The main requirement for plastics waste is a set of standards for material to be fed into moulding machines e.g. properties such as impurity level, meltflow index etc. RECOUP has developed guidelines on contaminants and the size of bale.
Wood	There are general specifications for wood used for chipboard manufacture, but they can be slightly different for individual producers.

Table 8.4: Standards for recyclates of certain materials

The development of such standards in the UK is one of the main goals of the Waste and Resources Action Programme (WRAP). WRAP aims to "demonstrate that many secondary materials are capable of meeting the same standards as virgin materials, and can be used for the same purposes" [38]. WRAP also aims to tackle discrimination against secondary materials in existing standards and specifications. Such a programme is required in Ireland for a similar purpose (see Section 8.3.4).

8.3.2 Information provision

At present there is no service in Ireland dedicated to giving information to all the stakeholders regarding waste and waste recovery. REPAK does supply some information regarding the recovery of waste packaging, especially to their member companies. ENFO supplies general environmental information to the public, serving schools well in particular. Local authorities supply some information regarding resources in their region, usually through web sites and environmental awareness officers. EPA provides information regarding legislation, licensing and research results through their website and regional inspectorates. However, while the level of information provision has improved greatly, it is not enough to meet the growing demands.

A one-stop-shop is required in Ireland to service all the waste-related information needs of all stakeholders for all waste streams. This service could advise on prevention, minimisation, reuse, recycling, energy recovery and disposal.

This service would mainstream specialised prevention and recycling information and would be the main depository of information relating to potential markets, standards, technical issues, R&D studies, successful schemes, best practice in other countries, legislative requirements, potential grants and financial supports, waste data and characterisation, etc. It would work under the aegis of the Market Development Programme (see below) to maximise information dissemination and focus.

Information would be supplied on each material waste stream. The service should probably (but not necessarily) be based in Dublin, but would make much of its information available on the Internet. It may have more than one office nationally. The service would also provide specific confidential advice and information (e.g. to potential investors and recyclers) and would employ experts to deliver this information.

The service would provide information to the following potential client groups:

- Waste Creators (householders, commercial, industrial, public agency *et alia*)
- Waste Collectors
- Waste Recyclers
- Local Authorities
- National Government
- NGOs
- Potential Investors
- Communities
- Schools and Colleges

The service would work in conjunction with other information suppliers such as the EPA, REPAK, ENFO, local authorities, and would deliver information on best practice relating to all aspects of the waste management hierarchy.

8.3.3 Design for the environment

In modern production systems, the lack of producer responsibility has created a 'built-in obsolescence' [39] and a lack of consideration of environmental issues. This deters designers from looking at the full life cycle of a product and its impact on the environment from its raw material extraction, transportation (several time usually), manufacturing, sales, distribution, usage, and end-of-life stages. By the time decisions are made regarding reuse or recycling, it is too late, and the product's recovery is expensive and its value is low. It is not widely known that raw materials are required and waste occurs at all stages of a product's life cycle – several times – and not just at its end-of-life. See figure 8.1 below. This waste must be reduced at all stages.

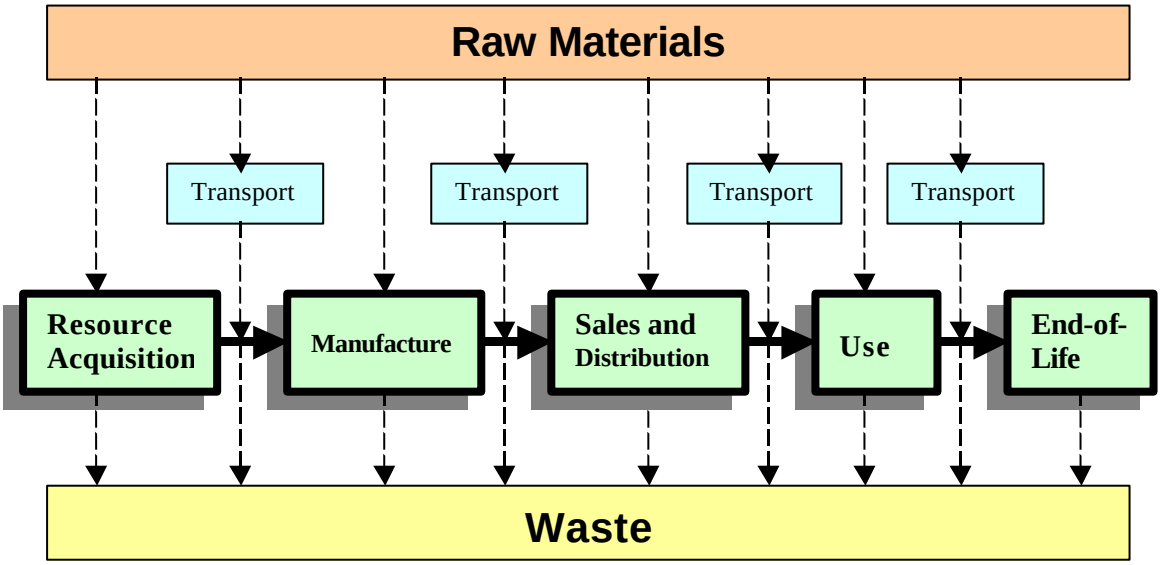

Figure 8.1: Life cycle of a product

Economic instruments are required to force production systems to take into account the environmental damage of products at all life cycle stages, and to support the reuse of materials and their recycling at all stages. These instruments will greatly reduce the cost difference between virgin raw materials and those from recovered wastes. This will greatly assist the economic viability of waste recovery and recycling.

Clearly the reusability and recyclability of a product is often dependent on its design and the materials that it is made from. It is clear, however, that reusability and recyclability are not of major consideration when manufacturers and packagers develop their products.

Design issues affect the recoverability of products especially in the electronics and electrical goods sector. When an electrical product is discarded, many of the components are both recyclable and reusable in other products. This is also true of motor vehicles. However, since these products are not designed for disassembly, the

cost of extracting the various parts and materials make recovery economically unfeasible. Design issues can also be important for other simpler products also. For example, if less green glass was used for the wine imported into Ireland, the problem with recovering this glass would not arise.

Designers and consumers of products must also be educated regarding the issue of life-cycle impacts in manufacture and purchasing. Reuse systems of packaging and products should be encouraged and examples of success stories should be promoted.

8.3.4 Market Development Programme

As was mentioned earlier, the UK has set up a programme to support the development of markets for recycled products, the Waste and Resources Action Programme (WRAP). The WRAP scheme has received funding of STG£40 million from government (DETR, DTI, National Assembly of Wales and Scottish Executive) for the period 2001 – 2004. It also aims to attract another £10 million investment per year in waste reprocessing capacities. WRAP will focus on three main instruments: financial mechanisms, procurement and standards to achieve the following goals:

- Create a market confidence
- Create a critical mass of demand
- Improve the economics of recycling
- Deliver sufficient high quality material to recyclers

WRAP has set itself a target of 15% recycling of its materials of concern: paper, glass, plastics, and wood. While this is low, it is also attainable, and WRAP aims to then build upon that success.

Ireland clearly needs a similar programme to boost markets in this country. This programme should be developed immediately, with the required resources in personnel and funding, in order to ensure the creation of sustainable markets for the increasing volumes of waste being recovered in Ireland.

This is a major instrument to boost markets and outlets for recyclates and recycled materials.

8.4 Economic Based Instruments

What we do in our daily lives and in our work is often dictated or influenced by economic considerations. So also our habits and practices relating to waste production, recovery and disposal. Therefore, in order to influence and encourage people to change their ways and move to more sustainable practices, it is necessary to apply instruments and tools that will imply an economic impact (either to benefit or penalise) associated with a waste-related activity.

Recycling is essentially a business with costs related to raw material acquisition, capital costs, transport costs, staff costs etc. These costs are offset and hopefully overcome by the value of the products created. To make recycling viable, it is necessary to apply economic instruments to decrease the costs involved and increase the value of the products created (especially in comparison with those made from virgin raw materials).

To quote a Danish Study on the application of such instruments in Denmark [40]: "The merits of economic instruments in environmental protection are increasingly acknowledged world-wide [41]. The European Union emphasises their potentials, and EU Member States have intensified the use of economic instruments in their environmental policies. In some member states, the concept is still fairly new and limited in use. Other Member States such as Denmark, the Netherlands, and Sweden, have all implemented tax reforms that include green taxes. Other countries (such as Austria, Germany, Belgium and France) apply economic instruments on a significant and increasing scale, but not yet as tax reform." It is fair to say that Ireland is one of those states in which the concept is "still fairly new and limited in use" and this usage needs to be developed in order to promote more sustainable practices relating to waste.

It is also the case that the resources currently being allocated to environmental protection in Ireland are inadequate to meet the problems that the country faces. It is proposed that all revenues accrued from these instruments should be used for environmental purposes, for grant aids, financial support, further research etc. and should not enter the general national budget. Furthermore the current allocations to the environment should not be decreased by this amount, rather these finances should be added to current allocations.

8.4.1 Economic instruments

The following are some economic instruments that could be applied in Ireland to ensure lower levels of waste production and higher levels of waste recovery:

Product Charges

Product charges, levies or taxes are generally applied to products or services that can have an environmental impact during raw material extraction, transport, production, usage or disposal i.e. at all stages of their life cycle. These charges are often differentiated based upon the seriousness of the impact to the environment, e.g. the charge on Nickel Cadmium (NiCD) batteries should be more than that on glass. In Denmark, for example, there are environmental product charges on energy, motor vehicles, vehicle fuels, tap water, retail containers, disposable tableware, CFCs and halons, chlorinated solvents, pesticides, growth promoters, and NiCD batteries. Two main types of product charges should be considered:

- A product charge on products being imported to or manufactured in Ireland would generate funds for waste recovery, and ensure less unnecessary material consumption. Such a charge would conform to the principle of Extended Producer Responsibility (EPR) and the current EU approach regarding Integrated Product Policies (IPP). All producers and importers of raw material would register with the Revenue Commissioners and certain levies and charges would be required for the imports of materials. These environmental taxes would be applied at this point and, of course, would be differentiated depending on the nature of the material, its reusability and recyclability in Ireland etc.
- A product charge on packaging would reduce the amounts of packaging entering the waste stream. The rate of this charge again would depend on the material in question, its suitability for packaging, its reusability or recyclability in Ireland,

potential better alternatives, etc. For example, packaging manufactured from recycled materials should be very low or zero.

One such product charge has already been accepted as a requirement to reduce waste in the *Waste Management (Amendment) Act, 2001*. This legislation proposed the imposition of a plastic shopping bag levy, of up to 19 cent (15p) per bag. This will have the affect of increasing the reuse of shopping bags, reducing their wastage and also developing funding (in An Environment Fund) that can be used to develop mechanisms to recover other waste streams for reuse and recycling. The plastic shopping bag levy will be implemented by the draft 2001 Regulations, which specify the exact amount (15 cents), the type of bags exempted (bag size and intended use), and the types of outlets covered. The levy can be extended to other articles (such as PET bottles, glass bottles, newspapers etc.). The levy is consumer price indexed and applicable from March, 2002.

Tax Differentiation

A Value Added Tax (VAT) differentiation is required between virgin and recycled products in order to reduce the unnecessary consumption of raw materials in Ireland, to boost the use of recycled materials and to encourage the financial viability of recovering waste streams. A reduction or elimination[16] of VAT on recyclate and recycled products, applied at the point of purchase, would make it more economically profitable for collectors of waste for recovery and it would also encourage greater usage of these materials in our work and daily lives. It would also give recycling an economic boost when competing with landfill costs. Thus the problem regarding the economic viability of recycled products would be tackled from both the supply and demand sides. The real value of the collected materials would be greatly enhanced and a more profitable price in net terms could be achieved from outlets in Ireland and abroad than is currently the case.

User Fees (Landfill Charges and Levies)

User charges are payments for the costs of services related to waste collection and disposal, usually related to landfill or incineration and usually paid to local authorities, who are responsible for waste disposal. In the case of waste arisings in Ireland, these user charges should include the cost of landfilling the waste and an extra cost should be applied in line with the polluter pays principle. The situation still arises that some local authorities are subsidising the landfilling of waste and the polluter is not paying appropriately. This extra cost to support measures for increasing awareness levels and reducing waste could be in the form of a landfill levy, which at present has been proposed by the government in the *Waste Management (Amendment) Act, 2001*. These user charges should apply to all domestic, commercial, public agency and industrial sources of waste. However, the charges imposed upon households should not be regressive and those households in low-income brackets should receive assistance. Furthermore, in line with the polluter pays principle, all domestic waste charges should be weight or volume related so that those who create more waste than others should pay accordingly.

[16] In terms of ease of implementation, a total elimination of VAT may be simpler than a tiered system, and precedents for VAT elimination do exist (e.g. books).

Grant aid and financial supports

One of the main problems that recyclers and collectors of waste cite is the lack of financial support for their environmentally friendly activities. Without this support, especially for infrastructural development, these actors cannot play the required role in the recovery of waste paper and other materials. In the field of waste recovery these grants etc. could be supportive of infrastructural development, new technologies to reduce and recover waste, new equipment (such as bins, balers, skips etc.) required to facilitate recovery, R&D to study new outlets for waste and new product development, research and pilot projects to study how we can reduce our raw material consumption and to understand why we use and waste so much.

These grants can be funded from general exchequer sources, national development plans as well as from the charges, fees, levies and taxes discussed above. Those paying such charges should be informed as to the environmental benefit of the costs they have incurred.

The Minister's recent announcement of €100 million in new capital grants to support infrastructural development is a timely boost in this regard.

8.4.2 Extended producer responsibility

Extended producer responsibility means that the responsibility of producers for their products is extended to the post-consumer stage and includes the full life-cycle of the product or packaging. In practice, this responsibility usually takes the form of an arrangement between the producers and an appointed body.

REPAK, the appointed body in Ireland since 1996, has helped to alleviate the problem relating to packaging waste, and has met its targets for the year 2000. However, within its current legal and financial scope, it cannot attain the high levels of recovery that are apparent in similar schemes in other countries. Companies' costs to join the ARA and DSD systems in Austria and Germany, for example, are far higher that that of waste packaging producers in Ireland.

Since REPAK's initial focus was mainly on its industrial and commercial members, the amounts of domestic packaging waste recovered have not increased sufficiently, especially with respect to future targets of 50% and 75% recovery. While the situation regarding the 'low hanging fruit' of recovered packaging waste from commercial and industrial sources has improved, with REPAK's support, the domestic problem continues to be grave. However, local authorities have the primary role in domestic waste recovery and this dichotomy between roles, supports and responsibilities hinders significant improvement. Lack of enforcement of the *Waste Management (Packaging) Regulations 1997* is another deterrent to REPAK's future success. As long as non-compliant companies are allowed to flaunt the law, this damages REPAK's credibility and causes hostility from compliant companies who are, in some cases, paying very large membership fees to the scheme.

While the REPAK scheme focuses only on packaging waste, and is driven by the Packaging Directive, the producers non-packaging waste streams, paper in particular, are not taking responsibility for their waste. Of the approximate 2 million tonnes of municipal waste arisings in 1998, less than 700,000 tonnes comprised packaging waste. Thus there is little or no producer responsibility for about 65% of the waste produced in Ireland.

Extended producer responsibility is required for all significant waste streams in Ireland, not just for packaging waste.

8.4.3 Pan-Ireland approach

In order to ensure the highest possible levels of waste recovery and reuse, the best economies of scale should be employed. Several organisations in Northern Ireland at present accept waste material from the Republic for recovery. A recent EU LIFE Environment Programme funded project, *Giving Life to Waste*, formed a successful partnership on both sides of the border to develop a guide for waste reduction, 13 case studies in waste minimisation and recovery and a 32 county directory of recyclers. This directory was produced jointly by NI2000 and the Tipperary Rural and Business Development Institute [43].

As Mr. Noel Dempsey, a previous Minister for the Environment and Local Government, stated in the foreword of the directory: "We [Northern Ireland and the Republic of Ireland] face the same basic challenges in developing a better recycling economy, and clearly there is scope for significant co-operation, for instance in terms of shared policy approaches, joint market development initiatives and the exploitation of possible economies of scale in infrastructural development". Any strategy for the increase of waste recovery should include the whole island of Ireland and all facilities for collection, separation, transport, processing and recycling should be fully utilised in both regions. This is especially important in the case of major infrastructural developments such as a paper mill, steel mill, metal foundries, plastic reprocessing plants etc.

Both governments, north and south, should combine resources and expertise for maximum effect. This co-operation can be built using the North-South Ministerial Council or other mechanisms. This pan-Ireland approach is also recommended in a similar study of potential market development in Northern Ireland [39].

8.4.4 Green public procurement programmes

One of the problems regarding poor environmental behaviour in the general public and business is the poor relationship between Irish people and the authorities. When initiatives in Denmark or Austria are launched for improved practices, the public accept them because of the high level of trust in their local and national authorities. Stringent legislation and punitive economic instruments have been applied in countries such as Sweden, Denmark, Germany etc. without much public disquiet because the authorities are seen to be committed and environmentally conscious themselves. Green guides and green procurement policies are the norm among authorities in these countries, who lead by example.

One of the reasons for public scepticism regarding being 'told what to do' in Ireland is that often the authorities themselves are major contributors to the problems. The environmental record of government offices and agencies, schools, universities, health boards, local authorities etc. can be significantly improved. Green procurement policies are not being implemented on a wide scale. It is vital that these offices and authorities are seen to be acting responsibly with respect to the environment, rather than just preaching good practice. In order for people to trust the information and advice they are getting from authorities, these organisations must be seen to be implementing best environmental practice.

Once the authorities have implemented green procurement programmes themselves, and have advertised their success, a programme of support and the implementation of economic instruments to encourage green procurement chains can be successfully put into practice on a national scale in business and industry. Green public procurement offers public bodies and agencies an opportunity to lead Ireland towards more sustainable consumption and waste management practices and to implement national policies.

Since public agencies have such a high purchasing power and can account for up to 14% of GDP [26] (€12.3 billion in the case of Ireland), such a procurement policy can also greatly boost the development of viable markets for recycled products, especially relating to materials such as plastics, paper, cardboard, glass etc. Several recyclers contacted during this study bemoaned the fact that local authorities, in particular, would not support the market for their recycled products. A large amount of Construction and Demolition (C&D) work is carried by or behalf of local authorities, for example. This offers major opportunities in public procurement since many potential outlets for waste streams occur in this sector.

A C&D Task Force was set up in 1999 with a view of meeting the Irish targets of 85% recovery from this sector by 2013. However, as yet, the recommendations of this task force are unclear with respect to this industry's commitment to recovering more waste from its activities and its commitment to supporting recycled materials in its procurement policies in the future.

8.4.5 Public Private Partnerships

Public Private Partnership (PPP) is the recommended methodology for better waste management in the policy statement *Changing our Ways*. This document states: "There is considerable scope for increased participation by the private sector in all areas of waste management in Ireland, and authorities should encourage and facilitate business involvement in the provision of waste management services. Private participation can contribute much needed capital investment in infrastructure, specialist expertise in the application of alternative and emerging technologies, a better understanding of the dynamics of the marketplace, especially in relation to recyclables, and in some cases greater operational efficiency and flexibility. It can also release local authority staff and resources for other productive uses."

Since recycling is primarily a business and should be seen as a commercial activity, local authorities can only have a limited role to play and private business must be involved as a driver. But private business cannot develop the recycling industry on its own. Since local authorities manage most landfill sites and are responsible for most municipal waste collection, they too have a major role to play, especially in the area of making waste material available for recovery and recycling. Local authorities also have a significant role in the enforcement of responsible waste management practices.

Already in Ireland, there are many good examples of successful public private partnerships in the field of waste recovery and recycling. Most bring sites in Ireland, for example, are run by private contractors who are supported by local authorities in making sites available etc. The kerbside collection schemes in Dublin (involving four local authorities) and Galway involve private waste management contractors in the collection, post-collection separation and recycling of the gathered materials. The kerbside collection scheme in Co. Waterford involves the collection of the dry waste

fraction (cardboard, paper, plastic, UBCs, drink cans and food tins) in two towns (building up to 7 towns) by the local authority and the subsequent segregation by a private company for recycling. In a C&D recovery scheme in Cork City, over 300,000 tonnes of waste C&D was recovered, in a facility provided by the local authority, and reprocessed by a private company for reuse by the local authority in the closure of the landfill and for other uses. Other local authorities in Ireland work in co-operation with private waste management firms in the kerbside collection of commercial cardboard and other waste streams.

It is clear that this waste management system works when applied properly. Good public private partnerships require the following elements [44]:

- Large packages of frontline activity
- Long-term contracts
- Base price sharing of 'additional benefits'
- Close understanding

Combined, these ensure added value from investment, specialist expertise and the ability to grow the business (and jobs).

8.5 Infrastructure Based Instruments

As was mentioned in Section 6, the waste recovery infrastructure in Ireland is very underdeveloped. There is a reasonably developed infrastructure of waste collection for disposal, in terms of companies available, premises, trucks, skips, bins, etc. But this system is geared almost exclusively, especially for domestic waste, towards landfill.

8.5.1 Infrastructure

Infrastructure is required in Ireland for three stages of the recycling chain, for:

- Segregation
- Collection
- Processing

The requirements for wide-scale segregation of waste streams from domestic, commercial, public agency and industrial sources cannot currently be met. Adequate storage facilities for the different waste streams must be identified for each target group and supplied. Separate bags or bins systems are required for proper segregation in households. Larger storage facilities for commerce and industry are required and, in some cases, the ability to compact and bale this waste. Compacting reduces the space required for storage and baling ensures that the material is ready for collection and recovery.

Waste collection facilities and schemes for collection must be developed. The infrastructure for kerbside collection for domestic sources is required, similar to the systems in Dublin, Galway, and Co. Waterford. Pay as you throw schemes of disposal, involving weighing facilities, chips on bins, global positioning systems in trucks etc. require development. Better and more bring sites are required, especially in rural areas where population density cannot sustain kerbside collection. These bring sites need to

be situated in suitable areas, convenient to shops, housing estates, in city centres. They need to be maintained well, avoiding litter and misuse. Multi material bring sites need to be developed, so that plastics, wood, metals, paper, cardboard, food tins, etc. can be collected on a wider scale.

Section 4 pointed out the lack of processing facilities for most waste streams in Ireland. This is especially pressing for paper, cardboard and plastics. Suitable measures to support the development of such facilities, through grants, financial aid, advice, market development, standards, more raw materials (in terms of quantity and quality), green procurement etc. are required to reduce the requirements of exporting so much of our waste.

8.5.2 Development of a paper mill in Ireland

Paper is a major waste stream facing many barriers for recovery in Ireland, the main barrier being that this commodity must be exported for wide-scale recovery. There are approximately 1,200 pulp and paper mills in Europe but only two in Ireland (a small pulp mill in Lurgan, and a larger cardboard mill in Dublin). The main recovery outlet for waste paper and cardboard in Europe is the manufacture of paper and cardboard in these 1200 mills.

The Landfill Directive will result in a significant increase in the recovery level of waste paper and cardboard, in the UK, Spain and the other countries where Irish waste paper and cardboard is currently sent. This could mean a glut of this material in the market, which could lead to capacities being fully utilised and/or would greatly decrease the value of this material and the price being offered by mills. Without its own paper mill or mills, Ireland could face a major problem in finding suitable markets for its waste paper.

While opinions vary as the viability of a paper mill in Ireland, it is clear that such an enterprise should not be entered into lightly. Furthermore, for any company to embark on such a commitment, certain requirements and supports would be necessary regarding financial or grant aid support, the guarantee of suitable raw materials and the guarantee of adequate markets.

A full scale feasibility study of such a venture is required urgently, involving discussions with all relevant stakeholders, including major waste management firms, major waste paper collectors and recyclers, major users of paper (e.g. newspapers, local authorities, national government etc.), local authorities, government departments, etc. Such a study will produce a set of recommendations and indicate the conditions, measures and instruments required for the development of such a mill. A detailed cost-benefit analysis will be required, including the environmental benefits of such a venture and the requirements to reduce landfill dependency for paper.

8.6 Legislation Based Instruments

It is clear that a supportive legislative structure, properly enforced, is required to create the climate for a high level of waste recovery and recycling. Some legislative instruments that can be applied in Ireland include:

8.6.1 Landfill bans

One very successful instrument that has boosted the recovery of waste cardboard is the implementation of landfill bans for this material from commercial outlets. Landfill bans are a very effective tool, once the waste streams being targeted can be recycled readily using a cost-effective scheme. In Cork City, for example, the local authorities provided commercial outlets with a kerbside collection facility before they banned commercial waste cardboard to the landfill. The cost to commercial outlets of having this waste stream collected is less than what it would cost to send it to landfill using a waste disposal contractor. While other local authorities have also implemented this instrument, it should be encouraged on a national scale, for specific streams in particular. The power to implement such a measure at a national level is provided in the Waste Management (Amendment) Act, 2000.

Recently, some landfill sites have banned all commercial waste arisings, due to lack of available landfill space. While this may create difficulties for companies in the short term, in the long term it will cause them to radically change their waste production habits and move initially towards recycling, and ultimately to prevention. It is not proposed that all landfill sites ban all commercial waste (this would create chaos). However, the banning of recoverable streams should be widespread and these bans should be extended as more recovery options become available for different materials.

These bans should also be implemented for household waste in those regions where a domestic kerbside collection system of recyclables is in place, or where major improvements have been made regarding collection facilities, bring sites and other alternatives to landfill. They should especially be considered for container glass waste, aluminium cans and cardboard waste.

When there is a more environmentally friendly alternative readily available to domestic or commercial sources of waste, every effort should be made to dissuade the landfilling of this waste and the subsequent potential for pollution arising from it. Landfill bans provide one very effective such support mechanism. However, such a measure must also be enforced stringently by local authorities and the potential for fly-tipping due to such bans must also be tackled vigorously.

8.6.2 Legislation implementation

In the past, a number of EU environment-related Directives and measures have had a profound affect on how we deal with waste in Ireland. These include the 1975 and 1991 Waste Framework Directives, the 1989 Community Strategy on Waste, the 1994 Directive on Packaging and Packaging Waste, the 1996 Community Waste Management Strategy, the 1996 Integrated Pollution Prevention and Control Directive, the 1999 Landfill Directive etc. Legislation, when properly implemented, is a major driving force for better environmental behaviour and the protection of our soil, water and air.

However, even further measures are now in the development stages in Brussels. These will have even more profound effects and, if implemented properly, will further drive reductions in waste arisings, reductions in landfill dependency, increases in the levels of waste prevention, minimisation, reuse and recovery.

These proposals include:

- Waste management statistics (proposal for a Regulation)

- Electronic and electronic waste (proposal for a Directive)
- Environmental issues relating to PVC (proposal for a Communication)
- Climate change and waste management (Report to be presented)
- Construction and Demolition waste (Recommendation to be presented)
- Integration of environment policy into other policies (Communication)
- Sustainable Development Strategy (Communication)
- Environmental crime (proposal for a Decision)
- Environmental liability (proposed Directive)
- Public access to environmental information (proposal for a Directive)
- Sixth Environmental Action Programme (proposal for a Decision)
- Public participation (proposal for a horizontal Directive)
- Sewage sludge (Amending Directive to be proposed)
- Batteries and accumulators (amending Directive to be proposed)
- Packaging waste recovery and recycling targets (amending Directive to be proposed)
- Classification of waste-to-energy processes (expected Commission Decision)
- Mining waste (Directive to be proposed)
- Biodegradable waste (Directive to be proposed)
- Definition of waste (possible guidance document or measure)
- Waste recycling (possible measure to be proposed)
- End-of-Life Vehicles (expected amending Commission Directive to be proposed)
- Integrated product policy (Green paper)
- Public procurement and the environment (Communication)
- Sustainable use of resources (expected Green paper)

It is imperative that this legislation is implemented properly and effectively and that these measures, guidance documents, communications etc. are supported fully in order to achieve significant waste reduction in Ireland and major recovery of waste. They should be based on prevention principles, fully implementing the waste management hierarchy. They should have adequate penalties to significantly deter non-compliance, including severe fines and imprisonment. Above all, they should be properly regulated and enforced to ensure compliance and prevent free-loading – this is not currently the case with respect to aspects of waste related legislation in Ireland.

A major problem relating to waste management in Ireland is the failure of the authorities to enforce regulations in place. This is especially true for regulations pertaining to waste disposal and packaging waste.

Hundreds of thousands of tonnes of waste are being disposed of illegally in Ireland on an annual basis. This includes waste from industry, C&D, domestic sources, hospitals etc. The perpetrators of these crimes have gone undetected and unpunished, although enforcement action is increasing. They are also bringing proper waste management into disrepute, since those companies and individuals who are making the effort to comply with regulations and implement best practice see these 'free-loaders' flaunting the law and gaining unfair competitive advantage.

In a recent speech by the then Minister for Environment and Local Government, Mr. Noel Dempsey TD pointed out the problem regarding the waste packaging regulations. "I also acknowledge that one of the biggest problems has been a lack of enforcement of the Packaging Regulations. The legal difficulties which hindered prosecutions have been overcome. There has been seen some recent success in Dublin. But unfortunately, most local authorities have done little or nothing to advance enforcement. This has to change."[45] As long as some companies do not meet the regulations, the whole scheme is damaged and compliers are suffering a competitive disadvantage. There is a major need to enforce the regulations.

Another problem relating to increased recovery is the difficulty of achieving planning permission for bring sites. This planning requirement is unwieldy and slow and many applications are rejected. Without a change in the regulations, the required growth in bring site numbers cannot be achieved. These planning requirements need to be changed.

8.7 Further Research

The specific requirements for further research into each of the material waste streams are detailed in the Fact Sheets. Lack of adequate information is hindering sustainable recovery and recycling systems for all the materials under consideration.

The lack of waste-related data in Ireland has been addressed to some extent by the development of National Waste Databases, 1995 and 1998. The lack of information on other waste issues, including recovery, has also been partly addressed by the series of waste related research projects commissioned by the Environmental Protection Agency, as part of the Operational Programme for Environmental Services 1994-1999 under the European Regional Development Fund (ERDF) and the Environmental RTDI Programme 2000-2006.

However, these projects and this research is just the beginning. It is clear that the level of expertise in Ireland among all the key stakeholders must be developed. Further knowledge on each of the material waste streams is required. Feasibility and pilot studies are required to further investigate and test potential markets and outlets for the various streams. Standards must be developed based on best available information and the most relevant research carried out elsewhere. The best possible methods to increase environmental awareness and public participation must be studied in detail and tested. Research and pilot studies on green procurement must be carried out to learn how best the commercial, industrial and public service sectors can shift their procurement chains to support new markets for recycled products and increase the recovered fractions of their waste streams. Further investigation of specific economic and legislative instruments and a detailed analysis of their effects must be undertaken. The best methods of fairly and effectively implementing the polluter pays principle and extended

producer responsibility must be assessed, specific to the Irish socio-economic framework.

8.8 Full Recycling Chain Focus

As is discussed above, there are four main elements to the waste recycling cycle: supply of good quality waste; collection of this segregated waste; processing facilities for this waste; markets to consume the recyclate and subsequent products. It is vital that instruments be applied to all of these four stages of the recycling chain, so that there is no weak link. The range of instruments recommended here are designed to stimulate all of these four elements, with different tools applicable to the four different stages as shown in Table 8.5 below:

Recycling Element	**Support Instruments**	
Supply	Economic instruments Information provision Standards Participatory approach Pan-Irish approach Landfill bans Infrastructure	Extended producer responsibility Paper Mill Forthcoming legislation Public private partnerships Design for the environment Awareness raising programmes Research
Collection	Economic instruments Research Information provision Infrastructure Paper Mill	Pan-Irish approach Forthcoming legislation Public private partnerships Extended producer responsibility Awareness raising programmes
Processing	Economic instruments Pan-Irish approach Paper Mill Research Standards	Information provision Infrastructure Public private partnerships Design for the environment Forthcoming legislation
Demand	Economic instruments Awareness raising programmes Participatory approach Green purchasing programmes Eco-labels	Standards Information provision Paper Mill Research Market Development Programme Forthcoming legislation Public Private Partnerships

Table 8.5: Elements of recycling and support instruments

8.8.1 Supply of waste materials

As would be expected, almost all instruments are designed to support the supply of good quality, segregated waste materials. People are empowered to make their waste available for recycling by motivational and educational information. Research into the best motivational methods, best awareness raising schemes, best segregation methods etc. also support provision. Waste producers are also encouraged/punished by financial incentives to reduce the amounts they send to landfill and increase the amounts they make available for recycling. Provision of waste materials from households is also aided by the availability of better and more bring sites to overcome the major deterrent of convenience. Kerbside collection schemes (supported by financial instruments in particular) make waste provision even more convenient and are the most effective instrument for that sector. Finally, legislative instruments such as landfill bans and producer responsibility force producers to make their waste available.

8.8.2 Collection of waste materials

Once sufficient amounts of clean and segregated waste materials have been made available by the various producers, it must be collected for recycling. Such collection schemes are usually implemented by private companies in the case of commercial or industrial producers. Some kerbside schemes (also run by private firms) are also in place for domestic producers in Dublin, Galway and Co. Waterford. However, currently, most domestic waste recovered is brought voluntarily by domestic producers to bring sites from which the streams are collected, usually by private contractors.

Collection of waste for recovery is stimulated by economic instruments that increase its value to the collector, making it cost effective. A proper infrastructure of storage facilities, collection schemes, methods of transport, etc. also aid this collection process. Reduced transport costs to Irish recyclers (rather than foreign ones), for example to an Irish paper mill, also aid collection. A pan-Irish approach to the markets for recyclates also support economies of scale making collection more cost effective. Further research into the best collection systems, bring-site systems, kerbside systems, lessons learned elsewhere, technology transfer etc. also support waste collection for recycling. Well designed Public Private Partnerships between Local Authorities and Contractors greatly support higher collection levels in kerbside schemes and bring site facilities.

8.8.3 Processing (recycling) of waste materials

It can be seen from Section 4 that there are inadequate recycling and reprocessing systems for several waste streams in Ireland today. In the case of paper and some metals, no facilities exist. For paper in particular this is major deterrent to higher recovery levels and must be addressed. Economic instruments such as grants, taxation support etc. greatly aid the development of current and future recycling facilities in Ireland. Research and information provision to potential recyclers will support investors and entrepreneurs. Public Private Partnerships between recyclers and local authorities (whereby, for example, local authorities supply raw materials or provide markets for recycled products) can greatly increase processing capacity. Quality and technical standards for recyclate and products stimulate confidence in these markets and hence greater investment and business commitment to develop processing facilities to recycle.

8.8.4 Demand (markets) for recyclates and products

Without markets, the collection and recycling of waste materials is worthless. The main focus of this study was in the development and support of current and new markets, with a view to stimulating recovery levels and ensuring that all recovered waste is successfully utilised. Economic instruments and raised awareness levels will support such market development and encourage consumers to choose more recycled products. Good quality standards are required to ensure that public and business confidence in these products is high. Green purchasing programmes, especially in public agencies can greatly boost the markets for recycled products from paper, glass, plastics, wood etc. and are a vital driving force. The proposed Market Development Programme is a major tool to tackle this element of the recycling chain. Research and the availability of its results can also greatly aid potential investors and entrepreneurs in the development of markets for new products.

9. Implementation of Instruments and Actions

There are two crucial groups of stakeholders in the implementation of the strategy. These are those who develop the instruments, and those who are targeted by them.

9.1 Instrument Developers

In any strategy all concerned must also be clear of their assigned roles. The role of the instrument developers is especially important since these organisations will implement the instruments by a series of actions. The main stakeholder groups that will be responsible for implementing the instruments of the strategy are as follows:

- **National Government**[17]: this includes the Department of Environment and Local Government (DOELG) in particular, but also other relevant departments, such as Finance (DF), Education and Science (DES), and Enterprise Trade and Employment (DETE). It also includes state agencies such as Enterprise Ireland, the National Standards Authority of Ireland, Forfás etc.
- **Local Government**: this includes County Councils, Town and City Corporations, Urban District Corporations
- **Industry**: this includes all elements of business and commerce including all industrial sectors, agriculture, service sectors, tourism, finance, commerce, retail, transport etc.
- **Consumers**[18]: this includes all consumers such as domestic, industrial, public agencies etc.
- **Recyclers**: this includes all business elements involved in waste management, collection, reprocessing, reusing and recycling.
- **Waste Producers**: this includes all waste producers such as domestic, industrial, public agencies etc.

It is clear from Table 9.1 on page 100 that the main role in the promotion and development of these instruments are national and local governments.

Industry also has a major role to play in the development of awareness raising, greening purchasing programmes, research, public private partnerships, design for the environment, etc.

Other stakeholder groups with an important role in the development of a viable recycling industry in Ireland are:

- **EPA**: the EPA will obviously play a central role in the licensing and regulating of waste issues, the development of data, the co-ordination of research, the development of a strategy etc.

[17] Note: in the case of green purchasing, awareness raising, research etc. national and local government also includes all public agencies including schools, health boards, hospitals, colleges, universities, semi-state companies etc.

[18] While everybody consumes material in their home, job and at leisure these instruments focus on the consumption activity of these people. Similarly everybody produces waste, but these instruments focus on the activity of waste production.

- **NGOs**: NGOs will continue to play an important role regarding waste recycling, as representatives of the general public, as independent environmental protectors etc.
- **REPAK**: REPAK is the only current government approved body to implement producer responsibility with respect to packaging waste in Ireland.
- **Environmental Experts**: independent environmental experts will continue to carry out research and develop the required information to drive recycling, develop new markets etc.
- **General Public:** the general public must play its part, accepting responsibility for its waste, making itself aware of the issues, increasing its waste recovery and purchasing recycled and more environmentally friendly products.

9.2 Target Groups

The target groups are mainly those who consume products and produce waste (everyone, including domestic, industrial, commercial, public agencies), but some instruments are specifically geared towards products consumption (e.g. green procurement programmes, eco-labels) and other towards waste production (e.g. landfill bans). Other instruments focus on activities specific to industrial waste production (e.g. extended producer responsibility), and in this case the target is listed as 'Industry'.

Another important target group is recyclers. These are the people who drive the recycling activity from a business perspective, and this sector is a vital stakeholder if recovery levels are to increase. In general they must be supported so that they can develop viable businesses, in collection, reprocessing or selling recycled products – often in public private partnerships. Economic instruments, especially grant aid, a pan-Irish approach, standards, research etc. will help these companies to develop and prosper.

Instruments	Instrument developer(s)	Instrument target(s)
Economic instruments	National Government Local Government	Waste Producers[19] Recyclers
Extended producer responsibility	National Government Local Government Industry	Industry[20] National Government Local Government
Awareness raising programmes	National Government Local Government Industry	Waste Producers Consumers[21]
Participatory approach	National Government Local Government Industry	Waste Producers Consumers

Table 9.1: Instrument developers and targets

[19] Waste producers include industry, households and public agencies

[20] Industry includes all sectors of business, manufacturing and non-manufacturing

[21] Consumers include all product consumers including industry, households and public agencies

Instruments	Instrument developer(s)	Instrument target(s)
Pan-Irish approach	National Government Local Government Northern Ireland Government Recyclers	Waste Producers Consumers, Recyclers[22]
Green purchasing programmes	National Government Local Government Industry	Recyclers Consumers
Eco-labels	National Government Local Government Industry	Recyclers Consumers
Design for the environment	National Government Industry	Industry
Standards	National Government Recyclers Industry	Recyclers Consumers
Information provision	National Government	Waste Producers, Recyclers Consumers
Infrastructure	National Government Local Government	Waste Producers, Recyclers
Paper mill	National Government Local Government Industry	Waste Producers, Recyclers Consumers, Local Government, Industry
Market Development Programme	National Government	Recyclers
Forthcoming legislation	National Government Local Government	National Government Local Government Waste Producers Recyclers, Industry Consumers
Landfill bans	National Government Local Government	Waste Producers
Research	National Government Local Government Industry	National Government Local Government Industry Waste Producers Recyclers, Consumers
Public private partnerships	National Government Local Government Industry Recyclers	National Government Local Government Industry, Recyclers

Table 9.1 cont: Instrument developers and targets

[22] Recyclers include reprocessors, collectors, and all service providers related to recycling

9.3 Main Developers' Instruments

As was stated earlier, each stakeholder group is required to play its role in the implementation of any strategy to develop recycling in Ireland. In particular, worthwhile tools and instruments are required from those in a position to implement them. The instrument required from each of these stakeholder groups is as follows:

9.3.1 National Government instruments

As would be expected, the national government, its departments and agencies have the main role to play in the required strategy for the increase in recycling in Ireland. This stakeholder has some responsibility in the development of all the instruments identified. In some cases, the national government will have the main role, such as in the advancement of new legislation, economic instruments, support of research etc. In others, such as eco-labels, design for the environment, etc. its role will be secondary to industry. These are tabulated in Table 9.2 below:

Economic instruments	Green procurement programmes	Information provision
Extended producer responsibility	Design for the environment	Infrastructure
Awareness raising programmes	Legislation implementation	Paper mill
Participatory approach	Further research	Market development programme
Landfill bans	Pan-Irish approach	

Table 9.2: National Government instruments

9.3.2 Local Government instruments

Since local authorities have a major role to play and have the main responsibility for waste management in their areas, they too will be required to develop many instruments to increase recovery levels. Local authorities in Ireland have limited ability to raise revenue, create legislation etc. in comparison to other countries. However, they can still become involved in developing economic instruments, pubic private partnerships, landfill bans, infrastructure, extended producer responsibility, etc. The range of instruments to be advanced by local government include those shown in Table 9.3:

Economic instruments	Green procurement programmes	Infrastructure
Extended producer responsibility	Landfill bans	Paper mill
Awareness raising programmes	Further research	Forthcoming legislation
Participatory approach	Pan-Irish approach	

Table 9.3: Local Government instruments

9.3.3 Industry instruments

Industry, in all sectors, is a major waste producer in Ireland and is a target for many of the instruments identified. However industry must also develop instruments within its organisations, using umbrella bodies, support bodies etc. to reduce its waste creation and disposal. These include awareness raising (through training etc.) and green procurement in particular. Others, such as eco-labels and design for the environment are used widely by industry in other countries, but not in Ireland. The instruments to be developed by industry include those shown in Table 9.4 below:

Extended producer responsibility	Design for the environment	Awareness raising programmes
Infrastructure	Eco-labels	Paper mill
Participatory approach	Further research	Green procurement programmes
Pan-Irish approach		

Table 9.4: Industry instruments

9.3.4 Recyclers' instruments

Recyclers are the target of several instruments (economic, purchasing programmes, legislation etc.), but they must also be more proactive in developing the instrument of public private partnerships. By better organisation, focus, management, information development (including standards) and promotion, recyclers can instigate cost-effective proposals to national government and local government, to increase recovery levels.

9.4 Specific Action-Based Recommendations

While general tools and policy instruments are all very well, they must be developed by the implementation of a range of specific and concrete actions. These actions must be focused, responsibilities must be clear, objectives must be attainable and explicit. Several recommended actions are listed in Tables 9.5 to 9.9, on pages 104 to 108, specific to the support of the five main strategy components or building blocks described in Section 8: awareness, information, economic, infrastructure, and legislation.

However, these actions must be considered in the context of an overall national strategy for waste management that is preventive based and built upon the principles of sustainable development. As part of this strategy it is also necessary, as outlined in Section 7.6, to allocate specific responsibilities for implementation of the various elements of the strategy, with the provision of required authority/powers and resources.

AWARENESS-BASED ACTIONS	
Responsibility	**Action**
DOELG	Implement a wide-ranging 10 year awareness campaign on recycling, expanding the *It's Easy to Make a Difference* scheme with elements outlined in Section 8.
Local authorities	Implement effective and long term local awareness raising campaigns, with elements outlined in Section 8.
Local authorities	Employ adequate number of environmental education/training offers to significantly increase environmental awareness levels in each region.
Industry	Industry to use eco-label systems on their products and packaging.
DOELG/DES	Include environmental issues, including waste, in curricula of primary, secondary and tertiary educational systems.
DOELG	Greater public participation approach when drafting new policies, strategies, plans etc.
DOELG	Greater openness and transparency in decision making relating to waste and recycling.
All public agencies	Training of all relevant public agency staff of waste reduction and recovery issues.
DOELG	Better communication of national policies, plans, strategies etc. to all stakeholders.
Local authorities	All relevant local authority employees to be trained in waste prevention and recovery issues.
Local authorities	Greater public participation approach when drafting new policies, strategies, plans etc.
Local authorities	Greater openness and transparency in decision making relating to waste and recycling.
Local authorities	Better communication of local policies, plans, strategies etc. to all stakeholders.
Industry	All employees to be trained on waste prevention and recovery issues.
Industry	Better stakeholder approach when drafting new policies, strategies, plans etc.
Recyclers	Greater public participation approach when planning better infrastructure, new facilities etc.
Recyclers	Better communication to public of plans, new facilities, operations etc.
REPAK	Continue to improve communications with stakeholders, including public on recycling issues.
REPAK	Increase openness, transparency and participation levels in the development of initiatives, plans, and fees.
NGOs	Increase involvement in waste plans and projects with local authorities and government.
NGOs	Increase public awareness levels, especially at local level of issues relating to waste recovery and recycling.
General Public	Inform themselves on waste related issues and best options.

Table 9.5: Awareness based actions

INFORMATION-BASED ACTIONS	
Responsibility	**Action**
DOELG and other stakeholders	Implement a Market Development Programme to acquire and disseminate information regarding markets for waste streams; the programme will also disseminate grants and financial support for market development issues; the programme will work with recyclers and others to develop markets; the programme will develop and disseminate standards and quality criteria relating to recyclates and products from recyclates; adequate provision of resources, expertise and funding required.
DOELG and other stakeholders	Development of service to acquire, store and disseminate information relating to waste issues.
Local authorities	Support national programme on market development and promote the programme at a local level.
Industry	Development of standards and quality criteria relating to recyclates as a raw material suitable for usage in industry.
Industry	Greater importance placed on environment in design and production decisions.
Industry	Increase level of waste related research to reduce industrial waste production and increase recovery.
Recyclers	Development of standards and quality criteria to facilitate the use of recyclates and recycled products in appropriate circumstances.
Recyclers	Utilise national programme for market development.
EPA/DOELG	Continue to develop adequate data regarding waste arisings, recovery, disposal etc.
EPA/DOELG	Co-ordinate increased levels of appropriate research regarding waste prevention and recovery.
Local authorities	Increase level of waste related research to investigate awareness, information, economic, infrastructural, and legislative requirements.
REPAK	Facilitate training programmes for all member companies to increase waste prevention and recovery.
REPAK	Increase market development focus and co-fund market related projects from research, pilot schemes etc.
Local Authorities	Dissemination of information to potential recyclers or users of recycled materials.

Table 9.6: Information based actions

ECONOMIC-BASED ACTIONS	
Responsibility	**Action**
DOELG	In conjunction with the other key stakeholders, secure the implementation of producer responsibility initiatives within the respective sectors for the various streams of waste.
DOELG	In the absence of producer responsibility initiatives being implemented within the various sectors, put into place mechanisms for the introduction of product charges on non-packaging waste generating products. Product charges should be a priority target for newspapers, office paper, etc.
DOELG	Investigate the effects of extending the responsibility obligations in the packaging sector by a reduction of the threshold for obligated waste packaging producers (as Major Producers) to 10 tonnes per annum.
DOELG	Review the conditions established for REPAK to operate as an Approved Body in the certification of the scheme by the Minister to include for specified numerical targets for the recycling and recovery of packaging waste in the period 2002 to 2005.
DOELG/DF	Investigate the removal of VAT on recyclates and the reduction of VAT on recycled products.
Local Authorities	Substantially increase landfill charges by end of year 2002.
DOELG	Implement grant aid schemes for recycling projects, infrastructure, research etc.
DOELG and all agencies	DOELG to provide guidance documents to all government and public agencies who would then develop and implement detailed green procurement policies.
DOELG and all agencies	DOELG to provide guidance documents to all government and public agencies who would then develop plans to significantly increase their waste recovery levels.
Local Authorities	Implement weight/volume related charges (pay-as-you-throw) schemes, so that larger domestic waste producers pay more (these charges must not be regressive).
Local Authorities	All local authorities to apply the guidance issued by central government and to ensure that all its agencies and departments develop and implement a green procurement policy.
Local Authorities	All local authorities to apply the guidance issued by central government and to ensure that all its agencies and departments recover their waste where appropriate.

Table 9.7: Economic based actions

ECONOMIC-BASED ACTIONS cont.	
Responsibility	**Action**
Local Authorities	All local authorities to avail of public private partnerships for waste segregation, collection, and recycling as well as the development of infrastructure where appropriate.
Industry	Reduce level of green glass usage for container glass.
Industry	Accept responsibility for the production of manufacturing waste and the waste arising from products. Accordingly, implement producer responsibility initiatives designed to reduce the level of waste production and put into place measures to ensure that waste which is generated from products is collected for recycling, in particular to support new Irish recycling facilities, such as a paper mill or mills.
Industry	Develop green procurement policies within industry, in particular to support new Irish recycling facilities, such as a paper mill or mills.
DOELG	Carry out discussions with Environment officials from Northern Ireland with a view to developing joint projects and infrastructural development.
Recyclers	Develop public private partnerships with local authorities.

Table 9.7: Economic based actions cont.

INFRASTRUCTURAL SUPPORT-BASED ACTIONS	
Responsibility	**Action**
DOELG	Significantly increase direct funding and support of local authorities for infrastructural development for segregation, collection and recycling facilities.
DOELG/DETE/ Enterprise Ireland	Undertake a detailed feasibility study, with particular reference to the potential for a producer responsibility initiative, in relation to the possible development of a paper mill in Ireland in partnership with industry, local authorities, recyclers and other stakeholders.
Local Authorities	Implement kerbside collection schemes for dry recyclables in urban areas.
Local Authorities	Develop bring site numbers to a level of 1 bring site per 500 persons.
Local Authorities	Extend materials collected in bring sites, to include: textiles, plastics, food cans, UBCs.
REPAK	Develop national infrastructure by co-funding with local and national government.
NGOs	Actively support improvements in infrastructure from bring sites etc.

Table 9.8: Infrastructural support based actions

LEGISLATIVE-BASED ACTIONS	
Responsibility	**Action**
DOELG	Implement a national landfill ban on all materials for which adequate bring sites or collection facilities are nationally in place.
DOELG	Streamline planning regulations to facilitate the early development of substantial additional bring sites.
Local Authorities	Implement a local landfill ban for all material streams for which adequate bring sites or collection facilities are in place.
Local Authorities	Ensure total enforcement of waste packaging regulations within each region.
Local Authorities	Ensure that only legal waste disposal occurs within each region.

Table 9.9: Legislative based actions

The following series of tables describes each of these 68 actions in further detail allocating the following characteristics:

- a number
- who is responsible for its implementation
- a brief description
- its effects
- whether or not it is a priority action
- the type of action (Concrete, Aspirational, or On-Going)
- whether it is Immediate, Short-term, Medium-term or Long-term
- if it has a cost implication for the public purse

9.4.1 Awareness based actions

The following actions are recommended to improve the awareness levels of all Irish citizens and stakeholder groups:

Action No.	**1**
Responsibility	**DOELG** [23]
Action	Implement a wide-ranging 10 year awareness campaign on recycling, expanding the *It's Easy to Make a Difference* scheme, as described in Section 8.
Effects	Higher public awareness on environmental issues. Higher support for recycling schemes.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	**2**
Responsibility	**Local authorities**
Action	Implement effective and long term local awareness raising campaigns, with elements outlined in Section 8.
Effects	Greater public awareness. Greater public support for recycling schemes.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

[23] DOELG: Department of Environment and Local Government; DES: Department of Education and Science; DETE: Department of Employment, Trade and Enterprise; DF: Department of Finance

Action No.	**3**
Responsibility	**Local authorities**
Action	Employ adequate number of environmental education/training offers to significantly increase environmental awareness levels in each region.
Effects	Greater public awareness. Greater public support for recycling schemes.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	**4**
Responsibility	**Industry**
Action	Industry to use eco-label systems on their products and packaging.
Effects	Improvement in recycled product markets. More efficient usage of resources in products and packaging.
Priority	YES
When	SHORT TERM
Type	CONCRETE
Public cost	NO

Action No.	**5**
Responsibility	**DOELG/DES**
Action	Include environmental issues, including waste, in curricula of primary, secondary and tertiary educational systems.
Effects	Higher public awareness on environmental issues. Higher support for recycling schemes.
Priority	YES
When	MEDIUM TERM
Type	CONCRETE
Public cost	YES

Action No.	**6**
Responsibility	**DOELG**
Action	Greater public participation approach when drafting new policies, strategies, plans etc.
Effects	Greater support for national actions relating to the environment Better policies, strategies, plans etc.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**7**
Responsibility	**DOELG**
Action	Greater openness and transparency in decision making relating to waste and recycling.
Effects	Greater support for national actions relating to the environment. Better policies, strategies, plans etc.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**8**
Responsibility	**All public agencies**
Action	Training of all relevant public agency staff of waste reduction and recovery issues.
Effects	Greater employee awareness and knowledge. Much reduced levels of public agency waste.
Priority	NO
When	MEDIUM TERM
Type	CONCRETE
Public cost	YES

Action No.	**9**
Responsibility	**DOELG**
Action	Better communication of national policies, plans, strategies etc. to all stakeholders.
Effects	Greater support for national actions relating to the environment. Better policies, strategies, plans etc.
Priority	NO
When	MEDIUM TERM
Type	ASPIRATIONAL
Public cost	YES

Action No.	**10**
Responsibility	**Local authorities**
Action	All relevant local authority employees to be trained in waste prevention and recovery issues.
Effects	Greater employee awareness and knowledge. Much reduced levels of local authority waste.
Priority	NO
When	MEDIUM TERM
Type	CONCRETE
Public cost	YES

Action No.	**11**
Responsibility	**Local authorities**
Action	Greater public participation approach when drafting new policies, strategies, plans etc.
Effects	Greater support for local actions relating to the environment. Less NIMBY factor and hostility to infrastructural development. Better policies, strategies, plans etc.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**12**
Responsibility	**Local authorities**
Action	Greater public participation approach when drafting new policies, strategies, plans etc.
Effects	Greater support for national actions relating to the environment. Better policies, strategies, plans etc.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**13**
Responsibility	**Local authorities**
Action	Greater openness and transparency in decision making relating to waste and recycling.
Effects	Greater support for national actions relating to the environment. Better policies, strategies, plans etc.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**14**
Responsibility	**Local authorities**
Action	Better communication of local policies, plans, strategies etc. to all stakeholders.
Effects	Greater support for national actions relating to the environment. Better policies, strategies, plans etc.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**15**
Responsibility	**Industry**
Action	All employees to be trained on waste prevention and recovery issues.
Effects	Greater employee awareness and knowledge. Much reduced levels of industrial waste.
Priority	NO
When	SHORT TERM
Type	CONCRETE
Public cost	NO

Action No.	**16**
Responsibility	**Industry**
Action	Better stakeholder approach when drafting new policies, strategies, plans etc.
Effects	Greater support from stakeholders when implementing plans, actions etc. Greater trust of local communities, regulators etc. Less hostility to activities relating the environment.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**17**
Responsibility	**Recyclers**
Action	Greater public participation approach when planning better infrastructure, new facilities etc.
Effects	Less local hostility towards new facilities. Greater level of recycling and usage of facilities.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**18**
Responsibility	**Recyclers**
Action	Better communication to public of plans, new facilities, operations etc.
Effects	Less local hostility towards new facilities. Greater level of recycling and usage of facilities.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**19**
Responsibility	**REPAK**
Action	Continue to improve communications with stakeholders, including public on recycling issues.
Effects	Improve trust in REPAK scheme. Increase recovery levels.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**20**
Responsibility	**REPAK**
Action	Increase openness, transparency and participation levels in the development of initiatives, plans, and fees.
Effects	Improve trust in REPAK scheme. Increase recovery levels.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**21**
Responsibility	**NGOs**
Action	Increase involvement in waste plans and projects with local authorities and government.
Effects	Increase awareness levels and improve trust.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**22**
Responsibility	**NGOs**
Action	Increase public awareness levels, especially at local level of issues relating to waste recovery and recycling.
Effects	Increase awareness levels and increase recycling.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

Action No.	**23**
Responsibility	**General Public**
Action	Inform themselves on waste related issues and best options.
Effects	Reduction of waste generated. Increase of waste recovered. Increase in markets for recycled products.
Priority	NO
When	WHEN REQUIRED
Type	ASPIRATIONAL
Public cost	NO

9.4.2 Information based actions

The following information based actions are recommended in order to increase the information levels and knowledge base of all relevant stakeholders, in particular the recycling industry.

Action No.	**24**
Responsibility	**DOELG and other stakeholders**
Action	Implement a Market Development Programme to acquire and disseminate information regarding markets for waste streams; The programme will also disseminate grants and financial support for market development issues; The programme will work with recyclers and others to develop markets; The programme will develop and disseminate standards and quality criteria relating to recyclates and products from recyclates; adequate provision of resources, expertise and funding required.
Effects	Better and more markets for recyclates and recycled products. More and better informed investment in processing facilities. Better value for potential investors in recycling.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	**25**
Responsibility	**DOELG and other stakeholders**
Action	Development of service to acquire, store and disseminate information relating to waste issues.
Effects	More information available to all stakeholders regarding waste options. Greater knowledge among recyclers and potential investors in the recycling industry. More support for potential investors. Better decisions regarding potential markets etc.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	**26**
Responsibility	**Local authorities**
Action	Support national programme on market development and promote the programme at a local level.
Effects	Greater local recycling initiatives. More local solutions to local problems. More viable public private partnerships.
Priority	YES
When	IMMEDIATE
Type	ASPIRATIONAL
Public cost	NO

Action No.	**27**
Responsibility	**Industry**
Action	Development of standards and quality criteria relating to recyclates as a raw material suitable for usage in industry.
Effects	Greater trade in recyclates. Greater usage of recyclates as a raw material in industry. Greater production of products from recyclates.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**28**
Responsibility	**Industry**
Action	Greater importance placed on environment in design and production decisions.
Effects	More recyclable products. Greater reuse of products. Cheaper disassembly of waste products.
Priority	YES
When	IMMEDIATE
Type	ASPIRATIONAL
Public cost	NO

Action No.	**29**
Responsibility	**Industry**
Action	Increase level of waste related research to reduce industrial waste production and increase recovery.
Effects	Reduction in amounts of waste generated. Increase amounts of material recycled. Increase markets for recycled products.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**30**
Responsibility	**Recyclers**
Action	Development of standards and quality criteria to facilitate the use of recyclates and recycled products in appropriate circumstances.
Effects	Greater trade in recyclates. Greater usage of recyclates as a raw material. Greater production of products from recyclates. Greater markets for products made from recycled materials.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**31**
Responsibility	**Recyclers**
Action	Utilise national programme for market development.
Effects	Better information for potential investments. Better quality products and more viable products developed. Economic supports for potential investments.
Priority	YES
When	MEDIUM TERM
Type	ASPIRATIONAL
Public cost	NO

Action No.	**32**
Responsibility	**EPA/DOELG**
Action	Continue to develop adequate data regarding waste arisings, recovery, disposal etc.
Effects	Improve understanding of the waste situation in Ireland.
Priority	YES
When	IMMEDIATE
Type	ONGOING
Public cost	YES

Action No.	**33**
Responsibility	**EPA/DOELG**
Action	Co-ordinate increased levels of appropriate research regarding waste prevention and recovery.
Effects	Improve understanding of issues regarding prevention and recovery. Create confidence in the recycling industry. Increase recovery levels and markets for recyclates and products.
Priority	YES
When	IMMEDIATE
Type	ONGOING
Public cost	YES

Action No.	**34**
Responsibility	**Local Authorities**
Action	Increase level of waste related research to investigate awareness, information, economic, infrastructural, and legislative requirements.
Effects	Improve understanding of local issues regarding prevention and recovery. Create confidence among local communities regarding recycling. Increase segregation and recovery levels and markets for recyclates and products.
Priority	YES
When	IMMEDIATE
Type	ONGOING
Public cost	YES

Action No.	**35**
Responsibility	**REPAK**
Action	Facilitate training programmes for all member companies to increase waste prevention and recovery.
Effects	Improve relations between REPAK and members. Improve knowledge base of members. Reduction in waste arisings and growth in recovery.
Priority	NO
When	IMMEDIATE
Type	ONGOING
Public cost	NO

Action No.	**36**
Responsibility	**REPAK**
Action	Increase market development focus and co-fund market related projects from research, pilot schemes etc.
Effects	Improve markets for recyclates and recycled products.
Priority	NO
When	IMMEDIATE
Type	ONGOING
Public cost	NO

Action No.	**37**
Responsibility	**Local authorities**
Action	Dissemination of information to potential recyclers or users of recycled materials.
Effects	Greater local recycling initiatives. More local solutions to local problems.
Priority	NO
When	MEDIUM TERM
Type	ONGOING
Public cost	YES

9.4.3 Economic based actions

The following actions are recommended in order to develop the economic base within which the recycling industry can prosper in Ireland, improving the trade in recyclates and products manufactured from recycled materials.

Action No.	**38**
Responsibility	**DOELG**
Action	In conjunction with the other key stakeholders, secure the implementation of producer responsibility initiatives within the respective sectors for the various streams of waste.
Effects	Reduction in non-packaging waste generated. More efficient use of all resources, not just packaging. Potential creation of funding to develop other recycling measures and instruments.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	39
Responsibility	DOELG
Action	In the absence of producer responsibility initiatives being implemented within the various sectors, put into place mechanisms for the introduction of product charges on non-packaging waste generating products. Product charges should be a priority target for newspapers, office paper, etc.
Effects	Reduction in non-packaging waste generated. More efficient use of all resources, not just packaging. Creation of funding to develop other recycling measures and instruments.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	40
Responsibility	DOELG
Action	Investigate the effects of extending the responsibility obligations in the packaging sector by a reduction of the threshold for obligated waste packaging producers (as Major Producers) to 10 tonnes per annum.
Effects	Reduction in packaging waste generated. Increase in packaging waste recovered.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	41
Responsibility	DOELG
Action	Review the conditions established for REPAK to operate as an Approved Body in the certification of the scheme by the Minister to include for specified numerical targets for the recycling and recovery of packaging waste in the period 2002 to 2005.
Effects	Reduction in landfill dependency. Increase in packaging waste recovered.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**42**
Responsibility	**DOELG/DF**
Action	Investigate the removal of VAT on recyclates and the reduction of VAT on recycled products.
Effects	Boost values of recyclates making recovery more economically feasible. Boost value of recycled products making them more cost effective than those from raw materials.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**43**
Responsibility	**DOELG**
Action	Increase landfill levy by a substantial amount in year 2003.
Effects	Decreases amounts sent to landfill. Makes recycling more cost effective and boosts amounts of segregated waste available. Greater resources for supporting recycling. Greater levels of recycling locally.
Priority	YES
When	SHORT TERM
Type	CONCRETE
Public cost	NO

Action No.	**44**
Responsibility	**Local Authorities**
Action	Substantially increase landfill charges by end of year 2002.
Effects	Decreases amounts sent to landfill. Makes recycling more cost effective and boosts amounts of segregated waste available. Greater resources for supporting recycling. Greater levels of recycling locally.
Priority	YES
When	SHORT TERM
Type	CONCRETE
Public cost	NO

Action No.	**45**
Responsibility	**DOELG**
Action	Implement grant aid schemes for recycling projects, infrastructure, research etc.
Effects	Makes recycling more cost effective and boosts amounts of segregated waste available. Makes infrastructural development possible and more cost effective. Increases level of recycling.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	**46**
Responsibility	**DOELG and all government and public agencies**
Action	DOELG to provide guidance documents to all government and public agencies who would then develop and implement detailed green procurement policies.
Effects	Increase in markets for recyclates and recycled products.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**47**
Responsibility	**DOELG and all government and public agencies**
Action	DOELG to provide guidance documents to all government and public agencies who would then develop plans to significantly increase their waste recovery levels.
Effects	Increase amounts of material recycled.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**48**
Responsibility	**Local authorities**
Action	Implement weight/volume related charges (pay-as-you-throw) schemes, so that larger domestic waste producers pay more (these charges must not be regressive).
Effects	Reduction in waste creation. Increase in domestic waste recovery.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**49**
Responsibility	**Local authorities**
Action	All local authorities to apply the guidance issued by central government and to ensure that all its agencies and departments develop and implement a green procurement policy.
Effects	Increase in markets for recyclates and recycled products.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**50**
Responsibility	**Local authorities**
Action	All local authorities to apply the guidance issued by central government and to ensure that all its agencies and departments recover their waste.
Effects	Increase amounts of waste recovered.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**51**
Responsibility	**Local authorities**
Action	All local authorities to avail of public private partnerships for waste segregation, collection, and recycling as well as the development of infrastructure.
Effects	Increase amounts of waste recovered. Increase markets for recyclates and recycled products.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**52**
Responsibility	**Industry**
Action	Reduce level of green glass usage for container glass.
Effects	Increase recovery levels of glass.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**53**
Responsibility	**Industry**
Action	Accept responsibility for the production of manufacturing waste and the waste arising from products. Accordingly, implement producer responsibility initiatives designed to reduce the level of waste production and put into place measures to ensure that waste which is generated from products is collected for recycling, in particular to support new Irish recycling facilities, such as a paper mill or mills.
Effects	Reduction of industrially generated waste produced. Increase in waste recovery.
Priority	YES
When	IMMEDIATE
Type	ASPIRATIONAL
Public cost	NO

Action No.	**54**
Responsibility	**Industry**
Action	Develop green procurement policies within industry, in particular to support new Irish recycling facilities, such as a paper mill or mills.
Effects	Increase in markets for recyclates and recycled products.
Priority	YES
When	IMMEDIATE
Type	ASPIRATIONAL
Public cost	NO

Action No.	**55**
Responsibility	**DOELG**
Action	Carry out discussions with Environment officials from Northern Ireland with a view to developing joint projects and infrastructural development.
Effects	Improve economies of scale. Increase recovery levels, especially in Border Regions.
Priority	YES
When	ONGOING
Type	CONCRETE
Public cost	NO

Action No.	**56**
Responsibility	**Recyclers**
Action	Develop public private partnerships with local authorities.
Effects	Improve access to segregated waste streams. Improve cost-effectiveness of collection and recycling of waste.
Priority	NO
When	AS REQUIRED
Type	CONCRETE
Public cost	NO

9.4.4 Infrastructural support based actions

The following direct actions are recommended for the support of infrastructural development to improve segregation, collection and recycling of waste:

Action No.	**57**
Responsibility	**DOELG**
Action	Significantly increase direct funding and support of local authorities for infrastructural development for segregation, collection and recycling facilities.
Effects	Increase amounts of material recycled.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	**58**
Responsibility	**DOELG/DETE/Enterprise Ireland**
Action	Undertake a detailed feasibility study, with particular reference to the potential for a producer responsibility initiative, in relation to the possible development of a paper mill in Ireland in partnership with industry, local authorities, recyclers and other stakeholders.
Effects	Increase amounts of paper recycled.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	**59**
Responsibility	**Local authorities**
Action	Local authorities to implement kerbside collection schemes for dry recyclables in urban areas.
Effects	Increase amounts of waste recovered.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	60
Responsibility	**Local authorities**
Action	Local authorities to develop bring site numbers to a level of 1 bring site per 500 persons.
Effects	Increase amounts of waste recovered.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	61
Responsibility	**Local authorities**
Action	Local authorities to extend materials collected in bring sites, to include: textiles, plastics, food cans, UBCs .
Effects	Increase amounts of waste recovered.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	YES

Action No.	62
Responsibility	**REPAK**
Action	Develop national infrastructure by co-funding with local and national government.
Effects	Improve segregation, collection and recycling infrastructure.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	63
Responsibility	**NGOs**
Action	Actively support improvements in infrastructure from bring sites etc.
Effects	Improved infrastructure for segregation, collection, recovery.
Priority	NO
When	IMMEDIATE
Type	ONGOING
Public cost	NO

9.4.5 Legislative based actions

The following actions are recommended in order to improve the legislative base under which the landfilling of waste is minimised, the levels of recovered waste can develop, and the markets for recyclates and products made from recyclates can be increased.

Action No.	**64**
Responsibility	**DOELG**
Action	Implement a national landfill ban on all materials for which adequate bring sites or collection facilities are nationally in place.
Effects	Increase amounts of material recycled.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**65**
Responsibility	**DOELG**
Action	Streamline planning regulations to facilitate the early development of substantial additional bring sites.
Effects	Increase amounts of material recycled.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**66**
Responsibility	**Local authorities**
Action	Implement a local landfill ban for all material streams for which adequate bring sites or collection facilities are in place.
Effects	Increase amounts of material recycled.
Priority	YES
When	IMMEDIATE
Type	CONCRETE
Public cost	NO

Action No.	**67**
Responsibility	**Local authorities**
Action	Ensure total enforcement of waste packaging regulations within each region.
Effects	Increase amounts of material recycled.
Priority	YES
When	IMMEDIATE
Type	ASPIRATIONAL
Public cost	YES

Action No.	**68**
Responsibility	**Local authorities**
Action	Ensure that only legal waste disposal occurs within each region.
Effects	Increase amounts of material recycled.
Priority	YES
When	IMMEDIATE
Type	ASPIRATIONAL
Public cost	YES

9.5 Recommended Actions for Stakeholders

It is important that each relevant stakeholder group should be involved in any strategy, both in the development and implementation stages. Every stakeholder group identified in Section 7.5 has a role to play and should act accordingly. The actions relating to the five main component elements of the strategy (awareness, information, economy, infrastructure, legislation) are detailed above. Specific to each stakeholder group the following actions should be seriously considered for implementation.

National Government

The following actions should be seriously considered for implementation by the relevant elements of national government:

1. Enunciate a national strategy for sustainable waste management.
2. Allocate specific responsibility for implementation of the various elements of the strategy, with the provision of required authority/powers and resources.
3. Implement a wide-ranging awareness campaign on recycling, expanding and building upon the *It's Easy to Make a Difference* scheme, as described in Section 8 of this report.
4. Implement a Market Development Programme to acquire and disseminate information regarding markets for waste streams; the programme will also disseminate grants and financial supports for market development issues; the programme will work with recyclers and other to develop markets; the programme will promote standards and quality criteria relating to recyclates and products from recyclates; adequate resources, expertise and funding required to be provided.
5. Develop a service to acquire, store and disseminate information relating to waste issues.
6. In conjunction with the other key stakeholders, secure the implementation of producer responsibility initiatives within the respective sectors for the various streams of waste.
7. In the absence of producer responsibility initiatives being implemented within the various sectors, investigate potential mechanisms for the introduction of product charges on non-packaging waste generating products. Product charges should be a priority target for newspapers, office paper, etc.
8. Review the conditions established for REPAK to operate as an Approved Body in the certification of the scheme by the Minister to include for specified numerical targets for the recycling and recovery of packaging waste in the period 2002 to 2005.

9. Investigate the effects of extending the responsibility obligations in the packaging sector by a reduction of the threshold for obligated waste packaging producers (as Major Producers) to 10 tonnes per annum.
10. Investigate the removal of VAT on recyclates and the reduction of VAT on recycled products.
11. Increase landfill levy by a substantial amount in year 2003.
12. Implement grant aid and financial assistance schemes in support of worthwhile recycling projects, infrastructure, research etc.
13. DOELG to provide guidance documents to all government and public agencies who would then develop and implement detailed green procurement policies.
14. DOELG to provide guidance documents to all government and public agencies who would then develop plans to significantly increase their waste recovery levels.
15. Carry out discussions with Environment officials from Northern Ireland with a view to developing joint projects and infrastructural development.
16. Significantly increase direct funding and support of local authorities for infrastructural development for segregation, collection and recycling facilities.
17. Undertake a detailed feasibility study, with particular reference to the potential for a producer responsibility initiative, in relation to the possible development of a paper mill in Ireland in partnership with industry, local authorities, recyclers and other stakeholders.
18. Implement a national landfill ban on all materials for which adequate bring sites or collection facilities are nationally in place.
19. Streamline planning regulations to facilitate the early development of substantial additional bring sites.
20. Increase level of waste related research to investigate awareness, information, economic, infrastructural, and legislative requirements.
21. Include environmental issues, including waste, in curricula of primary, secondary and tertiary educational systems.
22. Ensure greater public participation approach when drafting new policies, strategies, plans etc.
23. Ensure greater openness and transparency in decision making relating to waste and recycling.
24. Provide better communication of national policies, plans, strategies etc. to all stakeholders.
25. Implement training of all relevant public agency staff of waste reduction and recovery issues.

Local Government

The following actions should be seriously considered for implementation by local authorities, within their regions:

1. Implement effective and long term local awareness raising campaigns, with elements outlined in Section 8 of this report.
2. Employ adequate number of environmental education/training offers to significantly increase environmental awareness levels in each region.
3. Support national programme on market development and promote the programme at a local level.

4. Substantially increase landfill charges by end of year 2002.
5. Implement weight/volume related charges (pay-as-you-throw) schemes, so that larger domestic waste producers pay more (these charges must not be regressive).
6. All local authorities to apply the guidance issued by central government and to ensure that all its agencies and departments develop and implement a green procurement policy.
7. All local authorities to apply the guidance issued by central government and to ensure that all its agencies and departments recover their waste.
8. All local authorities to avail of public private partnerships for waste segregation, collection, and recycling as well as the development of infrastructure.
9. Local authorities to implement kerbside collection schemes for dry recyclables in urban areas.
10. Local authorities to develop bring site numbers to a level of 1 bring site per 500 persons.
11. Local authorities to extend materials collected in bring sites, to include: textiles, plastics, food cans, UBCs.
12. Implement a local landfill ban for all material streams for which adequate bring sites or collection facilities are in place.
13. Ensure total enforcement of waste packaging regulations within each region.
14. Ensure that only authorised waste disposal occurs within each region.
15. Increase level of waste related research to investigate *local* awareness, information, economic, infrastructural, and legislative requirements.
16. Greater public participation approach when drafting new policies, strategies, plans etc.
17. Greater openness and transparency in decision making relating to waste and recycling.
18. Better communication of local policies, plans, strategies etc. to all stakeholders.
19. Training of all relevant local authority staff of waste reduction and recovery issues.
20. Promotion of standards and quality criteria relating to recyclates and products from recyclates.
21. Dissemination of information to potential recyclers or users of recycled materials.

Industry

The following actions should be seriously considered for implementation by industry in order to improve its performance in all sectors, vis-à-vis waste production, recovery, reuse, recycling and the usage of recyclates and recycled products in industry:

1. Develop green procurement policies within industry, in particular to support new Irish recycling facilities, such as a paper mill or mills.
2. Accept responsibility for the production of manufacturing waste and the waste arising from products. Accordingly, implement producer responsibility initiatives designed to reduce the level of waste production and put into place measures to ensure that waste which is generated from products is collected for recycling, in particular to support new Irish recycling facilities, such as a paper mill or mills.
3. All employees to be trained on waste prevention and recovery issues.
4. Development of standards and quality criteria relating to recyclates as a raw material suitable for usage in industry.
5. Greater importance placed on environment in design and production decisions.
6. Reduce level of green glass usage for container glass.
7. Industry to use eco-label systems on their products and packaging.
8. Increase level of waste related research to reduce industrial waste production and increase recovery.
9. Better stakeholder approach when drafting new policies, strategies, plans etc.

Recyclers

The following actions should be seriously considered for implementation by recyclers to support the development of that industry and to ensure a significant trade in recyclates and recycled products in Ireland:

1. Develop public private partnerships with local authorities.
2. Utilise national programme for market development.
3. Development of standards and quality criteria to facilitate the use of recyclates and recycled products in appropriate circumstances.
4. Better communication to public of plans, new facilities, operations etc.
5. Greater public participation approach when planning better infrastructure, new facilities etc.

Environmental Protection Agency

The following actions should be seriously considered for implementation by the EPA to support the development of the national recycling strategy:

1. Continue to develop adequate data regarding waste arisings, recovery, disposal etc.
2. Co-ordinate increased levels of appropriate research regarding waste prevention and recovery.
3. Play a major role in the development and implementation of national strategy on sustainable waste management and the coordination of waste recovery strategy.

REPAK

The following actions should be seriously considered for implementation by REPAK to improve the recovery levels of packaging waste in Ireland and the development of viable markets for recyclates and recycled products:

1. Develop national infrastructure by co-funding with local and national government.
2. Maintain and improve the level of recovery of packaging waste from commercial/industrial sources while steadily increasing the focus on domestic packaging waste recovery.
3. Facilitate training programmes for all member companies to increase waste prevention and recovery.
4. Increase market development focus and co-fund market related projects from research, pilot schemes etc.
5. Continue to improve communications with stakeholders, including public on recycling issues.
6. Increase openness, transparency and participation levels in the development of initiatives, plans, and fees.

Environmental Experts

There is a range of environmental experts in Ireland. These are part of industry, recycling organisations, private consultancies, NGOs, local or national government, the general public, the EPA, academic organisations, research agencies etc. These experts have a role to play in the strategy, carrying out the following actions:

1. Carry out prevention and recovery related research and disseminate results.
2. Implement pilot and other schemes regarding recyclate usages.
3. Co-operate with other stakeholder to increase knowledge base.

Non-Governmental Organisations (NGOs)

The following actions are required from NGOs to support the improved recovery, reuse and recycling levels in Ireland:

1. Actively support improvements in the waste recycling infrastructure including improved collection and reprocessing facilities.
2. Increase involvement in waste plans and projects with local authorities and government.
3. Play an active role in the development and implementation of the national strategy.
4. Increase public awareness levels, especially at local level of issues relating to waste recovery and recycling.

The General Public

Everyone must play their part and accept responsibility for their actions. The following actions should be seriously considered for implementation by the general public:

1. Buy recycled goods and goods with less packaging and recycled packaging.
2. Segregate waste and make it available for recovery using collection schemes, brings sites, etc.
3. Inform themselves on waste related issues and best options and the best practical options to be taken by them at a local level.

10 Summary and Main Findings

It is clear from the best available data that the arisings of waste in Ireland are very high and that the rate of growth of these arisings is unsustainable. It is vital, therefore, that Ireland, as a matter of urgency, implements a national waste prevention plan, whereby the growth rates of waste arisings is firstly halted, and ultimately reversed.

It is also clear that the recovery rate for the reuse and recycling of this waste in Ireland leaves a great deal of room for improvement. At present the rate of waste recovery is much lower than international norms and is also well below our national targets. The recovery levels for all waste streams considered (glass, textiles, ferrous metals, paper, cardboard, plastic, non-ferrous metals, aluminium, wood and used beverage cartons) are less than acceptable.

A study of the current outlets for the recovered municipal solid waste streams considered shows that such outlets are being utilised for all these streams, both in Ireland and abroad, with the exception of used beverage cartons. A variety of such outlets for the various materials was identified and analysed in this study. Wood is the only material that is recycled solely in Ireland, currently no waste wood is being exported for recycling. All the container glass recovered in Ireland is also recycled, either in the Republic of Ireland or in a facility in Northern Ireland. However, many of the outlets for other waste streams are abroad, and this sometimes adversely affects the viability of their long-term usage for a variety of reasons.

The situation regarding the export of large volumes of waste paper, cardboard and plastic in particular is problematic. There is an urgent and major requirement to increase the Irish facilities to recycle these waste streams.

Several potential new outlets for each waste stream were identified and analysed as part of this study. While some of these are more viable than others, many such outlets are worth considering, all of which are being widely utilised in other countries with higher recycling levels than Ireland.

The barriers to recycling in Ireland were also identified and analysed as part of this study. This analysis considered current general barriers to waste recovery and also specific barriers to each material waste stream. Many of these barriers are having a deleterious effect on the viability of developing a widespread culture of recycling in Ireland.

In order to overcome these barriers, a strategic approach is recommended, whereby all the required elements for a major increase in the recovery and recycling of waste can be put into place and the forces and drivers to achieve this can be managed effectively and proactively. A variety of key stakeholder groups are identified in this study, whose active participation is of paramount importance.

Three levels are recommended in this strategy. At the widest level is the strategy itself in order to create a sustainable culture of recycling in Ireland. Within the strategy, and driving it, a range of tools and policy instruments are required in order to develop the proper awareness, information, economic, infrastructural and legislative conditions necessary for a higher rate of recycling. Several such recommended tools and instruments are identified and described in this report.

However, in order to bring about and deliver these instruments, several specific actions are required by the various main stakeholders. The carrying out of these actions delivers

the tools and instruments required to put into place the framework for widespread recycling. These stakeholder groups and their required actions are identified and described in this report. In particular, a range of actions is required from National Government, Local Government, Industry, Recyclers, the EPA, REPAK, Environmental Experts, NGOs and the General Public. In all, 79 such actions are recommended in the main body of this report so that these stakeholder groups can play their role in the development of recycling in Ireland.

All stages of the recycling chain (supply, collection, processing and demand) must be developed in Ireland. All are interdependent and mutually supportive, and all require positive actions by a range of stakeholders, using a carrot and stick approach, to solve the problem.

This overall strategy to create stable, long-term recycling markets for Irish waste streams must be developed and co-ordinated properly. In particular, allocation of responsibility and provision of adequate resources are required to drive forward the actions necessary to create the conditions under which a sustainable recycling system can prosper in Ireland.

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